**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**
KAKINADA – 533 003, Andhra Pradesh, India

**DEPARTMENT OF AGRICULTURAL ENGINEERING**

# COURSE STRUCTURE AND SYLLABUS

## For UG – R20

## B. TECH - AGRICUTLTURAL ENGINEERING

*(Applicable for batches admitted from 2020-2021)*

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

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## DEPARTMENT OF AGRICULTURAL ENGINEERING

# COURSE STRUCTURE

### I Year – I SEMESTER

| S. No. | Course Code | Subject | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | BS1101 | Mathematics – I (Calculus & Differential Equations) | 3 | 0 | 0 | 3 |
| 2 | BS1102 | Principles of Soil Science and Agronomy | 3 | 0 | 0 | 3 |
| 3 | HS1101 | Communicative English | 3 | 0 | 0 | 3 |
| 4 | ES1103 | Engineering Workshop and IT Workshop | 1 | 0 | 4 | 3 |
| 5 | BS1108 | Engineering Physics | 3 | 0 | 0 | 3 |
| 6 | HS1102 | English Communication Skills Laboratory | 0 | 0 | 3 | 1.5 |
| 7 | BS1102 | Soil Science and Agronomy Field Lab | 0 | 0 | 3 | 1.5 |
| 8 | BS1109 | Engineering Physics Laboratory | 0 | 0 | 3 | 1.5 |
| | **Total Credits** | | | | | **19.5** |

### I Year – II SEMESTER

| S. No. | Course Code | Subject | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | BS1201 | Mathematics – II (Linear Algebra & Numerical Methods) | 3 | 0 | 0 | 3 |
| 2 | BS1210 | Engineering Chemistry | 3 | 0 | 0 | 3 |
| 3 | ES1204 | Engineering Mechanics | 3 | 0 | 0 | 3 |
| 4 | ES1201 | Programming for Problem Solving Using C | 3 | 0 | 0 | 3 |
| 5 | ES1103 | Engineering Drawing | 3 | 0 | 0 | 3 |
| 6 | ES1202 | Programming for Problem Solving Using C Lab | 0 | 0 | 3 | 1.5 |
| 7 | BS1211 | Engineering Chemistry Laboratory | 0 | 0 | 3 | 1.5 |
| 8 | ES1220 | Machine Drawing and Computer Graphics Laboratory | 0 | 0 | 3 | 1.5 |
| 9 | MC1201 | Environmental Science | 2 | 0 | 0 | 0 |
| | **Total Credits** | | | | | **19.5** |

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| I Year - I Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **MATHEMATICS-I (BS)** (Calculus & Differential Equations)<br>**(Common to all Branches for I Year B. Tech)** | | | | | |

**Course Objectives:**

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5 )

**UNIT – I: Sequences, Series and Mean value theorems: (10 hrs)**

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

**UNIT – II: Differential equations of first order and first degree: (10 hrs)**

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

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

**UNIT – III: Linear differential equations of higher order: (10 hrs)**

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type $e^{ax}$, sin ax, cos ax, polynomials in $x^n$, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

Applications: LCR circuit, Simple Harmonic motion.

**UNIT – IV: Partial differentiation: (10 hrs)**

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and MacLaurin's series expansion of functions of two variables.

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

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**UNIT – V: Multiple integrals:** **(8 hrs)**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.
Applications: Finding Areas and Volumes.

**Text Books:**

1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

**Reference Books:**

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

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| I Year - I Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **PRINCIPLES OF SOIL SCIENCE AND AGRONOMY (BS)** | | | | | |

**Objective:** To impart Knowledge on Soil genesis, properties etc, so as to enable students to design implements in related to soil, soil conservation, irrigation and drainage applications. Also, to enable students to understand farming principles, to grow agricultural field and orchard crop and farming practices.

**Unit I:** **(10 h)**

Soil: Definition –soil as a three phase four component system-branches of Soil science difference between surface and sub surface soil, Rocks: Definition – classification of rocks based on mode of formation-igneous sedimentary and metamorphic rocks, Minerals: Definition, classification, primary, secondary, essential, accessory, silicate, non-silicate minerals, light and heavy minerals primary silicate minerals; quartz, feldspars-micas pyroxenes amphiboles secondary silicate; secondary minerals, Ca, Mg, S and Micronutrient containing minerals-chemical formulate, Weathering:- Definition-types of weathering physical weathering of rocks, agents of physical weathering, temperature, water, wind and glaciers, Chemical weathering, solution, hydration, hydrolysis carbonation-oxidation-reduction biological weathering role of plants and animals in weathering.

Soil formation: Soil forming factors –active and passive soil factors and their role in soil formation, Soil forming processes: Elluviation, illuviation, humification, calcification, laterization, podzolozation, salinization, alkalization and gleization, Soil Profile, Detailed description of theoretical soil profile, Soil physical properties: Soil separates and their properties. Specific surface, soil texture-definition-textural classes-methods of determination of soil texture, importance of soil structure,

**Unit II:** **(10 h)**

Soil structure; Definition-classification based on type, class and grade, factors influencing formation of aggregates-importance and management of soil structure, Soil structure; Definition-classification based on type, class and grade-factors influencing formation of aggregates-importance and management of soil structure, Soil consistency; Definition-forms of consistency and importance of soil consistency, Bulk density and particle density; factors influencing and their importance; porosity –types-calculation-importance, Soil water; structure of water and the effect of H-bonding on properties of water retention of water in soils-soil moisture tension-soil moisture potential –soil moisture constants.

Soil water movement; saturated, unsaturated and vapor flows, laws governing water flow-Darcy's and Poiseuille's law- Infiltration; Factors-importance. Evaporation; Factors influencing evaporation- Ways to minimize it-soil mulch-organic mulch, etc., Soil air; Composition of soil air-processes of gaseous exchange –soil aeration indices –and their importance (oxygen content-ODR-aeration porosity-redox potential) management of soil air, Soil temperature; influence of soil temperature on plant growth-factors influencing soil temperature-management of soil temperature. Soil color determination importance, Soil colloids: Definition-general properties-inorganic and organic colloids origin of charge on colloids (positive &negative).

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**Unit-III:** **(10 h)**

Secondary silicate clay minerals (inorganic soil colloids) Kaolinite montmoriloniteillite their structures and properties, Ion exchange, Cation and anion exchange –factors influencing ion exchange capacity of soils importance of ion exchange calculation of base saturation and exchangeable acidity, Soil organic matter: importance of organic matter CN ration of organic matter and its importance, Soil biology;- Soil flora and fauna their characteristics role of beneficial organisms mineralization–immobilization, nitrogen fixation, nitrification, denitrification, solubilization of phosphorus and sulphur, Soil fertility:- Concepts of soil fertility and soil productivity:- definitions and differences Arnon's criteria of essentiality-essential and beneficial elements-factors influencing availability of nutrients. Problem Soils: Definition – Physical problems soil depth slope soil crust soil compaction drainage submergence (formation-adverseeffects-effectonsoilpropertiesandplantgrowthmanagement), Chemical problems– classification acid, saline, saline saline-sodic and calcareous soils-characteristics-nutrient availability in problem soils and their reclamation.

**Unit-IV:** **(10 h)**

Irrigation water: Quality of irrigation water-classification based on EC, SAR, RSC and Boron content-use of saline waters in agriculture, Soil taxonomy: New comprehensive system of soil classification ($7^{th}$ approximation) soil orders and their characteristics, Important soil groups of India: Alluvial soils-black soils –red soils laterite soils and coastal soils.

Meaning and scope of agronomy, History of agricultural development in ancient India, Agriculture in civilization era, National and International Agricultural Research Institutes in India, Classification of crops, Classification of field crops, According to Origin, Botanical Commercial, Economical, seasonal, Ontogeny, Agronomic, Lead Morphology and Special Purpose crops, Definition of climate and weather, Definition of meteorology, Climatology, Agri-meteorology, Introduction, scope and practical utility of Agricultural meteorology, composition and structure of atmosphere, Influence of weather on crop grain development, essential Resources for crop production, factors influencing plant growth, Biotic and Abiotic factors, Crop seasons, Kharif, Rabi and summer seasons in A.P.-Agro-climatic zones of A.P. and India.

**Unit-V:** **(8 h)**

Tillage and tilth, Objective of tillage, characteristic of good seed bed, effect of tillage on soil properties (Pore space, texture, structure, bulk density, color of the soil), Types of Tillage, preparatory cultivation, inter cultivation, after cultivation and preparatory cultivation for lowland rice pudding, implement used for seed bed preparation, sowing, inter-cultivation and special operation, Sowing, Methods of sowing, time and depth of sowing of major agricultural crops, Methods and time of application of manure and fertilizers.

Weeds- Influence of weeds on crop production, principles and practices of weed management, Basics on soil plant-water relationship, Types of Soil Erosion, Factors influencing soil erosion, Soil conservation, erosion preventive measures, Agronomic measures for soil and water conservation, Dry land Agriculture, Problems of Crop production in dry farming, Agronomic measure in reducing evapo-transpiration losses, Watershed management, aims and Objectives, Organic farming-Sustainable Agriculture, Definition, Principles and importance.

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**TEXT BOOKS:**

1. Principles of Agronomy, Yella Manda Reddy T & Shankar Reddy, Publications.
2. Nature and Properties of soils. Brady Nyle C and Ray R Well 2002. Pearson Education Inc., New Delhi.
3. Fundamental of Soil Science. Indian Society of Soil Science 1988. IARI, New Delhi.

**REFERENCES:**

1. Meteorology, William L Donn, 1965, McGraw-Hill Book. Co. New York.
2. Crop Production in Dry Regions, Arnon L 1972, Leonard Hill Publishing Co., London.
3. Manures and Fertilizers, Yawalkar K S and Agrawal J P, 1977, Agricultural Horticultural Publishing House, Nagpur.
4. Principle of Weed Science, Rao V S, 1992, Oxford and IBH Publishing Co. Ltd., New Delhi.
5. Soil Fertility and Fertilizers, Tisdale S L, Nelson W L, Beaton J D and Havlin J L 1995. Prentice-Hall of India, New Delhi.
6. Introduction to Soil Physics, Hillel D 1982. Academic Press, London.

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| I Year - I Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **COMMUNICATIVE ENGLISH (HS)** | | | | | |

**Introduction**

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

**Course Objectives**

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

**Learning Outcomes**

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

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

**Unit 1:**

**Lesson-1: A Drawer full of happiness** from "**Infotech English**", Maruthi Publications

**Lesson-2: Deliverance by Premchand** from "**The Individual Society",**Pearson Publications. (Non-detailed)

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**Listening:** Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.

**Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

**Reading:** Skimming text to get the main idea. Scanning to look for specific pieces of information.

**Reading for Writing:** Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

**Vocabulary:** Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

**Grammar:** Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

**Pronunciation**: Vowels, Consonants, Plural markers and their realizations

**Unit 2:**

**Lesson-1: Nehru's letter to his daughter Indira on her birthday** from "**Infotech English**", Maruthi Publications

**Lesson-2: Bosom Friend by Hira Bansode** from "**The Individual Society",** Pearson Publications.(Non-detailed)

**Listening:** Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

**Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

**Reading for Writing**: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

**Vocabulary**: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

**Grammar**: Use of articles and zero article; prepositions.

**Pronunciation**: Past tense markers, word stress-di-syllabic words

**Unit 3:**

**Lesson-1: Stephen Hawking-Positivity 'Benchmark'** from "**Infotech English**", Maruthi Publications

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**Lesson-2: Shakespeare's Sister by Virginia Woolf** from "**The Individual Society",** Pearson Publications.(Non-detailed**)**

**Listening:**Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

**Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed.Functional English:Complaining and Apologizing.

**Reading**: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.

**Reading for Writing**: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.

**Vocabulary**: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

**Grammar**: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

**Pronunciation**: word stress-poly-syllabic words.

**Unit 4:**

**Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography** from "**Infotech English**", Maruthi Publications

**Lesson-2: Telephone Conversation-Wole Soyinka** from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

**Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

**Reading**: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

**Reading for Writing**: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.

**Vocabulary**: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

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**Grammar**: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

**Pronunciation**: Contrastive Stress

**Unit 5:**

**Lesson-1: Stay Hungry-Stay foolish** from "**Infotech English**", Maruthi Publications

**Lesson-2: Still I Rise by Maya Angelou** from "**The Individual Society",** Pearson Publications.(Non-detailed)

**Listening:** Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

**Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.

**Reading**: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.

**Reading for Writing**: Writing academic proposals- writing research articles: format and style.

**Vocabulary**: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

**Grammar**: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

**Pronunciation**: Stress in compound words

**Prescribed text books for theory for Semester-I:**

**1.** "**Infotech English**", Maruthi Publications. (Detailed)

**2.**"**The Individual Society",** Pearson Publications.(Non-detailed)

**Prescribed text book for Laboratory for Semesters-I & II:**

1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

**Reference Books:**


- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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| I Year - I Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 1 | 0 | 4 | 3 |
| **ENGINEERING WORKSHOP AND IT WORKSHOP** | | | | | |

## Engg Workshop

**Course Objective: To impart hands-on practice on basic engineering trades and skills.**
**Note: At least two exercises to be done from each trade.**

**Unit 1:**
Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes or operations in wood working; Introduction to Smithy tools and operations; Introduction to welding, types of welding, Oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Casting processes; Classification, constructional details of center lathe, Main accessories and attachments.

**Unit 2:**
Main operations and tools used on center lathes. Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations.

**Unit 3:**
Types of drilling machines. Constructional details of pillar types and radial drilling machines. Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes. Types and classification. Constructional details and principles of operation of column and knee type universal milling machines. Plain milling cutter. Main operations on milling machine.

**Practical**
**Trade:**

| | |
|---|---|
| **1. Carpentry** | 1. T-Lap Joint |
| | **2.** Cross Lap Joint |
| | **3.** Dovetail Joint |
| | **4.** Mortise and Tenon Joint |
| **2. Fitting** | 1. Vee Fit |
| | 2. Square Fit |
| | 3. Half Round Fit |
| | 4. Dovetail Fit |
| **3. Black Smithy** | 1. Round rod to Square |
| | 2. S-Hook |
| | 3. Round Rod to Flat Ring |
| | 4. Round Rod to Square headed bolt |
| **4. House Wiring** | 1. Parallel / Series Connection of three bulbs |
| | 2. Stair Case wiring |
| | 3. Florescent Lamp Fitting |
| | 4. Measurement of Earth Resistance |
| 5. **Tin Smithy** | 1. Taper Tray |
| | 2. Square Box without lid |
| | 3. Open Scoop |
| | 4. Funnel |
| 6. **IT Workshop** | 1. Assembly & Disassembly of Computer |

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# IT WORKSHOP:

## COURSE OBJECTIVES:

The objective of IT Workshop is to

1. Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
2. Demonstrate basic command line interface commands on Linux
3. Teach the usage of Internet for productivity and self-paced lifelong learning
4. Describe about Compression, Multimedia and Antivirus tools
5. Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

## Computer Hardware:

**Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones:** Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

## Operating Systems:

**Experiment 2: Internet Services:**

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn
- Source control on Github, Hackerrank, Codechef, HackerEarth, etc.
- Google hangout/ Skype/ gotomeeting video conferencing
- archive.org for accessing archived resources on the web

## Productivity Tools:

**Experiment 3:** Demonstration and Practice on archival and compression tools

- scanning and image editing tools
- OCR and text extraction
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

## Office Tools:

**Experiment 4:** Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc.
**Experiment 5:** Demonstration and practice on Microsoft Word, Power Point
**Experiment 6:** Demonstration and practice on Microsoft Excel.
**Experiment 7:** Demonstration and practice on LaTeX and produce professional pdf documents.
**Experiment 8:** Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud using Google Drive
- Document creation and editing text documents in your web browser using Google docs
- Handle task lists, create project plans, analyze data with charts and filters using Google Sheets
- Create pitch decks, project presentations, training modules using Google Slides
- Manage event registrations, create quizzes, analyze responses using Google Forms
- Build public sites, internal project hubs using Google Sites
- Online collaboration through cross-platform support using Jamboard
- Keep track of important events, sharing one's schedule, and create multiple calendars using Google Calendar

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**TEXT BOOKS:**

1. Computer Fundamentals, Anita Goel, Pearson Education, 2017
2. PC Hardware Trouble Shooting Made Easy, TMH

**REFERENCES:**

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Vekateswarlu, S. Chand

**WEB RESOURCES:**

1. https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
2. https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc
3. https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
4. https://www.pcsuggest.com/basic-linux-commands/
5. https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
6. https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/
7. https://gsuite.google.com/learning-center/products/#!/

**COURSE OUTCOMES:**

Students should be able to:

1. Assemble and disassemble components of a PC
2. Construct a fully functional virtual machine, Summarize various Linux operating system commands,
3. Secure a computer from cyber threats, Learn and practice programming skill in Github, Hackerrank, Codechef, Hacker Earth, etc.
4. Recognize characters & extract text from scanned images, Create audio files and podcasts
5. Create video tutorials and publishing, Use office tools for documentation, Build interactive presentations, Build websites, Create quizzes & analyze responses.

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| I Year - I Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **ENGINEERING PHYSICS (ES)** | | | | | |

**Unit-I: Wave Optics** **12hrs**

**Interference:** Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications -Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

**Diffraction:** Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits(Qualitative) – Grating - Dispersive power and resolving power of Grating(Qualitative).

**Polarization:** Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

**Unit Outcomes:**

**The students will be able to**

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

**Unit-II: Lasers and Fiber optics** **10hrs**

**Lasers:** Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion –Lasing action- Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

**Fiber optics:** Introduction –Principle of optical fiber- Acceptance Angle-Numerical Aperture-Classification of optical fibers based on refractive index profile and modes –Propagation of electromagnetic wave through optical fibers - Applications.

**Unit Outcomes:**

**The students will be able to**

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
- **Identify** the applications of optical fibers in various fields (L2)

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**UNIT III: Engineering Materials** **8hrs**

**Dielectric Materials:** Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation- Piezoelectricity.

**Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization- Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of
magnetic materials: Dia, para, Ferro, antiferro & Ferrimagnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

**Unit Outcomes:**

**The students will be able to**

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic devices (L3)

**Unit-IV: Acoustics and Ultrasonics** **10hrs**

**Acoustics**: Introduction – requirements of acoustically good hall– Reverberation – Reverberation time– Sabine's formula (Derivation using growth and decay method) - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

**Ultrasonics:** Introduction - Properties - Production by magnetostriction and piezoelectric methods
– Detection - Acoustic grating - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications.

**Unit Outcomes:**

**The students will be able to**

- **Explain** how sound is propagated in buildings (L2)
- **Analyze** acoustic properties of typically used materials in buildings (L4)
- **Recognize** sound level disruptors and their use in architectural acoustics (L2)
- **Identify** the use of ultrasonics in different fields (L3)

**Unit-V: Crystallography and X-ray diffraction** **8hrs**

**Crystallography**: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattice – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

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**X- ray diffraction:** Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

**Unit Outcomes:**

**The students will be able to**

- **Classify** various crystal systems (L2)
- **Identify** different planes in the crystal structure (L3)
- **Analyze** the crystalline structure by Bragg's X-ray diffractometer (L4)
- **Apply** powder method to measure the crystallinity of a solid (L4)

**Text books:**

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.
3. Engineering Physics by P.K.Palanisamy SciTech publications.

**Reference Books:**

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics – M.R.Srinivasan, New Age Publications
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
4. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press

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| I Year - I Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| **ENGLISH COMMUNICATION SKILLS LABORATORY (HS)** | | | | | |

## TOPICS

**UNIT I:**

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

**UNIT II:**

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

**UNIT III:**

Stress in compound words,rhythm, intonation,accent neutralisation.

**UNIT IV:**

Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

**UNIT V:**

Newspapers reading;Understanding and identifying key terms and structures useful for writing reports.

**Prescribed text boo**k: "**Infotech English**", Maruthi Publications.

**References:**

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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## DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - I Semester | | L | T | P | C |
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| | | 0 | 0 | 3 | 1.5 |
| **SOIL SCIENCE AND AGRONOMY FIELD LAB** | | | | | |

**PART-A**

To impose the knowledge of student on soil genesis, soil farming process structure, soil organic matte and chemical operation, etc.

It is helpful to the student to design farm implement in relation to soil and to maintain in soil health.

It is fine to the students to know the analyst of irrigation water, based on quality suitable crops will be selected.

**PART-B**

1. To enable the students to grow suitable agricultural crops and orchard crops and all farming practices.
2. To understand the soil, crop and machine specific parameters for design and development of forms machinery equipment & implements.
3. Students will be acquainted with seed processing equipment, soil and water engineering activating for efficient water and land producing and upcoming organic farming activity.

**PART-A**

Choose any six labs

1. Study of soil profile and collection of soil samples
2. Determination of bulk density ad particle density of soils
3. Determination of soil texture
4. Determination of Proctor moisture content
5. Determination of soil moisture at different tensions
6. Determination of hydraulic conductivity of soil
7. Determination of infiltration rate soil
8. Determination of soil strength and soil colour
9. Determination of pH and EC of soils
10. Determination of organic carbon content in soils
11. Estimation of available P & K of soils
12. Determination of anions and cations in irrigation water

**PART-B**

Choose any six labs

1. Visit to college farm
2. Study of meteorological instruments
3. Measurement of rainfall and evaporation
4. Practice of ploughing
5. Practice of pudding
6. Identification of crops and seeds
7. Identification of manures and fertilizers
8. Seed bed preparation for nursery
9. Practice of sowing
10. Soil moisture estimation by direct method
11. Practice of fertilizer application
12. Practice of intercultivation
13. Practice of weeding
14. Practice of harvesting

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| I Year - I Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| **ENGINEERING PHYSICS LABORATORY (BS)** | | | | | |

**(For All Non-Circuital Branches like ME, CE, Chemical etc)**

(Any 10 of the following listed experiments)

**List of Engineering Physics Experiments:**

1. Laser: Determination of wavelength using diffraction grating.
2. Young's modulus of given material by Strain gauge method.
3. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.
4. Determination of ultrasonic velocity in given liquid (Acoustic grating).
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Estimation of Planck's constant using photoelectric effect.
8. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
9. Determination of numerical aperture and acceptance angle of an optical fiber.
10. Determination of thickness of thin object by wedge method.
11. Determination of radius of curvature of given plano convex lens by Newton's rings.
12. Determination of wavelengths of different spectral lines in mercury spectrumusing diffraction grating in normal incidence configuration.
13. Determination of dispersive power of the prism.
14. Sonometer: Verification of laws of string.
15. Measurement of magnetic susceptibility by Kundt's tube method.

**References**:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **MATHEMATICS - II (BS)** (Linear Algebra & Numerical Methods)<br>**(Common to all Branches for I Year B. Tech)** | | | | | |

**Course Objectives:**

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

**UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)**

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

**Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10 hrs)**

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.
Singular values of a matrix, singular value decomposition (text book-3).

**UNIT – III: Iterative methods: (8 hrs)**

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

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**UNIT – IV: Interpolation: (10 hrs)**

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

**UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)**

Numerical differentiation using interpolating polynomial – Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series – Picard's method of successive approximations – Euler's method –Runge-Kutta method (second and fourth order).

**Text Books:**

1. **B. S. Grewal,** Higher Engineering Mathematics, $44^{th}$ Edition, Khanna Publishers.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **David Poole,** Linear Algebra- A modern introduction, $4^{th}$ Edition, Cengage.

**Reference Books:**

1. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. **M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
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| | | 3 | 0 | 0 | 3 |
| **ENGINEERING CHEMISTRY (BS1210)** | | | | | |

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

## COURSE OBJECTIVES

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Express*** the increases in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
  ***Classify and discuss*** the materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries. Lubrication is also ***summarized***.
- ***Relate*** the need of fuels as a source of energy to any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence introduced.
- ***Explain*** the importance and usage of water as basic material in almost all the industries; ***interpret*** drawbacks of steam boilers and also how portable water is supplied for drinking purposes.

## UNIT I: POLYMER TECHNOLOGY 8 hrs

***Polymerisation:-*** Introduction, methods of polymerization (emulsion and suspension), mechanical properties.
***Plastics:*** Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).
***Elastomers:-*** Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).
***Composite materials:*** Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

**Course Outcomes:** ***At the end of this unit, the students will be able to***

- ***Analyze*** the different types of composite plastic materials and ***interpret*** the mechanism of conduction in conducting polymers.

## UNIT II: ELECTROCHEMICAL CELLS AND CORROSION 10 hrs

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells ($H_2$-$O_2$, $CH_3OH$-$O_2$, phosphoric acid and molten carbonate).
***Corrosion:-***Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

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**Course Outcomes:** ***At the end of this unit, the students will be able to***

- ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to control corrosion.

**UNIT III: CHEMISTRY OF MATERIALS** **10 hrs**

**Part- A:**

***Nano materials:-*** Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]) with example ($TiO_2$), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

***Thermal analysis techniques***: Instrumentation and applications of thermogravimetric analysis (TGA), differential thermal analysis (DTA), differential scanning calorimetry (DSC).

**Part-B:**

***Refractories: -*** Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.

***Lubricants: -*** Definition, mechanism of lubricants, properties (definition and importance).

***Cement: -*** Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.

**Course Outcomes:** ***At the end of this unit, the students will be able to***

- ***Synthesize*** nanomaterials for modern advances of engineering technology.
- ***Summarize*** the techniques that detect and measure changes of state of reaction.
- ***Illustrate*** the commonly used industrial materials.

**UNIT IV: FUELS** **10 hrs**

Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, numerical problems, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch and Bergius), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, ethanol, methanol, natural gas, liquefied petroleum gas, compressed natural gas), Flue gas analysis by Orsat apparatus, rocket fuels.

**Course Outcomes:** ***At the end of this unit, the students will be able to***

- ***Differentiate*** petroleum, petrol, synthetic petrol and have knowledge how they are produced.
- ***Study*** alternate fuels and a***nalyse*** flue gases.

**UNIT V: WATER TECHNOLOGY** **8 hrs**

Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement), internal treatments, softening of hard water (zeolite process and related sums, ion exchange process), treatment of industrial waste water, potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).

**Course Outcomes:** ***At the end of this unit, the students will be able to***

- ***Analyze*** the suitable methods for purification and treatment of hard water and brackish water.

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**Standard Books:**


1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "**A Textbook of Engineering Chemistry**", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).


**Reference:**


1. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G. Palana, "**Engineering Chemistry**", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "**Textbook of Nanoscience and Nanotechnology**", University press (latest edition)

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **ENIGINEERING MECHANICS (BS1204)** | | | | | |

**Objectives:** The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

**UNIT I**

**Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.**
Introduction to Engg. Mechanics – Basic Concepts.
**Systems of Forces:** Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.
**Friction:** Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

**UNIT II**
**Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.**
**Equilibrium of Systems of Forces:** Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.

**UNIT III**
**Objectives: The students are to be exposed to concepts of center of gravity. The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.**
**Centroid:** Centroids of simple figures (from basic principles) – Centroids of Composite Figures
**Centre of Gravity:** Centre of gravity of simple body (from basic principles), center of gravity of composite bodies, Pappus theorems.
**Area moments of Inertia:** Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

**UNIT IV**
**Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.**
**Rectilinear and Curvilinear motion of a particle**: Kinematics and Kinetics- Work Energy method and applications to particle motion- Impulse momentum method.

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**UNIT – V**

**Objectives: The students are to be exposed to rigid motion kinematics and kinetics**

**Rigid body Motion:** Kinematics and kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse momentum method.

**TEXT BOOK:**

1. Engg. Mechanics - S. Timoshenko & D.H. Young., 4th Ed., McGraw-Hill publications.

**Course outcomes:**

1. The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2. He should be able to determine centroid for lines, areas and center of gravity for volumes and their composites.
3. He should be able to determine area and mass movement of inertia for composite sections
4. He should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **PROGRAMMING FOR PROBLEM SOLVING USING C (ES1201)** | | | | | |

**COURSE OBJECTIVES:**

**The objectives of Programming for Problem Solving Using C are**

1) To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2) To gain knowledge of the operators, selection, control statements and repetition in C
3) To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
4) To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5) To assimilate about File I/O and significance of functions

**UNIT I**

**Introduction to Computers:** Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

**Introduction to the C Language:** Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

**Structure of a C Program:** Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

**UNIT II**

**Bitwise Operators:** Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

**Selection & Making Decisions:** Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

**Repetition:** Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

**UNIT III**

**Arrays:** Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

**Strings:** String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

**Enumerated, Structure, and Union:** The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

**UNIT IV**

**Pointers:** Introduction, Pointers to pointers, Compatibility, L value and R value

**Pointer Applications:** Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

**Processor Commands**: Processor Commands

**UNIT V**

**Functions:** Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

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**Text Input / Output:** Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
**Binary Input / Output:** Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

**TEXT BOOKS:**

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE
2. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2ed, Pearson

**REFERENCES:**

1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

**COURSE OUTCOMES:**

Upon the completion of the course the student will learn

1) To write algorithms and to draw flowcharts for solving problems
2) To convert flowcharts/algorithms to C Programs, compile and debug programs
3) To use different operators, data types and write programs that use two-way/ multi-way selection
4) To select the best loop construct for a given problem
5) To design and implement programs to analyze the different pointer applications
6) To decompose a problem into functions and to develop modular reusable code
7) To apply File I/O operations

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **ENGINEERING DRAWING (ES1103)** | | | | | |

**Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is 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.**

**Unit I**

**Objective:** To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

**Polygons:** Constructing regular polygons by general methods, inscribing and describing polygons on circles.

**Curves:** Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normal for the curves.

**Scales:** Plain scales, diagonal scales and vernier scales

**Unit II**

**Objective:** To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

**Orthographic Projections:** Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to another plane.

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

**Unit III**

**Objective:** The objective is to make the students draw the projections of the plane inclined to both the planes.

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

**Unit IV**

**Objective:** The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

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

**Unit V**

**Objective:** The objective is 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.

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

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

**Note:** In the End Examination there will be no question from CAD.

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**TEXT BOOKS:**

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

**REFERENCE BOOKS:**

1. Engineering Drawing by K.L. Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGraw-Hill Publishers
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age

**Course Outcome:** The student will learn how to visualize 2D & 3D objects.

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| **PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1202)** | | | | | |

**Course Objectives:**

1) Apply the principles of C language in problem solving.
2) To design flowcharts, algorithms and knowing how to debug programs.
3) To design & develop of C programs using arrays, strings pointers & functions.
4) To review the file operations, preprocessor commands.

**Exercise 1:**

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

**Exercise 2:**

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

**Exercise 3:**

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

**Exercise 4:**

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

**Exercise 5:**

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

**Exercise 6:**

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

**Exercise 7:**

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

**Exercise 8:**

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

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**Exercise 9:**

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

**Exercise 10:**

1. Write a program in C to demonstrate the use of &(address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

**Exercise 11:**

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

**Exercise 12:**

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

**Exercise 13:**

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

**Exercise 14:**

1. 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
2. Write a program in C to convert decimal number to binary number using the function.

**Exercise 15:**

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

**Exercise 16:**

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

**Course Outcomes:**

**By the end of the Lab, the student**

1) Gains Knowledge on various concepts of a C language.
2) Able to draw flowcharts and write algorithms.
3) Able design and development of C problem solving skills
4) Able to design and develop modular programming skills.
5) Able to trace and debug a program

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| **ENGINEERING CHEMISTRY LABORATORY (BS1211)** | | | | | |

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard $Na_2CO_3$ solution.
2. Determination of alkalinity of a sample containing $Na_2CO_3$ and NaOH.
3. Determination of $Mn^{+2}$ using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of $Cu^{+2}$ using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of $Fe^{+3}$ by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of $Mg^{+2}$ present in an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

**Outcomes**: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

**Reference Books**

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| **MACHINE DRAWING AND COMPUTER GRAPHICS LABORATORY** | | | | | |

**Out comes:**

1. Practical skills on preparing manual drawings of model isometric view of the objects, machine components, assembly drawings of different joints.
2. Practice on drawing of missing views; principles of dimensions and their methods.
3. Practical skills on sectioning concepts and its drawing & mechanical parts.
4. Practical skills on types of rivet heads & parts, square headed and hexagonal nuts, bolts, different types lock nuts, stands machine screws.
5. Practical knowledge on components of CAD and its hardware requirements, terms & command in Auto CAD software for practice.
6. Practical skills on drawing of riveted joints and thread fasteners, computer graphics in agricultural engineering applications, practice of commands in Auto CAD software.
7. Practical skills on 2-D drawings and projects in Auto CAD.

**Course Objectives:**

1. Preparation of manual drawings with dimensions from Model and Isometric drawings of objects and machine components
2. Assembly drawings of machine components – Screw jack, knuckle joint, stuffing box and cotter joint
3. Drawing of missing views
4. Dimensioning methods and principles of dimensioning
5. Concept of sectioning, revolved and oblique section (Explanation of full sectioning and half sectioning concepts)
6. Sectional drawing of simple machine parts – Foot step bearing, shaft support, stuffing box
7. Types of rivet heads and riveted joints (Processes for producing leak proof joints, Symbols for different types of welded joints)
8. Square headed and hexagonal nuts and bolts
9. Different types of lock nuts, studs, machine screws
10. CAD System components and computer hardware for CAD
11. Explanation of draw tool bar commands in AutoCAD software
12. Drawing of riveted joints and thread fasteners
13. Computer graphics for agricultural engineering applications
14. Practice in the use of basic and drawing commands on AutoCAD
15. Generating simple 2-DdrawingswithdimensionsusingAutoCAD
16. Small projects using CAD

**REFERENCES:**


1. Elementary Engineering Drawing. Bhat. N.D. 1995. Charotar Publishing House, Anand.
2. MachineDrawing.BhattN.DandPanchalV.M.1995.CharotarPublishingHouse,Anand.
3. Machine Drawing. Narayana K.L. Kannaiah P. and Venkata Reddy K. 1996. New Age International Ltd., New Delhi.
4. Mastering CAD / CAM with Engineering Subscription Card. Ibhrahim Zeid, McGraw-Hill Science / Engineering / Math; 1st Edition (May 21,2004).
5. Principals of CAD / CAM / CAE/ Systems. Kunwoo Lee, Addison –Wesley.

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# DEPARTMENT OF AGRICULTURAL ENGINEERING

| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 0 |
| **ENVIRONMENTAL SCIENCE (MC1201)** | | | | | |

**Learning Objectives:**
The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

**UNIT-I:**
**Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects; Role of information technology in environment and human health.
**Ecosystems:** Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

**UNIT-II:**
**Natural Resources:** Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

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**UNIT-III:**

**Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

**UNIT – IV Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.

**Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

**UNIT – V Social Issues and the Environment:** Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act - Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

**Environmental Management**: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

**Text Books:**

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

**Reference:**

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014