JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

COURSE STURUCTURE - R10 (B.Pharm-I Year)

	I Semester	P	C		II Semester	P	C
1	**English – I Common with B.Tech.,**			**1**	**English – II Common with B.Tech.,**		
2	**English Proficiency Lab Common with B.Tech.,**			**2**	**English - Communication Skills Lab Common with B.Tech.,**		
3	Mathematics - I / Biology-I			3	Mathematics-II / Biology-II		
4	Biology Lab			4	Anatomy, Physiology & Health Education - II		
5	Anatomy, Physiology & Health Education - I			5	Anatomy, Physiology & Health Education Lab.		
6	Pharm. Inorganic Chemistry - I			6	Pharm Inorganic Chemistry- II		
7	Pharm Inorganic Chemistry Lab			7	Pharm. Organic Chemistry -II		
8	Pharm Organic Chemistry -I			8	Pharm. Organic Chemistry Laboratory		
9	Physical Pharmacy-I			9	Physical Pharmacy-II		
10	Computer Programming			10	Physical Pharmacy Lab		
11	Computer Lab			11	**Environmental Studies Common with B.Tech.,**		

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
Syllabus effective from 2010-2011

ENGLISH SYLLABUS FOR SEM. 1 & 2 of JNTU-K

Introduction

The major challenge of a language teaching in a technical institution is to prepare the student for employability through imparting language skills to develop communicative competence. The proficiency in English language is closely linked to 'good communication skills' more so in the recent times when employability is at stake for want of communication skills on the part of the students. Since skills and personal attributes are revealed through communication, the responsibility of grooming students in life skills is also emphasized as part of language teaching and learning.

The core key skills needed are:

- Communication
- Team Work
- Problem Solving
- Learning Skills

The personal attributes to be groomed are:

- Adaptability
- Commitment
- Enthusiasm
- Stress Management
- Integrity
- Sense of Humour
- Self-Motivation
- Reliability
- Self-esteem
- Personal Presentation

Since the inception of the Board of Studies for English, effort to design a Course Structure that would cater to the needs of a wide range of learner groups has been made. It was felt by the Board that the Course Structure has to take into consideration the above criteria and therefore the objectives of the Language course ought to be much focused.

Objectives

1: To improve the language proficiency of technical under graduates in English with emphasis on LSRW skills.

1.1: To provide learning environment to practice *listening, speaking, reading*, and *writing* skills within and beyond the classroom environment.

1.2: To assist the students to carry on the tasks and activities through guided instructions and materials.

2: To effectively integrate English language learning with employability skills and training.

2.1: To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.

The material may be culled from newspaper articles, advertisements, promotional material etc.

2.2: To provide hands-on experience through case-studies, mini-projects, group & individual presentations.

Each chapter will be structured with a short passage or collage of passages for reading. All further exercises and activities will draw upon the broad subject of the passage(s), and use **functional and situational approach**

Chapter / ***Grammar & vocabulary***	***Reading & comprehension***	***Listening & speaking***	***Core skills and personal attributes developed through the exercises***	***Objectives achieved through the exercises***	***Plan of evaluation***	
	Reading comprehension based on the passage(s): multiple-choice questions asking students to derive sense of a word from the context provided by a sentence, short questions asking students to sum up the key points of a passage, encouraging students to address not only explicit statement but also implied meaning.	Dialogues from situations related to what ***Writing and analysis*** has been encountered in the reading passages.; the dialogues may now be Instructions on how to lay out a piece of used in a role-play, and in groups, writing, and exercises where students may analyze them for meaning are asked to generate their own write-and implications, and ultimately engage in ups dialogues of their own making.			A three-tier system, allowing the student to work through self-assessment, assessment by peers, and finally, assessment by the teacher.	
Chapter – 1 .Read & Proceed The importance of the language used for communication: • Understanding the need for English in the wider world, and the opportunities afforded by a strong command of the language • Assessing one's level within the language, and understanding the ways in which grasp of the language can be bettered • Understanding the basic structure of the sentence. **English: subject – verb – object** - ***Functional grammar exercise:*** Students may discuss in groups or pairs when, why and where English is used. What, for example, if they have to face a job interview? Or make an official presentation in a State that does not use Telugu? Or even find their way in an unfamiliar city? **Possible areas of focus and evaluation:** • Making sentences from given keywords	Short extracts from: 1.An interview with Arundhati Roy 2.Jawaharlal Nehru's 'Tryst with Destiny' speech 3.Albert Einstein's essay 'The World As I See It'	Sentences Understanding and using the basic structure of the sentence in English (subject – verb – object); creating sentences; understanding the different kinds of sentences (whether a statement, or a question, or an exclamation, and so on)	**Small conversations between :** 1.A student and a hostel warden 2.An interviewer and an interviewee 3.Two friends together preparing for an oral examination at college	Communication teamwork, problem solving, learning skills	Enhanced learner-participation, development of linguistic proficiency	[Both Teacher's Manual and Sample Test Questions will be provided]

• Correcting the order of words to make sentences, noting how change in word order can affect meaning.						
Chapter 2. Travel Nouns, pronouns, and adjectives: • Understanding the kinds and uses of nouns • Understanding the use of pronouns to replace nouns • Understanding the ways in which nouns are qualified through adjectives • Understanding the kinds of adjectives, their degrees and their uses ***Functional grammar exercise:*** Students may be asked, in pairs, to plan a trip to a place of mutual interest. Each pair would then be encouraged to explain how and why they arrived at this choice. What words are used to identify – and distinguish – the proposed destination? What naming words are used? How those words are then qualified? How do the nouns (the naming words) and adjectives (the qualifiers) help to create a character and atmosphere for the place or site to be visited? Is it possible to build anticipation through such evocation? ***Potential areas of focus and evaluation:*** • Changing nouns to the related adjectives • Changing adjectives to the related nouns • Replacing nouns with pronouns while retaining the meaning of the sentence	Reading and analysis of short extracts from two or more of the following: 1.Vikram Seth, *From Heaven Lake* 2.Ruskin Bond, *Landor Days* 3.Rabindranath Tagore, *The Europe Traveller's Diary* 4.Pankaj Mishra, *Butter Chicken in Ludhiana*	**Paragraphs** Understanding the structure of a paragraph; retaining the thread of an argument; introducing the subject of the paragraph in the initial sentence; developing the argument in the next few sentences; drawing to a conclusion by reinforcing what has already been stated, but without introducing any new ideas towards the end; being brief and concise, but carrying all the information that needs to be conveyed	**Snippets of exchanges between:** 1.A tour guide and a tourist 2.A local inhabitant of a city and a visitor 3.A photographer and her friend, with the photographer telling about the places of interest she has been to in her recent travels	Communication, adaptability, sense of humour, reliability,	Functional approach to finding solutions, enhanced learner-participation, development of linguistic proficiency	[Both Teacher's Manual and Sample Test Questions will be provided]

Chapter 3. Gender Verbs and adverbs: • Understanding the placement of a verb within a sentence • Understanding tenses • Understanding the use of adverbs to describe verbs *Functional grammar exercise:* Students may be asked to consider recent news headlines for remarkable stories involving women. How are either the events or the women remarkable? What have these women done, or what do they do? What words of action are used to talk about the accomplishments of the women? How are actions of the past differentiated from actions of the present and actions yet to be performed? How (using what adverbs) are those actions qualified? ***Potential areas of focus and evaluation:*** • Changing verbs to the related adverbs	Reading and analysis of short extracts from four newspaper/journal pieces: 1. *The Telegraph* report on the 20-year old Burdwan girl who walked out of her marriage in revolt of her in-laws' demands for dowry 2. A perspective on astronaut Kalpana Chawla's achievement 3.The inspirational story of a young woman who survived child-marriage 4.Sudha Murthy's write on what it is possible for women to achieve	Essays and arguments Understanding that an essay or argument is a descriptive or persuasive piece of writing that needs to be organized as a succession of paragraphs; introducing the chief concerns in the first paragraph, and providing a layout of how the argument is going to be structured; developing the main thrust of the argument in the succeeding paragraphs; making smooth transitions between ideas and paragraphs(using appropriate connecting words or phrases); winding to a conclusion by drawing the various strings of the argument together	**Short exchanges between:** 1. Two friends, on an issue of contemporary interest 2. A reporter and a talk-show guest 3. A teacher and a student in school	Communication, teamwork, commitment, integrity, self-motivation, self-esteem	Enhanced learner-participation, development of linguistic proficiency, development of critical thinking	[Both Teacher's Manual and Sample Test Questions will be provided]

• Changing adverbs to the related verbs •Using verbs in their correct tenses, deriving the sense from the rest of the sentence						

Chapter 4. Disaster Management Articles and punctuation: • Understanding the uses of 'a', 'an', and 'the' • Understanding the uses of words/phrases expressing quantity, like 'some', 'a bit of', 'more', etc. • Understanding and using correct punctuation to convey meaning ***Functional grammar exercise:*** Students may be asked to imagine that in the aftermath of a natural disaster, they are part of a relief team effort. When asked to effectively identify the needs of the situation, how do they plan to go about providing necessary aid? Is *an* ambulance to be arranged for? Or *a* medical tent set up? Are *adequate* first-aid supplies available? Do *more* rations need to be fetched? Could there be a tie-up with *an* overseas relief organization?	Reading and analysis of a short piece on the tsunami	Official letters and emails Effectively using the format of official communication: providing one's own address and contact details, documenting the date and place from which the communication is sent, the salutation used for the addressee, the main body of the letter or email (keeping it comprehensive but to the point), and signing off	Dialogues between: 1.a social worker and an earthquake victim 2.two doctors working in an area afflicted by natural disaster 3.two school students campaigning to raise relief money	Communication, teamwork, problem solving, adaptability, stress management, reliability, integrity	Enhanced learner-participation, development of linguistic proficiency, functional approach to problem solving, enabling group work	[Both Teacher's Manual and Sample Test Questions will be provided]
Chapter 5 –Health Prepositions, conjunctions and exclamations: • Understanding the use of prepositions – words that connect verbs with their objects • Understanding that certain verbs use certain prepositions • Understanding the uses of common prepositions: to, for, at, by, of, and so on • Understanding the uses of conjunctio and exclamations ***Functional grammar exercise:*** Students may be asked to propose ways which healthier living might be attained eating better *and* exercising, drinking plenty *of* water, partaking fre vegetables *from* the Market, and so on. Possible exercises may be framed around: • Filling in blanks within sentences	Reading and analysis of three different kinds of writing, and comparisons between them: 1. A Government of India report on the success of nationwide campaigns for polio vaccination 2. A vegetarian's perspective on what makes for healthy living 3. An athlete's say on the benefits of lifelong exercise	**Reports** Learning the difference between an essay, for example, and a report; learning to identify the key points of an event or incident, and documenting them briefly but in a manner that conveys both the temper and the unfolding of the event; understanding what is meant by a 'target readership', and learning to tailor the piece to the needs of that readership	**Brief exchanges between:** 1. A father and his son/daughter, as he explains the importance of staying fit 2. A friends discussing the ideal diet 3. A campus counsellor and a student	Personal presentation, stress-management, commitment, enthusiasm,, self-motivation	Development of linguistic proficiency, functional approach to problem solving	[Both Teacher's Manual and Sample Test Questions will be provided]

• Distinguishing between different meanings possible through the use of different prepositions with the same verbs						

Chapter 6 Sports : Revision of all elements of grammar handled thus far, through evocative descriptions of State or national or international level sports stories, and discussion of them. ***Functional grammar exercise:*** Students may, in pairs, be asked to present an account of a memorable sports meet or game. The use of nouns pronouns, and adjectives should help to clarify exactly what event is being talked about. Judicious use of adjective will help provide the context: how important the game or match was, where it was held, and so on. In a brief account of the game, verbs and adverbs will be necessary to report exactly what happened. If the account has to be detailed and lively, students will be obliged to use the correct forms and tenses. Of course, throughout, not only will the right inflections and articles be necessary, so too will the precise use of prepositions.	Reading and analysis of two of four short pieces in depiction of: 1. Opportunities for men and women in sports 2. A decisive moment in a game 3. Expectation and failure 4. The attitude of sportsmanship	Presentations Learning to identify the key elements of any issue and putting them down as succinct points; structuring the points so that they may be elaborated on according to necessity; understanding the progression of points so that no important element is missed out, but also, repetitions are avoided	Small conversations between: 1. A fitness instructor and a trainee 2. Two friends discussing a possible career in sports 3. Two friends discussing their favorite game	Teamwork, integrity, self-motivation, self-esteem, commitment	Development of linguistic proficiency, functional approach to problem solving	[Both Teacher's Manual and Sample Test Questions will be provided]

Test Book: *Step by Step :; Learning Language and Life Skills by* Pearson Longman; Pearson Publishers
Lab Manual: Maruthi Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I/I Year B. Pharmacy **T P C**

Mathematics –I
(Biology stream students)

UNIT I

Algebra:
Arithmetic Progression-Geometric Progression- Permutations &combinations-Binomial theorem partial fractions-Matrices-Determinants-Application of determinants to solve simultaneous equations (Cramer's Rule).

UNIT II
Trigonometry: Trigonometric ratios and the relations between them Sin (A+B), Cos (A+B), Tan (A+B) formulae only. Trigonometric ratios of multiple angles-Heights and distances (simple 000 problems there on).

UNIT III
Co-ordinate Geometry: Distances between points-Area of a triangle, Co-ordinates of a point dividing a given segment in a given ratio-locus-equation to a straight line in different forms-Angle between straight lines-point of intersection.

UNIT IV
Differential Calculus: Continuity and limit: Differentiation, derivability and derivative, R.H. derivatives and L.H. derivatives, Differentiation, General theorems of derivation.

SUGGESTED TEXT BOOKS

.
1. Intermediate first Year mathematics and
2. Intermediate Second year mathematics., printed and published by Telugu Academy, Himayatnagar, Hyderabad
3. Pharmaceutical Arithmetic's by Mohd. Ali CBS publishers and distributor, New Delhi.
4. Higher Engineering Mathematics by Grewal.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I/I Year B. Pharmacy **T P C**

Biology – I

(Maths stream students)

UNIT I
Methods of classification of plants.

UNIT II
Plant cell: It's detailed structure, mitosis, meiosis different types of plant tissues and their functions.

UNIT III
Simple and compound microscopes used in biology; section cutting; staining and mounting of sections.

UNIT IV
Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of root and stem.

SUGGESTED TEXT BOOKS

1. Intermediate First Year and Second Year Botany / Zoology Text Books printed and published by Telugu Academy, Himayatnagar, Hyderabad.
2. A.C. Dutta, Text Book of Botany
3. Botnay for Degree students Vol I & II by B.P. Pandey

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

BIIOLOGY LAB

Description and study of floral characters of the plants representing the families in theory. Histological studies of the leaf, flower, stem and root with description of their sections: Demonstration of muscle contraction experiment: Frog gastrointestinal tract demonstration: Preparation of tissue slides: Observation of permanent slides.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year I Sem B. Pharmacy **T P C**

ANATOMY AND PHYSIOLOGY & HEALTH EDUCATION - I

UNIT-I

Scope of anatomy and physiology and basic terminology used in these subjects. Structure of cell, its components and their function. Elementary tissues of the human body: epithelial, connective, muscular and nervous tissues, their sub- types and characteristics.

Skeletal system: Structure, composition and functions of skeleton classification of joints, types of movements at joints, disorders of joints.

Skeletal muscles: Gross anatomy, physiology of muscle contraction, physiological properties of skeletal muscles and their disorders.

UNIT-II

Respiratory System: Anatomy of respiratory organs. Functions of respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity.

UNIT-III

Central Nervous System: Functions of different parts of brain and spinal cord. Neurochemical transmission in the central nervous system, reflex action, electroencephalogram, specialized functions of the brain, cranial nerves and their functions.

Autonomic Nervous System: Physiology and functions of autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S.

UNIT-IV

Urinary System: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance, diseases of the urinary system.

TEXT BOOKS

1. Tortora, G.J and Anagnodokas, Principles of Anatomy and Physiology, N.P Harper & Row Publishers N.Y
2. C.C.Chatterjee, Human Physiology.

REFERENCES

1. Donald.C Rizzo, Fundamental of Anatomy and Physiology.
2 T.S. Ranganathan, A Text book of Human Anatomy.
3. Subrhamanyam and Others, A textbook of Physiology

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year I Sem B. Pharmacy **T P C**

PHARMACEUTICAL INORGANIC CHEMISTRY - I

UNIT- I

1. Classification of Inorganic Pharmaceuticals based on their applications and therapeutic uses.
2. Sources of impurities, quality control and test for purity
3. Qualitative tests for anion and cations
4. Limit tests for Arsenic, heavy metals, lead, iron, chloride and sulphate and Pharmacopoeial standards.

Notes: Definition, Preparation, Assay principle, Limits tests and Uses for the following classes of compoundsfrom Unit II to Unit VII

UNIT - II

1. **Electrolytes**: Sodium, potassium and calcium replenishers.
2. **Sodium and potassium replenishers**: Sodium chloride, compound sodium chloride solution (Ringer solution), potassium chloride, ORS.
3. **Calcium replenishers**: Calcium chloride, calcium gluconate, dibasic calcium phosphate.
4. **Acid base regulators:** Sodium bicarbonate, sodium lactate, sodium citrate/potassium citrate, sodium acetate, and ammonium chloride
5. **Dialysis fluids:** Haemodialysis fluids, intraperitoneal dialysis fluids and gastro-intestinal agents.

UNIT III

1. **Acidifiers and Antacids: IP monographs:** Dilute hydrochloric acid, sodium acid phosphate, sodium bicarbonate, sodium citrate, potassium citrate, aluminium hydroxide gel, dried aluminium hydroxide gel, magnesium oxide (Magnesia), magnesium hydroxide mixture, magnesium carbonate, magnesium trisilicate, calcium carbonate.
2. **Adsorbents and related drugs**: Light kaolin, heavy kaolin, and activated charcoal.
3. **Laxatives:** Magnesium sulphate, sodium phosphate.

UNIT -IV

1) **Mineral Nutrients/Supplements**

(a) **Haematinics** – Ferrous sulphate, ferrous fumarate, ferrous gluconate, ferric ammonium citrate, iron and dextrose injection.

(b) **Halogens:** Iodine, Iodides and fluorides.

2) **Pharmaceutical aids:**

(a) **Excipients**: Dicalcium phosphate, tricalcium phosphate, magnesium stearate, talc and calcium carbonate (Precipitated chalk).

(b) **Suspending agents**: Bentonite, colloidal silica, aluminium stearate.

(c) **Colorants:** Titanium oxide, Ferric oxide

TEXT BOOKS

1. A.H.Beckett and J.B.Stenlake, Practical pharmaceutical chemistry, Part-I. The Athtone press, University of London, London.
2. Advanced Inorganic Chemistry by Satya prakash, G.D.Tuli

REFERENCES

1. J.H Block, E.Roche, T.O Soine and C.O. Wilson, Inorganic Medical and Pharmaceutical Chemistry Lea & Febiger Philadelphia PA.
2. P. Gundu Rao, Inorganic pharmaceutical chemistry; Vallabh Prakashan, Delhi.
3. L.M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Oxford University Press, London.

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

KAKINADA

I Year I Sem B. Pharmacy

PHARMACEUTICAL INORGANIC CHEMISTRY LAB

List of experiments:

A) Limit tests for the following as per the procedure given in md

Pharmacopoeia (1996— including the latest addenda)

1) Chlorides

2) Sulphates

3) Heavy metals

4) Iron

5) Arsenic (demonstration)

B) 6) Balances and Weighing; Calibration of weights, Pipette and Burette

7) Preparation and standardization of Hydrochloric acid solution (0.1

8) Preparation and standardization of Potassium permanganate solution (0.1N& 0.1M).

9) Preparation of a primary standard solution of 0.1N Potassium hydrogen-phthalate.

10) Preparation and standardization of 0.1N EDTA solution.

11) Preparation and purification of Boric acid.

12) Preparation and purification of Sodium citrate.

13) Preparation and purification of Potash alum.

14) Preparation and purification of Magnesium stearate.

15) Assay of sodium bicarbonate and assay of Boric a (Neutralization).

16) Assay of Calcium gluconate (or) any calcium compounds (Complexometry).

17) Assay of Copper sulphate (Redox titration).

18) Assay of Sodium acetate (Non-aqueous titration).

19) Assay of Ferrous sulphate (Oxidation-reduction / Redox titration

20) Exercises related to assay by Gravimetric method.

REFERENCES

1. Indian Pharmacopoeia - 1996.

2. Vogel's Qualitative Analysis.

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year I Sem B. Pharmacy **T P C**

PHARMACEUTICAL ORGANIC CHEMISTRY-I

UNIT – I

Structure and Activity of Organic Molecules: Shapes of organic molecules, bond lengths, bond angles and bond dissociation energies. Electronic effects in organic molecules: inductive effect, electrometric or mesomeric effect, hyperconjugation, concept of resonance; types of organic reagents and reactions.

UNIT – II

A Study of Hydrocarbons:

Aliphatic/Alicyclic Hydrocarbons: Nomenclature, isomerism (chain, conformational and geometrical) relative stabilities (heats of combustion and hydrogenation), ring stabilities of cyclohexane, chair-boat conformation, Bayer's strain theory and sachse-mohr theory. Free radical substitution reactions (halogenation) of alkanes, selectivity of halogen.

Alkenes: Electrophilic addition reactions of alkenes, Markovnikov's rule, Kharasch effect, Bayer's oxidation (cis-hydroxylation, polymerisation).

Alkadienes: Stability & 1,4 addition reactions of conjugated alkadienes.

Alkynes: Acidity of 1-alkynes, formation of metal acetylides. Stereo specific reduction of alkynes. Addition of hydrogen halide (HCl) addition of water and keto-enol tautomerism.

UNIT – III

Aromatic Hydrocarbons: Kekule's structure of benzene, bond lengths, heats of hydrogenation and stability, molecular orbital picture of benzene, aromaticity, Huckel's rule, nomenclature of benzene derivatives, characteristic reactions of benzene, theory of reactivity and orientation in monosubstituted benzenes, Birch reduction

Polynuclear aromatic hydrocarbons: Nomenclature, structure and aromatic character of naphthalene, anthracene, phenanthrene and naphthacene resonance structures, electron density and reactivity. Electrophilic substitution, oxidation and reduction reactions.

UNIT – IV

Halogen Compounds-Aliphatic: Nomenclature, general methods of preparation, characteristic nucleophilic substitution reactions, factors that play role in SN^1 and SN^2, Walden inversion, elimination reaction and Saytzeff's rule.

Halogen Compounds-Aromatic: Nomenclature, low reactivity of halo benzenes towards nucleophilic substitution, benzyne concept.

TEXT BOOKS

1. T.R.Morrison and R.N.Boyd, Organic chemistry, pentice hall of India private limited, New Delhi.
2. Ball & Ball, Advanced pharmaceutical organic chemistry.

REFERENCES

1. Jerry March, Reactions and Mechanism 4th ed.
2. I.L. Finar Vol.I. & Vol. II., The Fundamentals Principles of Organic Chemistry, ELBS/Longman.
3. Bruce, Organic chemistry.

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year I Sem B. Pharmacy **T P C**

PHYSICAL PHARMACY – I

UNIT I

Intermolecular forces and states of matter: Binding forces between molecules, the states of matter, the gaseous state, the liquid state, solids and the crystalline state. Phase equilibria and the phase rule.

UNIT II

Thermodynamics: The first law of thermodynamics. Thermochemistry. The second law of thermodynamics. The third law of thermodynamics, Free energy functions and applications.

UNIT III

Physical properties of Drug Molecules: Dielectric constant induced polarization, dipole moment, refractive index and molar refraction, optical rotatory dispersion.

UNIT IV

Solutions of Non electrolytes: Concentration expressions, ideal and real solutions, colligative properties, molecular weight determinations.

TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences Fifth Edition.

REFERENCES

1. Pharmacopoeia, (I.P., B.P., U.S.P. and European.)
2. Derle D.V., Essentials of Physical Pharmacy
3. C.V.S.Subramanyam, Essentials of Physical Pharmacy, Vallabh Prakashan.
4. B.S Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry.

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year I Sem B. Pharmacy

COMPUTER PROGRAMMING

UNIT I:

INTRODUCTION: Computer systems, Hardware & software concepts.

PROBLEM SOLVING: Algorithm / pseudo code, flowchart, program development steps, Computer Languages: machine, symbolic, and high-level languages, Creating and running programs: Writing, editing, compiling, linking, and executing.

BASICS OF C: Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation, Sample programs.

UNIT II:

BIT-WISE OPERATORS: logical, shift, rotation, masks.

SELECTION – MAKING DECISIONS: Two-way selection: if- else, null else, nested if, examples, Multi-way selection: switch, else-if, examples.

UNIT III:

STRINGS: concepts, c strings.

ITERATIVE: Loops - while, do-while and for statements, break, continue, initialization and updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest.

UNIT IV:

ARRAYS: Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays , Array applications: Matrix Operations, checking the symmetricity of a Matrix.

UNIT V:

FUNCTIONS-MODULAR PROGRAMMING: Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, Towers of Hanoi, header files, C pre-processor, example c programs. Passing 1-D arrays, 2-D arrays to functions.

UNIT VI:

POINTERS: Pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address –dangling memory, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

UNIT VII:

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications

UNIT VIII:

FILE HANDLING: Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations, example programs.

Text Books : ' The C – Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI

Reference :

1. C Programming : A Problem - Solving Approach, Forouzan, E. V. Prasad, Giliberg, Cengage, 2010.

2. Programming in C, Stephen G. Kochan, 3/e Pearson, 2007

***

AWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year I Sem B. Pharmacy

COMPUTER LAB

Objectives:

- To learn/strengthen a programming language like C, To learn problem solving techniques

Recommended Systems/Software Requirements:

- Intel based desktop PC, ANSI C Compiler with Supporting Editors, IDE's such as Turbo C, Bloodshed C,
- Linux with gcc compiler

Exercise l

Solving problems such as temperature conversion, student grading, income tax calculation, etc., which expose students to use basic C operators

Exercise 2

2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer.

b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

d) Write a program which checks a given integer is Fibonacci number or not.

Exercise 4

a) Write a C program to calculate the following Sum:

$$Sum=1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$$

b) Write a C program to find the roots of a quadratic equation.

Exercise 5

a) The total distance travelled by vehicle in't' seconds is given by distance = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 6

a) Simple programming examples to manipulate strings.

b) Verifying a string for its palindrome property

Exercise 7

Write a C program that uses functions to perform the following operations:

i. To insert a sub-string in to given main string from a given position.
ii. To delete n Characters from a given position in a given string.
iii. To replace a character of string either from beginning or ending or at a specified location

Exercise 8

Write a C program that uses functions to perform the following operations using Structure:

i) Reading a complex number

ii) Writing a complex number

iii) Addition of two complex numbers

iv) Multiplication of two complex numbers

Exercise 9

a) Addition of Two Matrices

b) Calculating transpose of a matrix in-place manner.

c) Matrix multiplication by checking compatibility

Exercise 10

a) Write C programs that use both recursive and non-recursive functions for the following

i) To find the factorial of a given integer.

ii) To find the GCD (greatest common divisor) of two given integers.

iii) To solve Towers of Hanoi problem.

Exercise 11

a) Write a C functions to find both the largest and smallest number of an array of integers.

b) Write a C function that uses functions to perform the following:

i) that displays the position/ index in the string S where the string T begins, or –1 if S doesn't contain T.

ii) to count the lines, words and characters in a given text.

Exercise 12

a) Write a C function to generate Pascal's triangle.

b) Write a C function to construct a pyramid of numbers.

Exercise 13

Write a C function to read in two numbers, x and n, and then compute the sum of this geometric progression:

$1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$

Write a C function to read in two numbers, x and n(no. of terms), and then compute sin(x) and cos(x).

Exercise 14

a. Pointer based function to exchange value of two integers using passing by address.
b. Program which explains the use of dynamic arrays.
c. Program to enlighten dangling memory problem (Creating a 2-D array dynamically using pointer to pointers approach.

Exercise 15

Examples which explores the use of structures, union and other user defined variables

Exercise 16

a) Write a C program which copies one file to another.
b) Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line)

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy **T P C**

(MATHEMATICS – II
(Biology stream students)

UNIT I

Derivatives of trigonometric functions (excluding inverse trigonometric and hyperbolic functions). Logarithmic differentiation. Partial differentiation maxima and minima (elementary).

UNIT II

Integral Calculus: Integration as on inverse process of differntiation, definite integrals, integration by substitution, integration by parts, integration of algebraic function of E^x evolution of area in simple cases.

UNIT III

Differential equations: Formation of a differential equation, order and degree, solution of first order differential equations.

UNIT IV

Introduction to Laplace transforms and their use.

5. Intermediate Second year Mathematics. Printed and published by Telugu Academy, Himayatnagar, Hyderabad

6. Pharmaceutical Arithmetic's by Mohd. Ali CBS publishers and distributor, New Delhi.
7. Higher Engineering Mathematics by Grewal.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy **T P C**

BIOLOGY - II
(Maths stream students)

UNIT I

General survey of animal kingdom: structure and life history of parasites illustrated by Amoeba, Entamoeba, Trypanosoma, Plasmodium, Taenia, Ascaris, Schistosoma, Oxyuris and Ancylostoma.

UNIT II

General structure and life history of insects like Cockroach, Mosquito, Housefly, Mite and Silkworm. Relationship of insects with medicinal crops.

SUGGESTED TEXT BOOKS:

Intermediate First Year and Second Year Botany / Zoology Text Books printed and published by Telugu Academy, Himayatnagar, Hyderabad.

1. A.C. Dutta, Text Book of Botany
2. Botnay for Degree students Vol I & II by B.P. Pandey
3. Intermediate first Year mathematics and

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy **T P C**

ANATOMY, PHYSIOLOGY & HEALTH EDUCATION – II

UNIT-I

Haemopoietic system: Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation.

Lymph and Lymphatic System: Composition, formation and ciruculation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen.

UNIT-II

Cardiovascular system: Basic anatomy of the heart. Physiology of heart, blood vessels and circulation. Basic understanding of cardiac cycle, heart sounds and electrocardiogram. blood pressure and its regulation. Brief outline of cardiovascular disorders like hypertension, hypotension, atherosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias.

UNIT-III

Digestive System: Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food.

UNIT - IV

Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testes and ovary, their hormones and functions.

TEXT BOOKS

1. Tortora, G.J and Anagnodokas, Principles of Anatomy and Physiology, N.P Harper & Row Publishers N.Y
2. Ross & Wilson – Anatomy & Physiology in health and illness – Anne Waugh, Allison Grant.

REFERENCES

1. Donald.C Rizzo, Fundamental of Anatomy and Physiology.
2 T.S. Ranganathan, A Text book of Human Anatomy.
3. Subrhamanyam and Others, A textbook of Physiology
4. A treatise on hygiene and public health, B.N.Ghosh, Calcutta scientific publishing company

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy **T P C**

ANATOMY, PHYSIOLOGY &HEALTH EDUCATION LAB

1. Study of human skeleton – 2 Experiments
2. Study of different systems with the help of charts and models – 2 Experiments.
3. Microscopic study of different tissues – 3 Experiments.
4. Estimation of Hemoglobin in blood, Determination of bleeding time, clotting time – 3 Experiments.
5. Estimation of R.B.C. count – 2 Experiments.
6. Estimation of W.B.C count – 2 Experiments.
7. Estimation of D.L.C. – 2 Experiments.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of electrocardiogram-PQRST waves and their significance – 3 Experiments.
9. Determination of vital capacity, experiments on spirometry – 2 Experiments.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy **T P C**

PHARMACEUTICAL INORGANIC CHEMISTRY - II

UNIT- I

(a) **Expectorants**: Ammonium chloride, potassium iodide.
(b) **Emetics**: Potassium antimony tartarate, copper sulphate, zinc sulphate.
(c) **Antidotes:** Sodium thiosulphate, sodium nitrite.

UNIT -II

***Topical agents*:**

1) **Astringents:** Zinc sulphate, zinc oxide, calcium hydroxide, copper sulphate, Bismuth sub carbonate.
2) **Topical protectants:** Zinc oxide, calamine, zinc stearate, talc, titanium-dioxide, heavy kaolin and light kaolin (only uses).
3) **Silicone polymers:** Activated dimethicone.
4) **Anti-Infectives:** Hydrogen peroxide solution, potassium permanganate, silver nitrate (silver protein), iodine, (solutions of iodine, povidone iodine), boric acid, zinc undecylenate, mercury compounds (yellow mercuric chloride)

UNIT- III

***Dental products*:**

1) **Fluorides**: Sodium fluoride, sodium monofluorophosphate and stannous fluoride.
2) **Oral antiseptics and Astringents**: Hydrogen peroxide, sodium peroxide (bp), magnesium peroxide, zinc peroxide and mouth washes.
3) **Dentifrices**: Calcium carbonate, dibasic calcium phosphate, calcium phosphate, sodium metaphosphate and strontium chloride.
4) **Cements & fillers** : Zinc oxide (only uses).

UNIT-IV

Miscellaneous Medicinal Agents

a)	Antineoplastics	:	Cisplatin
b)	Antidepressants	:	Lithium carbonate
c)	Diagnostic agents	:	Barium sulphate
d)	Surgical Aids	:	Plaster of Paris
e)	Antirheumatic agents	:	Sodium aurothiomalate
f)	Internal parasiticid	:	Sodium antimony gluconate
g)	Anti thyroid agents	:	Potassium perchlorate

TEXT BOOKS

1. A.H.Beckett and J.B.Stenlake, Practical pharmaceutical chemistry, Part-I. The Athtone press, University of London, London.
2. Advanced Inorganic Chemistry by Satya prakash, G.D.Tuli

REFERENCES

1. L.M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Oxford University Press, London.
2. Indian Pharmacopoeia 1996.
3. J.H Block, E.Roche, T.O Soine and C.O. Wilson, Inorganic Medical and Pharmaceutical Chemistry Lea & Febiger Philadelphia PA.

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy **T P C**

PHARMACEUTICAL ORGANIC CHEMISTRY-II

UNIT – I

Alcohols: Nomenclature, classification, general methods of preparation, physical properties, hydrogen bonding, characteristic nucleophilic substitution reactions (replacement of -OH by -Cl), elimination reactions, Reimer Tiemann reaction and relative reactivities of 1^o, 2^o and 3^o alcohols, Meerwein Pondorff Verley reduction

Ethers: Nomenclature, Williamson's synthesis, action of hydro iodic acid on ethers (Ziesel's method).

Phenols: Nomenclature, general methods of preparation, physical properties, acidity of phenols, stability of phenoxide ion, reactions of phenols, Kolbe-schmidt reaction stability of conjugated dienes, and Fries rearrangement.

UNIT – II

Carbonyl Compounds: Nomenclature, two important methods of preparation, polarity of carbonyl group, relative reactivities of carbonyl compounds, nucleophilic addition and addition-elimination reactions, oxidation-reduction reactions, aldol condensation, Cannizzaro reaction, benzoin condensation, Perkins reactions, Reformatsky reaction, Oppenauer oxidation.

UNIT – III

Carboxylic acids and their derivatives:

Carboxylic acids: Nomenclature, intermolecular association, stability of carboxylate anion, two important methods of preparation, decarboxylation, functional groups reactions, reduction of carboxylic acids. a note on dicarboxylic acids.

Acid derivatives: (acid chlorides, anhydrides, esters and amides). Nomenclature, reactions like hydrolysis, reduction of esters and amides, Hofmann's degradation of amides. Brief account of malonic and acetoacetic esters, their importance in synthesis.

UNIT – IV

Nitrogen Compounds:

Nitro compounds: Nomenclature, acidity of nitro compounds containing α- hydrogens, reductive reactions of aromatic nitro compounds.

Amines: Nomenclature, basicity of amines, classification, relative reactivity, hinsberg method of separation, acylation reactions. Diazotisation and reactions of diazonium salts.

Nitriles and isonitriles: Nomenclature, two methods of synthesis, reactivity and functional reactions.

TEXT BOOKS

1. T.R.Morrison and R.N.Boyd, Organic chemistry, pentice hall of India private limited, New Delhi.
2. L. Finar Vol.I. & Vol. II., The Fundamentals Principles of Organic Chemistry, ELBS/Longman.

REFERENCES

1.. Ball & Ball, Advanced pharmaceutical organic chemistry.
2. Bruce, Organic chemistry.
3. Jerry March, Advanced Organic Chemistry

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

KAKINADA

I Year II Sem B. Pharmacy

PHARMACEUTICAL ORGANIC CHEMISTRY LAB

Introduction to Equipment & Glassware, Recrystallization method, dets of M $, ILP and distillation

Preparation of organic compounds (each involving a specifiorganic reaction covered in theory)

1. N.Acetylation : Preparation of Acetanilide fro Aniline
2. 0-Acetylation : Preparation of Aspirin from ;aiicylic
3 Nuclear Bromiriation : Preparation of p-Bromoacanilide from Acetanilide
4 Hydrolysis : Preparation of p-Bromoanilinfrom from p-Bromoacetanilide
5. Nuclear Nitration : Preparation of m-Dinitrobenzle from nitrobenzene
6. Oxidation : Preparation of Benzoic acid from Benzyl chloride
7. Esterification : Preparation of n-Butylacetateom n-Butylalcohoi
8. Etherification : Preparation of -Naphthyl metl ether from –Naphthol

9. Halogeriation : Preparation of lodoform from Gdation of cetone
10. Extensive Nuclear Substitution : Preparation of Tribromophernor BrominationTribromoanilin from Phenol or Aniline

II. Systematic qualitative Analysis (Identification) of Monofurtional Organic Compounds:

Avoid water-soluble compounds, and compounds containing more than one tianclional group; at least six individual compounds to be analyzed.

REFERENCES

1. Vogel's Text Book of Practical Organic Chemistry, 5" Edition.
2. R.K. Bansal, Laboratory Manual of Organic Chemistry.
3. O.P. Agarwal, Advanced Practical Organic Chemistry.
4. F.G.Mann & B.C. Saunders, Practical Organic Chemistry.

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy **T P C**

PHYSICAL PHARMACY – II

UNIT I

Solutions of Electrolytes: Properties of solutions of electrolytes. The Arrhenius theory of electrolyte dissociation. The modern theory of strong electrolytes and other coefficients for expressing colligative properties.

UNIT II

Ionic equilibria: Modern theories of acids, bases and salts, Sorensen's pH scale, specific concentration as a function of pH, calculation of pH, graphical solution to pH problems, acidity constants.

UNIT III

Buffers and buffered isotonic systems: The buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions, methods of adjusting tonicity and pH (relevant numerical problems).

UNIT IV

Electromotive force and oxidation-Reduction systems: Electrochemical cells. Electrometric determination of pH and redox.

TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences Fifth Edition.

REFERENCES

1.C.V.S.Subramanyam, Essentials of Physical Pharmacy, Vallabh Prakashan.
2. B.S Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry.
3. Derle D.V., Essentials of Physical Pharmacy

***

I Year II Sem B. Pharmacy **T P C**

PHYSICAL PHARMACY – II LAB

1. Percent composition – Capillary Flow method
2. Percent composition – polarimeter & refractometer
3. Molecular weight – Landsberger method.
4. Molecular weight – Rast camphor method.
5. Calibration of pH Meter
6. pH Estimation – pH meter
7. pH Estimation – colourimetric method.
8. pH Estimation by Half Neturalization Method
9. Refractive index of liquids.
10. Phenol water system – CST
11. Lower consolute temperature – Tea and Water
12. Heat of neutralization
13. Phase diagram - Phenol – Water, Effect of Impurities.
14. Ternary phase diagram.
15. Preparation of Buffers and Buffer Capacity Determination.

***

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

I Year II Sem B. Pharmacy

ENVIRONMENTAL STUDIES

UNIT - I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

UNIT - II

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – 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, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - III

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 the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - IV

Biodiversity and its conservation : Introduction - Definition: genetic, species andecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - V

Environmental Pollution : Definition, Cause, effects and control measures of :

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution

f. Thermal pollution
g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT - VI

Social Issues and the Environment: From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. -Wasteland reclamation. – Consumerism and waste products. -Environment 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.

UNIT - VII

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health. –Case Studies. Page 37 of 79

UNIT - VIII

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

Text Books :

1. An Introduction to Environmental Studies by B. Sudhakara Reddy, T. Sivaji Rao, U. Tataji & K. Purushottam Reddy, Maruti Publications.

Reference:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Text Book of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.

***