

COURSE STRUCTURE AND SYLLABUS

For

COMPUTER SCIENCE AND ENGINEERING

(Applicable for batches admitted from 2016-2017)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year - I Semester

| S. No. | Subjects | L | T | P | Credits |
|----------------------|--|----|----|----|-----------|
| 1-HS | English – I | 4 | -- | -- | 3 |
| 2-BS | Mathematics - I | 4 | -- | -- | 3 |
| 3-BS | Mathematics – II (Mathematical Methods) | 4 | -- | -- | 3 |
| 4-BS | Applied Physics | 4 | -- | -- | 3 |
| 5 | Computer Programming | 4 | -- | -- | 3 |
| 6-ES | Engineering Drawing | 4 | -- | -- | 3 |
| 7-HS | English - Communication Skills Lab - 1 | -- | -- | 3 | 2 |
| 8-BS | Applied / Engineering Physics Lab | -- | -- | 3 | 2 |
| 9-ES | Applied / Engineering Physics – Virtual Labs – Assignments | -- | -- | 2 | -- |
| 10 | Computer Programming Lab | -- | -- | 3 | 2 |
| Total Credits | | | | | 24 |

I Year - II SEMESTER

| S. No. | Subjects | L | T | P | Credits |
|----------------------|--|----|----|----|-----------|
| 1-HS | English – II | 4 | -- | -- | 3 |
| 2-BS | Mathematics - III | 4 | -- | -- | 3 |
| 3-BS | Applied Chemistry | 4 | -- | -- | 3 |
| 4 | Object Oriented Programming through C++ | 4 | -- | -- | 3 |
| 5-HS | Environmental Studies | 4 | -- | -- | 3 |
| 6-ES | Engineering Mechanics | 4 | -- | -- | 3 |
| 7-BS | Applied / Engineering Chemistry Laboratory | -- | -- | 3 | 2 |
| 8-HS | English - Communication Skills Lab – 2 | -- | -- | 3 | 2 |
| 9 | Object Oriented Programming Lab | -- | -- | 3 | 2 |
| Total Credits | | | | | 24 |

II Year - I Semester

| S. No. | Subjects | L | T | P | Credits |
|----------------------|--|----|----|----|-----------|
| 1-HS | Statistics with R Programming | 4 | -- | -- | 3 |
| 2 | Mathematical Foundations of Computer Science | 4 | -- | -- | 3 |
| 3 | Digital Logic Design | 4 | -- | -- | 3 |
| 4 | Python Programming | 4 | -- | -- | 3 |
| 5 | Data Structures through C++ | 4 | -- | -- | 3 |
| 6 | Computer Graphics | 4 | -- | -- | 3 |
| 7 | Data Structures through C++Lab | -- | -- | 3 | 2 |
| 8 | Python Programming Lab | -- | -- | 3 | 2 |
| Total Credits | | | | | 22 |

II Year - II Semester

| S. No. | Subjects | L | T | P | Credits |
|----------------------|--------------------------------------|----|----|----|-----------|
| 1 | Software Engineering | 4 | -- | -- | 3 |
| 2 | Java Programming | 4 | -- | -- | 3 |
| 3 | Advanced Data Structures | 4 | -- | -- | 3 |
| 4 | Computer Organization | 4 | -- | -- | 3 |
| 5 | Formal Languages and Automata Theory | 4 | -- | -- | 3 |
| 6 | Principles of Programming Languages | 4 | -- | -- | 3 |
| 7 | Advanced Data Structures Lab | -- | -- | 3 | 2 |
| 8 | Java Programming Lab | -- | -- | 3 | 2 |
| Total Credits | | | | | 22 |

III Year - I Semester

| S. No. | Subjects | L | T | P | Credits |
|----------------------|---|----|----|----|-----------|
| 1 | Compiler Design | 4 | -- | -- | 3 |
| 2 | Unix Programming | 4 | -- | -- | 3 |
| 3 | Object Oriented Analysis and Design using UML | 4 | -- | -- | 3 |
| 4 | Database Management Systems | 4 | -- | -- | 3 |
| 5 | Operating Systems | 4 | -- | -- | 3 |
| 6 | Unified Modeling Lab | -- | -- | 3 | 2 |
| 7 | Operating System & Linux Programming Lab | -- | -- | 3 | 2 |
| 8 | Database Management System Lab | -- | -- | 3 | 2 |
| MC | Professional Ethics & Human Values | -- | 3 | -- | -- |
| Total Credits | | | | | 21 |

III Year - II Semester

| S. No. | Subjects | L | T | P | Credits |
|----------------------|--|----|----|----|-----------|
| 1 | Computer Networks | 4 | 2 | -- | 3 |
| 2 | Data Warehousing and Mining | 4 | -- | -- | 3 |
| 3 | Design and Analysis of Algorithms | 4 | -- | -- | 3 |
| 4 | Software Testing Methodologies | 4 | -- | -- | 3 |
| 5 | Open Elective: i. Artificial Intelligence ii. Internet of Things iii. Cyber Security iv. Digital Signal Processing v. Embedded Systems vi. Robotics | 4 | -- | -- | 3 |
| 6 | Network Programming Lab | -- | -- | 3 | 2 |
| 7 | Software Testing Lab | -- | -- | 3 | 2 |
| 8 | Data Warehousing and Mining Lab | -- | -- | 3 | 2 |
| 9 | IPR & Patents | -- | 2 | -- | -- |
| Total Credits | | | | | 21 |

IV Year - I Semester

| S. No. | Subjects | L | T | P | Credits |
|----------------------|--|----|----|----|-----------|
| 1 | Cryptography and Network Security | 4 | -- | -- | 3 |
| 2 | Software Architecture & Design Patterns | 4 | -- | -- | 3 |
| 3 | Web Technologies | 4 | -- | -- | 3 |
| 4- HS | Managerial Economics and Financial Analysis | 4 | -- | -- | 3 |
| 5 | Elective-I i. Big Data Analytics ii. Information Retrieval Systems iii. Mobile Computing | 4 | -- | -- | 3 |
| 6 | Elective-II i. Cloud Computing ii. Software Project Management iii. Scripting Languages | 4 | -- | -- | 3 |
| 7 | Software Architecture & Design Patterns Lab | -- | -- | 3 | 2 |
| 8 | Web Technologies Lab | -- | -- | 3 | 2 |
| Total Credits | | | | | 22 |

IV Year - II Semester

| S. No. | Subjects | L | T | P | Credits |
|----------------------|---|----|----|----|-----------|
| 1 | Distributed Systems | 4 | -- | -- | 3 |
| 2- HS | Management Science | 4 | -- | -- | 3 |
| 3 | Machine Learning | 4 | -- | -- | 3 |
| 4 | Elective-III i. Concurrent and Parallel Programming ii. Artificial Neural Networks iii. Operations Research | 4 | -- | -- | 3 |
| 5 | Seminar | -- | 3 | -- | 2 |
| 6 | Project | -- | -- | -- | 10 |
| Total Credits | | | | | 24 |

Total Course Credits = 48+44 + 42 + 46 = 180

SYLLABUS

| | | | | |
|----------------------------|----------|----------|----------|----------|
| I Year - I Semester | L | T | P | C |
| | 4 | 0 | 0 | 3 |

ENGLISH - I

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.

5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

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.

4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regulations)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. ' Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. ' The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved because animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

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|----------------------------|----------|----------|----------|----------|
| I Year - I Semester | L | T | P | C |
| | 4 | 0 | 0 | 3 |

MATHEMATICS-I (Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jacobian and minima of functions of two variables.

UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax} V(x)$, $xV(x)$ - Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

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|----------------------------|----------|----------|----------|----------|
| I Year - I Semester | L | T | P | C |
| | 4 | 0 | 0 | 3 |

MATHEMATICS-II (Mathematical Methods)
(Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Compute interpolating polynomial for the given data.
3. Solve ordinary differential equations numerically using Euler's and RK method.
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

UNIT I: Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II: Interpolation:

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

UNIT IV: Fourier Series:

Introduction- Periodic functions – Fourier series of π -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

UNIT V: Applications of PDE:

Method of separation of Variables- Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

UNIT VI: Fourier Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath and P.Vijayalakshmi**, Mathematical Methods, Himalaya Publishing House.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - I Semester

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | 0 | 3 |

APPLIED PHYSICS (CSE, ECE, EEE, IT, EIE, E.Com.E)

OBJECTIVES: *Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:*

- *Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.*
- *Teach Concepts of coherent sources, its realization and utility optical instrumentation.*
- *Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.*
- *Understand the physics of Semiconductors and their working mechanism for their utility in sensors.*

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton’s rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit - Cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III

POLARIZATION: Types of Polarization – Methods of production - Nicol Prism - Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).

LASERS: Characteristics– Stimulated emission – Einstein’s Transition Probabilities- Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV

ELECTROMAGNETIC FIELDS: Scalar and Vector Fields – Electric Potential- Gradient, Divergence of fields – Gauss and Stokes theorems-Propagation of EM waves through dielectric medium.

UNIT-V

QUANTUM MECHANICS: Introduction - Matter waves – Schrödinger Time Independent and Time Dependent wave equations – Particle in a box.

FREE ELECTRON THEORY: Defects of Classical free electron theory –Quantum Free electron theory - concept of Fermi Energy.

UNIT-VI

BAND THEORY OF SOLIDS: Bloch's theorem (qualitative) – Kronig – Penney model – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

SEMICONDUCTOR PHYSICS: Conduction – Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors

Outcome: Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.

Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshira sagar, S.Chand & Company Ltd., (2014)
2. 'Solid State Physics' by A.J.Dekker, Mc Millan Publishers (2011)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Applied Physics by P.K.Palanisamy, Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014)

I Year - I Semester

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | 0 | 3 |

COMPUTER PROGRAMMING

Learning objectives:

Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:

History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:

Introduction to C Programming- Identifiers, The main () Function, The printf () Function

Programming Style - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.

Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:

Arrays & Strings

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices

Strings: String Fundamentals, String Input and Output String Processing, Library Functions

UNIT-VI:

Pointers, Structures, Files

Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, BI Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

I Year - I Semester

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| 4 | 0 | 0 | 3 |

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

- To introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.
- To introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

UNIT I Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.

UNIT II Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.

UNIT III Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

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

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

UNIT VI Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Text Books:

1. Engineering Drawing, N. D. Butt, Chariot Publications
2. Engineering Drawing, K. L. Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics, P.I. Varghese, McGraw Hill Publishers

Reference Books:

1. Engineering Graphics for Degree, K. C. John, PHI Publishers
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

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|----------------------------|----------|----------|----------|----------|
| I Year - I Semester | L | T | P | C |
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ENGLISH - COMMUNICATION SKILLS LAB - I

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks
Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
Practice work.

UNIT 4:

1. Letters and Sounds
Practice work.

UNIT 5:

1. The Sounds of English
Practice work.

UNIT 6:

1. Pronunciation
 2. Stress and Intonation
- Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 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 the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

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

The rubric to assess the learners:

| | Body language | | Fluency & Audibility | Clarity in Speech | Neutralization of accent | Appropriate Language | | Total 10 marks | Remarks |
|--|---------------------|-------------|----------------------|-------------------|--------------------------|----------------------|--------------------------|----------------|---------|
| | Gestures & Postures | Eye Contact | | | | Grammar | Vocabulary & expressions | | |
| | | | | | | | | | |

- **Lab Assessment: Internal (25 marks)**
 1. Day-to-Day activities: 10 marks
 2. Completing the exercises in the lab manual: 5 marks
 3. Internal test (5 marks written and 5 marks oral)
- **Lab Assessment: External (50 marks)**
 1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording.
 2. Oral: Reading aloud a text or a dialogue- 10 marks
 3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - I Semester

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APPLIED/ENGINEERING PHYSICS LAB

(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements*

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APPLIED/ENGINEERING PHYSICS - VIRTUAL LABS – ASSIGNMENTS
(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

I Year - I Semester

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COMPUTER PROGRAMMING LAB

OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics

- a) What is an OS Command, Familiarization of Editors - vi, Emacs
- b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math

- a) Write a C Program to Simulate 3 Laws at Motion
- b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I

- a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- b) Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II

- a) Write a C Program to Find Whether the Given Number is
 - i) Prime Number
 - ii) Armstrong Number
- b) Write a C program to print Floyd Triangle
- c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

- a) Write a C Program demonstrating of parameter passing in Functions and returning values.
- b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

- a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case

b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of $\sin x$ and $\cos x$ and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays

Demonstration of arrays

- a) Search-Linear.
- b) Sorting-Bubble, Selection.
- c) Operations on Matrix.

Exercises - 9 Structures

- a) Write a C Program to Store Information of a Movie Using Structure
- b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

- a) Write a C Program to Access Elements of an Array Using Pointer
- b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

- a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

Exercise – 12 Strings

- a) Implementation of string manipulation operations **with** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare
- b) Implementation of string manipulation operations **without** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare

Exercise -13 Files

- a) Write a C programming code to open a file and to print its contents on screen.
- b) Write a C program to copy files

Exercise - 14 Files Continued

- a) Write a C program merges two files and stores their contents in another file.
- b) Write a C program to delete a file.

Exercise - 15

- a) System Assembling, Disassembling and identification of Parts / Peripherals. b) Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

Exercise - 16

- a) MS-Office / Open Office
- i) Word - Formatting, Page Borders, Reviewing, Equations, symbols.
 - ii) Spread Sheet - organize data, usage of formula, graphs, charts.
 - iii) Powerpoint - features of power point, guidelines for preparing an effective presentation.
- b) Network Configuration & Software Installation-Configuring TCP/IP, Proxy, and firewall settings. Installing application software, system software & tools.

OUTCOMES:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

Note:

- a) All the Programs must be executed in the Linux Environment. (Mandatory)**
- b) The Lab record must be a print of the LATEX (.tex) Format.**

I Year - II Semester

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ENGLISH -II

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.

5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

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.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 (**R-16 Regulations**)

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL:THE GREAT INDIAN SCIENTISTS Published by **Cengage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. 'A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. 'A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME: The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. 'The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. 'Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - II Semester

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MATHEMATICS-III (Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordan- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.

Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.

Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Applications: Evaluation of integrals.

