COURSE STRUCTURE & SYLLABUS

For

BIO-TECHNOLOGY

(Applicable for batches admitted from 2016-2017)

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

I Year - I Semester

S.No.	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-ES	Engineering Chemistry	4	--	--	3
4-BS	Engineering Mechanics	4	--	--	3
5-BS	Computer Programming	4	--	--	3
6-ES	Environmental Studies	4	--	--	3
7-HS	Engineering/Applied Chemistry Laboratory	--	--	3	2
8-BS	English - Communication Skills Lab - I	--	--	3	2
9-ES	Computer Programming Lab	--	--	3	2
Total Credits					**24**

I Year - II Semester

S.No.	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics – II (Mathematical Methods)	4	--	--	3
3-BS	Fundamentals of Biology	4	--	--	3
4-ES	Engineering Physics	4	--	--	3
5-HS	Process Engineering Principles	4	--	--	3
6-ES	Engineering Drawing	4	--	--	3
7-BS	English - Communication Skills Lab - II	--	--	3	2
8-HS	Engineering/Applied Physics Lab	--	--	3	2
9-ES	Engineering / Applied Physics – Virtual Labs - Assignments	--	--	2	--
10	Engg.Workshop & IT Workshop	--	--	3	2
Total Credits					**24**

II Year - I Semester

S. No	Subjects	L	T	P	Credits
1	Biochemistry	4	--	--	3
2	Biochemical Thermodynamics	4	--	--	3
3	Cell Biology	4	--	--	3
4	Microbiology	4	--	--	3
5	Mathematics – III	4	--	--	3
6	Managerial Economics & Financial Analysis	4	--	--	3
7	Biochemistry Lab	--	--	3	2
8	Cell biology and Microbiology Lab	--	--	3	2
Total Credits					**22**

II Year - II Semester

S.No.	Subjects	L	T	P	Credits
1	Molecular Biology	4	--	--	3
2	Heat Transfer in Bioprocess	4	--	--	3
3	Instrumental methods of Analysis	4	--	--	3
4	Developmental Biology	4	--	--	3
5	Genetics	4	--	--	3
6	Industrial Biotech products	4	--	--	3
7	Instrumental methods of Analysis Lab	--	--	3	2
8	Molecular biotechnology Laboratory	--	--	3	2
Total Credits					**22**

III Year - I Semester

S.No.	Subjects	L	T	P	Credits
1	Mass transfer operations	4	--	--	3
2	Bioprocess Engineering	4	--	--	3
3	Immunology	4	--	--	3
4	Biochemical Reaction Engineering	4	--	--	3
5	Biosensors & Bioelectronics	4	--	--	3
6	Bioprocess Engineering Laboratory	--	--	3	2
7	Mass transfer Laboratory	--	--	3	2
8	Immunology laboratory	--	--	3	2
9	IPR & Patents	--	2	--	--
	Total Credits				**21**

III Year - II Semester

S.No	Subjects	L	T	P	Credits
1	Plant and Animal Biotechnology	4	--	--	3
2	Bioethics, Biosafety, Clinical & regulatory affairs	4	--	--	3
3	Genetic Engineering and rDNA Technology	4	--	--	3
4	Bioinformatics	4	--	--	3
5	**OPEN ELECTIVE** 1. Principles of Communication Engineering 2. Principles of food processing 3. Cyber and Information Security 4. Renewable energy Technologies 5. Medical Biotechnology 6. Fundamentals of Neurobiology and Cognitive Sciences	4	--	--	3
6	Genetic Engineering Laboratory	--	--	3	2
7	Plant tissue culture laboratory	--	--	3	2
8	Bioinformatics Laboratory	--	--	3	2
MC	Professional Ethics & Human Values	--	3	--	--
	Total Credits				**21**

IV Year - I Semester

S.No	Subjects	L	T	P	Credits
1	Cancer Biology	4	--	--	3
2	Environmental Biotechnology	4	--	--	3
3	Molecular modelling and Drug design	4	--	--	3
4	Protein Engineering	4	--	--	3
5	**Elective I** 1. Environmental Toxicology and Health 2. Tissue Engineering 3. Genomics and Proteomics	4	--	--	3
6	**Elective II** 1. Molecular Pathogenesis of Infections Disease 2. Food Microbiology 3. Bioreactor Design	4	--	--	3
7	Molecular Modelling and Drug Design Laboratory	--	--	2	2
8	Downstream processing laboratory	--	--	2	2
	Total Credits				**22**

IV Year - II Semester

S.No	Subjects	L	T	P	Credits
1	Fermentation Technology	4	--	--	3
2	Nanotechnology for Biomedical applications	4	--	--	3
3	Pharmaceutical Biotechnology	4	--	--	3
4	**Elective – III** 1. Animal Cell Science and Technology 2. Regulatory Affairs and Clinical Trials 3. Metabolic Engineering	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
	Total Credits				**24**

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

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

ENGLISH –I
(Common to All Branches)

DETAILED TEXT-I

English Essentials: Recommended topics:

UNIT I: IN LONDON: M.K.GANDHI
LO: To apprise the learner how Gandhi spent a period of three years in London as a student.
LA: The learner will understand how Gandhi grew in introspection and maturity.

UNIT II: THE KNOWLEDGE SOCIETY- APJ KALAM
LO: To make the learners rediscover India as a land of Knowledge.
LA: The learners will achieve a higher quality of life, strength and sovereignty of a developed nation.

UNIT III: THE SCIENTIFIC POINT OF VIEW- J.B.S. HALDANE
LO: This essay discusses how scientific point of view seeks to arrive at the truth without being biased by emotion.
LA: This develops in the student the scientific attitude to solve many problems which we find difficult to tackle.

UNIT IV: PRINCIPLESOF GOOD WRITING
LO: To inform the learners how to write clearly and logically.
LA: The learner will be able to think clearly and logically and write clearly and logically.

UNIT V: MAN'SPERIL
LO: To inform the learner that all men are in peril.
LA: The learner will understand that all men can come together and avert the peril.

UNIT VI: THE DYING SUN—SIR JAMES JEANS
LO: This excerpt from the book "The Mysterious Universe" presents the mysterious nature of the Universe and the stars which present numerous problems to the scientific mind. Sir James Jeans uses a poetic approach to discuss the scientific phenomena.
LA: This provides the students to think about the scientific phenomena from a different angle and also exposes the readers to poetic expressions.

UNIT VII: LUCK—MARK TWAIN

LO: This is a short story about a man's public image and his true nature. The theme of the story is that luck can be a factor of life, so that even if one is incompetent but lucky, one can still succeed. **LA**: The story is humorous in that it contains a lot of irony. Thus this develops in the learner understand humorous texts and use of words for irony.

TEXT BOOK
'English Essentials' by Ravindra Publications

NON-DETAILED TEXT:

(From Modern Trailblazers of Orient Blackswan)
(Common single Text book for two semesters)
(Semester I (1 to 4 lessons)/ Semester II (5 to 8
lessons)

UNIT I: G.D.NAIDU
LO: To inspire the learners by G.D. Naidu's example of inventions and contributions.
LA: The learner will be in a position to emulate G.D. Naidu and take to practical applications.

UNIT II: G.R.GOPINATH
LO: To inspire the learners by his example of inventions.
LA: Like G.R. Gopinath, the learners will be able to achieve much at a low cost and help the common man.
UNIT III: SUDHAMURTHY
LO: To inspire the learners by the unique interests and contributions of Sudha Murthy.
LA: The learner will take interest in multiple fields of knowledge and make life worthwhile through social service.
UNIT IV: VIJAY BHATKAR
LO: To inspire the learner by his work and studies in different fields of engineering and science. **LA:** The learner will emulate him and produce memorable things.

TEXT BOOK
'Trail Blazers' by Orient Blackswan Pvt. Ltd. Publishers

I Year – I Semester

	L	T	P	C
	4	0	0	3

MATHEMATICS – I (DIFFERENTIAL EQUATIONS)
(Common to All Branches)

UNIT IDIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE

Linear Bernoulli Exact Reducible to exact.

Applications: Newton's Law of cooling Law of natural growth and decay orthogonal trajectories. Subject Category:

ABET Learning Objectives a d e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B

E

UNIT IILINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax}, Sinax, cos ax, polynomials in x, $e^{ax}V(x)$, $xV(x)$.

Applications: LCR circuit, Simple Harmonic

motion Subject Category:

ABET Learning Objectives a d e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B

E

UNIT III LAPLACE TRANSFORMS

Laplace transforms of standard functions, Shifting Theorems, Transforms of derivatives and integrals – Unitstep function –Dirac's delta function-Inverse Laplace transforms– Convolution theorem (without proof).

Application: Solutions of ordinary differential equations using Laplace

transforms. Subject Category:

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B

E

UNIT IV PARTIAL DIFFERENTIATION

Introduction-Total derivative- Chain rule-Generalized Mean Value theorem for single variable (without proof) Taylors and Mc Laurent's series for two variables– Functional dependence Jacobian.

Applications: Maxima and Minima of functions of two variables with constraints and without constraints.
Subject Category:
ABET Learning Objectives a c e

ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

UNIT V FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions -solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations
Subject Category:
ABET Learning Objectives a e
ABET internal assessments 1 2 6
JNTUK External Evaluation A B
E

UNIT VI HIGHER ORDER PARTIAL DIFFERENTIAL EQUATIONS

Solutions of Linear Partial differential equations with constant coefficients, Method of separation of Variables
Applications: One dimensional Wave, Heat equations two dimensional Laplace
Equation. Subject Category:
ABET Learning Objectives a e
ABET internal assessments 1 2
6 JNTUK External Evaluation B
E

TEXT BOOKS

1. **B.S.GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
2. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley India
3. **GREENBERG,** Advanced Engineering Mathematics, 2nd edition, Pearson education
4. **DEAN G. DUFFY,** Advanced engineering mathematics with MATLAB, CRC Press
5. **PETER O'NEIL,** advanced Engineering Mathematics, Cengage Learning.

Subject Category	ABET Learning Objectives	ABET Internal Assessments	JNTUK External Evaluation	Remarks
Theory Design Analysis Algorithms Drawing Others	a) Apply knowledge of math, science, & engineering b) Design & conduct experiments, analyze & interpret data c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints d) Function on multidisciplinary teams e) Identify, formulate, & solve engineering problems f) Understand professional & ethical responsibilities g) Communicate effectively h) Understand impact of engineering solutions in global, economic, environmental, & societal context i) Recognize need for & be able to engage in lifelong learning j) Know contemporary issues k) Use techniques, skills, modern tools for engineering practices	1. Objective tests 2. Essay questions tests 3. Peer tutoring based 4. Simulation based 5. Design oriented 6. Problem based 7. Experiential (project based) based 8. Lab work or field work based 9. Presentation based 10. Case Studies based 11. Role-play based 12. Portfolio based	A. Questions should have: B. Definitions, Principle of operation or philosophy of concept. C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference. D. Design oriented problems E. Trouble shooting type of questions F. Applications related questions G. Brain storming questions	

I Year – I Semester

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ENGINEERING CHEMISTRY

UNIT I: WATER TECHNOLOGY

Hard Water – Estimation of hardness by EDTA method – Potable water Sterilization and Disinfection –Boiler feed water – Boiler troubles – Priming and foaming , scale formation, corrosion, caustic embrittlement, turbine deposits – Softening of water – Lime soda, Zeolite processes – Reverse osmosis – Electro Dialysis, Ion exchange process

LO: For prospective engineers knowledge about water used in industries (boilers etc.) and for drinking purposes is useful.

LA: Assessment of chemistry of hard water, boiler troubles and modern methods of softening hard water is introduced.

UNIT II: ELECTROCHEMISTRY

Concept of Ionic conductance – Ionic Mobility – Applications of Kohlrausch law – conducto-metric titrations – Galvanic cells – Electrode potentials – Nernst equation – Electrochemical series – Potentiometric titrations – Concentration cells – Ion selective electrode –Glass electrodes – Fluoride electrode; Batteries and Fuel cells

LO: Knowledge of galvanic cells, electrode potentials, concentration cells is necessary for engineers to understand corrosion problem and its control

LA: Assessment of ability in understanding modern biosensors, fuel cells and improve them.

UNIT III: CORROSION

Causes and effects of corrosion – theories of corrosion (dry, chemical and electrochemical corrosion) –

Factors affecting corrosion – Corrosion control methods – Cathodic protection –Sacrificial Anodic, Impressed current methods – Surface coatings – Methods of application on metals (Hot dipping, Galvanizing, tinning ,Cladding, Electroplating, Electrode less plating) – Organic surface coatings – Paints – Their constituents and their functions.

LO: The problems associated with corrosion are well known and the engineers must be aware of these problems and also how to counter them

LA: Assessment of ability to understand the problems of corrosion

UNIT IV: HIGH POLYMERS

Types of Polymerization – Stereo regular Polymers – Physical and Mechanical properties of polymers –Plastics – Thermoplastics and thermo setting plastics – Compounding and Fabrication of plastics –Preparation and properties of Polyethylene, PVC and Bakelite – Elastomers – Rubber and Vulcanization –Synthetic rubbers – Styrene butadiene rubber – Thiokol – applications.

LO: Plastics are materials used very widely as engineering materials.

LA: Assessment of ability to understand properties particularly physical and mechanical properties of polymers / plastics / elastomers helps in selecting suitable materials for different purposes.

UNIT V: FUELS

Coal – Proximate and ultimate analysis – Numerical problems based on analysis – Calorific value – HCV and LCV – Problems based on calorific values; petroleum – Refining – Cracking – Petrol – Diesel knocking; Gaseous fuels – Natural gas – LPG, CNG – Combustion – Problems on air requirements.

LO: A board understanding of the more important fuels employed on a large scale

LA: Assessment of ability for all engineers to understand energy related problems and solve them.

UNITVI: CHEMISTRY OF ADVANCED MATERIALS

Nanomaterials (Preparation of carbon nanotubes and fullerenes – Properties of nanomaterials – Engineering applications) – Liquid crystals (Types – Application in LCD and Engineering Applications) – Fiber reinforced plastics – Biodegradable polymers – Conducting polymers – Solar cells (Solar heaters – Photo voltaic cells –Solar reflectors – Green house concepts – Green chemistry (Methods for green synthesis and Applications) –Cement – Hardening and setting – Deterioration of cement concrete

LO: To demonstrate the properties and applications of nanomaterials.

LA: With the knowledge available now, future engineers should know at least some of the advanced materials that are becoming available. Hence some of them are introduced here.

TEXT BOOKS

1. Jain and Jain (Latest Edition), Engineering Chemistry, Dhanpat Rai Publishing company Ltd, 2015
2. N.Y.S.Murthy, V.Anuradha, K. Rama Rao "A Text Book of Engineering Chemistry", Maruthi Publications, 2012
3. C.Parameswara Murthy, C.V.Agarwal, Andhra Naidu Text Book of Engineering Chemistry, B.S.Publications, 2006
4. B.Sivasankar (2010), Engineering Chemistry, McGraw Hill companies.
5. Ch.Venkata Ramana Reddy and Ramadevi (2013) , Engineering Chemistry, Cengage Learning

REFERENCES

1. S.S. Dara Text Book of Engineering Chemistry, S.Chand Technical Series, 2013
2. K.Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, Pearson Publications. 2013
3. R.Gopalan, D.Venkatappayya, Sulochana Nagarajan, Text Book of Engineering Chemistry, Vikas Publications. 2011
4. B.Viswanathan and M.Aulice Scibioh, Fuel Cells, Principals and applications, University Press. 2009

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	4	**0**	**0**	**3**

ENGINEERING MECHANICS

UNIT I: 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. Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

LO: The students are to be exposed to the concepts of force and friction, direction and it's Application

LA: Assessment of ability to understand the basic concepts of the mechanics

UNIT II: EQUILIBRIUM OF SYSTEMS OF FORCES

Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

LO: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

LA: Assessment of ability to understand the equilibrium of the systems.

UNIT III: CENTROID

Centroids of simple figures (from basic principles) – Centroids of Composite Figures Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, pappus theorem.

LO: The students are to be exposed to concepts of centre of

gravity. **LA:** Assessment of ability to understand the centroid

concept.

UNIT IV: MOMENTS OF INERTIA

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.

LO: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

LA: Assessment of ability to understand the inertia concepts

UNIT V: KINEMATICS AND KINETICS

Rectilinear and Curve linear motions – Velocity and Acceleration – Motion of Rigid Body –Types and their Analysis in Planar Motion. Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation –

Rolling Bodies.

LO: 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

LA: Assessment of ability to understand the kinematics

UNIT VI: WORK – ENERGY METHOD

Equations for Translation, Work Energy Applications to Particle Motion, Connected System Fixed Axis Rotation and Plane Motion. Impulse momentum method.

LO: The students are to be exposed to concepts of work, energy and particle motion

LA: Assessment of ability to understand the kinematics

TEXT BOOKS

1. Engg. Mechanics S.Timoshenko & D.H.Young., 4th ed,Mc Graw Hill publications, 2013.
2. Engineering Mechanics: Statics and Dynamics 3rd ed, Andrew Pytel and Jaan Kiusalaas; Cengage Learning publishers. 2013.

REFERENCES

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, dynamics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
4. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
5. Mechanics for Engineers, statics F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Mechanics for Engineers, dynamics F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
7. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G.McLean, 5th Edn – Schaum's outline series McGraw Hill Publ.
8. Engineering Mechanics, Fedinand. L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics, A Nelson, Mc Graw Hill publications
10. Engineering Mechanics, Tayal. Umesh Publ.

I Year – I Semester   **L   T   P   C**

<div align="right">**4   0   0   3**</div>

COMPUTER PROGRAMMING

UNIT I: OBJECTIVE

Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux, computer systems, Hardware and 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(vi/emacs editor), Compiling(gcc), Linking and Executing in under Linux. 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 operator, expressions, type conversions, Conditional Expressions, precedence and order of evaluation, Sample Programs.

LO: Formulating algorithmic solutions to problems and implementing algorithms in C

 LA: Assessment of ability to analyze the basics of C

UNIT II SELECTION – MAKING DECISION

Two Way Selections: if-else, null else, nested if, examples, Multi way selection: switch, else-if examples**.** Iterative: loop-while, do-while and for statements, break, continue, initialization and Updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest. ARRAYS: Arrays concepts, declaration, definition, accessing elements, storing elements, Strings and String Manipulations, 1Darrays, 2Darrays and character arrays, string manipulations, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix STRINGS: concepts, c strings.

LO: To understand branching, iteration and data representation using arrays

LA: Assessment of ability to understand arrays, string, etc.

UNIT III 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 Preprocessor, example c programs, Passing 1Darrays, 2Darrays to functions.

LO: Modular programming and recursive solution formulation

LA: Assessment of ability to understand usage of different functions

UNIT IV 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 multi-dimensional arrays, dynamic memory management functions, command line arguments

LO: To understand pointers and dynamic memory allocation

LA: Assessment of ability to understand the usage of
pointers

UNIT V: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, type-def, bit fields, program applications, Bit-Wise Operators: logical, shift, rotation, masks**.**
LO: To understand miscellaneous aspects of C
LA: Assessment of ability to understand structures and union types.

UNIT VI: FILE HANDLING
Input and output-concept of a file, text files and binary files, Formatted I/O, File I/O operations, example programs
LO: To comprehend the file operations
LA: Assessment of ability to
understand

TEXT BOOKS
1. Problem Solving and Program Design in C, Hanly, Koffman, 8th ed, PERSON, 2015.
2. Programming in C, Second Edition Pradip Dey and Manas Ghosh, 2nd ed OXFORD Higher Education.
3. Programming in C, A practical approach Ajay Mittal PEARSON, 2010
4. Programming in C, B. L. Juneja, Anith Seth, Cengage Learning, 2011

REFERENCE BOOKS AND WEB LINKS
1. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE
2. Programming with C, Bichkar, Universities Press
3. Programming in C, Reema Thareja, OXFORD
4. C by Example, Noel Kalicharan, Cambridge

ENVIRONMENTAL STUDIES

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.

LO: To understand the multidisciplinary action on environmental

studies **LA:** Assessment of the overall relations of the environment.

UNIT II: 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 overwater, 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 nonrenewable 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.

LO: To understand the natural resources and its importance

LA: Assessment the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources

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 Hotspots of biodiversity Threats to biodiversity: habitat loss, man wildlife conflicts. Endangered and endemic species of India – Conservation of biodiversity:

conservation of biodiversity.

LO: To understand the ecosystem and its diversity.

LA: Assessment of the biodiversity of India and the threats to biodiversity, and conservation practices to protect the 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. Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

LO: To understand the environmental pollution

LA: Assessment of the ability to perform the 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.

LO: To understand the social issues on the environment.

LA: Assessment of social issues both rural and urban environment and the possible means to combat the challenges

UNIT VI: ENVIRONMENTAL MANAGEMENT

Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism - The student should submit a report individually on any issues related to Environmental Studies course and give a power point presentation.

LO: To understand the multidisciplinary action on environmental studies.

LA: Assessment of the overall relations of the environment.

TEXT BOOKS
1. Environmental Studies by R. Rajagopalan, 2nd Edition, Oxford University Press, 2011
2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi, 2012
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES
1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning, 2011
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada, 2015
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi, 2009
4. Environmental Studies by Piyush Malaviya, Pratibha Singh, Anoop singh: Acme Learning, NewDelhi, 2009

I Year – I Semester

	L	T	P	C
	0	0	3	2

ENGINEERING CHEMISTRY LABORATORY

List of Experiments
1. Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions,
2. Volumetric titrations, Quantitative analysis, Quantitative analysis etc.,
3. Trial experiment – Estimation of HCI using standard Na2co3 solutions
4. Estimation of KMnO4 using standard Oxalic acid solution.
5. Estimation of Ferric iron using standard K2Cr2O7 solution.
6. Estimation of Copper using standard K2Cr2O7 solution.
7. Estimation of Total Hardness water using standard EDTA solution.
8. Estimation of Copper using standard EDTA solution.
9. Estimation of Copper using Colorimeter
10. Estimation of pH of the given sample solution using pH meter.
11. Conductometric Titrations between strong acid and strong base
12. Conductometric Titrations between strong acid and Weak base
13. Potentiometric Titrations between strong acid and strong base
14. Potentiometric Titrations between strong acid and Weak base
15. Estimatinog of Zinc using standard potassium ferrocyanide solution
16. Estimation of Vitamin – C

TEXT BOOKS
1. Dr.Jyotsna Cherukuri(2012)Laboratory Manual of Engineering ChemistryII,VGS Techno Series.
2. Chemistry Practical Manual, Lorven Publications
3. K. Mukkanti (2009) Practical Engineering Chemistry, B.S.Publication

I Year – I Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

ENGLISH – COMMUNICATION SKILLS LAB – I

Suggested Lab Manuals:
OBJECTIVE: To impart to the learner the skills of grammar as well as communication through listening, speaking, reading, and writing including soft, that is life skills.

BASIC COMMUNICATION SKILLS
UNIT 1
A. Greeting and Introductions
B. Pure Vowels

UNIT 2
 A. Asking   for   information   and
Requests B. Diphthongs

UNIT 3
A. Invitations
B. Consonants

UNIT 4
A. Commands and Instructions
B. Accent and Rhythm

UNIT 5
A. Suggestions and Opinions
B. Intonation

TEXT BOOK:
'Strengthen your Communication Skills Part 'A' by Maruthi Publications

REFERENCE BOOKS
1. INFOTECH English (Maruthi Publications)
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)

COMPUTER PROGRAMMING LAB

Exercise l

a. Write a C Program to calculate the area of triangle using the formula area = (s (sa)(sb)(sc))1/2 where s= (a+b+c)/2

b. Write a C program to find the largest of three numbers using ternary operator.

c. Write a C Program to swap two numbers without using a temporary variable.

Exercise 2

a. 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.

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

c. 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 3

a. Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.

b. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1.

c. Subsequent terms are found by adding the preceding two terms in the sequence

d. Write a C program to generate the first n terms of the sequence

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

Exercise 4

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.

b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.

c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to implement a liner search.

c) Write a C program to implement binary search

Exercise 6

a) Write a C program to implement sorting of an array of elements.

b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them

Exercise 7

Write a C program that uses functions to perform the following

operations: i. To insert a substring 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

Write C Programs for the following string operations without using the built in functions To concatenate two strings to append a string to another string to compare two strings

Exercise 10

Write C Programs for the following string operations without using the built in functions To find the length of a string to find whether a given string is palindrome or not

Exercise 11

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

b) Write C programs illustrating call by value and call by reference concepts.

Exercise 12

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 find Fibonacci sequence

Exercise 13

a) Write C Program to reverse a string using pointers

b) Write a C Program to compare two arrays using pointers

Exercise 14

a) Write a C program consisting of Pointer based function to exchange value of two integers using passing by address.

b) Write a C program to swap two numbers using pointers

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 count the number of characters and number of lines in a file.

c) Write a C Program to merge two files into a third file. The names of the files must be entered using Command line arguments.

I Year – II Semester

	L	T	P	C
	4	0	0	3

ENGLISH –II
(Common to All Branches)

UNIT I: TECHNOLOGY WITH A HUMAN FACE
LO: To make the learner understand how modern life has been shaped by technology.
LA: The proposed technology is people's technology. It serves the human person instead of making him the servant of machines.

UNIT II: CLIMATE CHANGE AND HUMAN STRATEGY
LO: To make the learner understand how the unequal heating of earth's surface by the Sun, an atmospheric circulation pattern is developed and maintained.
LA: The learner's understand that climate must be preserved.

UNIT III: EMERGING TECHNOLOGIES
LO: To introduce the technologies of the 20th century and 21st centuries to the learners.
LA: The learner will adopt the applications of modern technologies such as nanotechnology.

UNIT IV: WATER- THE ELIXIR OF LIFE
LO: To inform the learner of the various advantages and characteristics of water. **LA**: The learners will understand that water is the elixir of life.

UNIT V: THE SECRET OF WORK
LO: In this lesson, Swami Vivekananda highlights the importance of work for any development.
LA: The students will learn to work hard with devotion and dedication.

UNIT VI: WORK BRINGS SOLACE
LO: In this lesson Abdul Kalam highlights the advantage of work.
LA: The students will understand the advantages of work. They will overcome their personal problems and address themselves to national and other problems.

TEXT BOOK :
'Sure Outcomes' by Orient Black Swan Pvt. Ltd. Publishers

NON-DETAILED TEXT:

(From Modern Trailblazers of Orient Blackswan)
(Common single Text book for two semesters)
(Semester I (1 to 4 lessons)/ Semester II (5 to 8
lessons)

UNIT V: J.C. BOSE
LO: To apprise of J.C.Bose's original contributions.
LA: The learner will be inspired by Bose's achievements so that he may start his own original work.

UNIT VI: HOMI JEHANGIR BHABHA
LO: To show Bhabha as the originator of nuclear experiments in India.
LA: The learner will be inspired by Bhabha's achievements so as to make his own experiments.

UNIT VII: VIKRAM SARABHAI
LO: To inform the learner of the pioneering experiments conducted by Sarabhai in nuclear energy and relevance of space programmes.
LA: The learner will realize that development is impossible without scientific research.

UNIT VIII: A SHADOW- R.K.NARAYAN
OBJECTIVE: To expose the reader to the pleasure of the humorous story
OUTCOME: The learner will be in a position to appreciate the art of writing a short story and try his hand at it.

TEXT BOOK :
'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers

I Year – II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**3**

MATHEMATICS – II
(MATHEMATICAL METHODS)
(Common to All Branches)

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS
Introduction Bisection Method – Method of False Position – Iteration Method – Newton Raphson Method(One variable and Simultaneous Equations)
Subject Category
ABET Learning Objectives a e k
ABET internal assessments 1 2 4 6
JNTUK External Evaluation A B

E

UNIT II INTERPOLATION

Introduction Errorsin Polynomial Interpolation – Finite differences Forward Differences Backward differences –Central differences – Symbolic relations and separation of symbols Differences of a polynomial Newton's formulae for interpolation – Interpolation with unevenly spaced points Lagrange's Interpolation formula
Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 4 6
JNTUK External Evaluation A B
E

UNIT III NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS
Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method
Runge-Kutta Methods
Subject Category
ABET Learning Objectives a e
ABET internal assessments 1 2 4 6
JNTUK External Evaluation A B
E

UNIT IV FOURIER SERIES
Introduction-Determination of Fourier coefficients – even and odd functions –change of interval–
Half-range sine and cosine series
Application: Amplitude, spectrum of a periodic
function Subject Category
ABET Learning Objectives a e d
ABET internal assessments 1 2 6
JNTUK External Evaluation A B
E

UNIT V FOURIER TRANSFORMS
Fourier integral theorem (only statement) – Fourier sine and cosine integrals sineand cosine transforms –properties – inverse transforms – Finite Fourier transforms
Subject Category
ABET Learning Objectives a d e k
ABET internal assessments 1 2 6
JNTUK External Evaluation A B
E

UNIT VI Z-TRANSFORM

Introduction– properties – Damping rule – Shifting rule – Initial and final value theorems Inverse Z-transform-Convolution theorem – Solution of difference equation by Z transforms.

Subject Category

ABET Learning Objectives a b e

k ABET internal assessments 1 2

6

TEXT BOOKS:
1. B.S.GREWAL, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2013
2. ERWIN KREYSZIG, Advanced Engineering Mathematics, 9th Edition, Wiley India, 2011
3. GREENBERG, Advanced Engineering Mathematics, 2nd edition, Pearson, 2002
4. DEAN G. DUFFY, Advanced engineering mathematics with MATLAB, 3rd ed CRC Press, 2013
5. PETER O'NEIL, advanced Engineering Mathematics, 7th ed Cengage Learning, 2012

Subject Category	ABET Learning Objectives	ABET Internal Assessments	JNTUK External Evaluation	Remarks
Theory Design Analysis Algorithms Drawing Others	a) Apply knowledge of math, science, & engineering b) Design & conduct experiments, analyze & interpret data c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints d) Function on multidisciplinary teams e) Identify, formulate, & solve engineering problems f) Understand professional & ethical responsibilities g) Communicate effectively h) Understand impact of engineering solutions in global, economic, environmental, & societal context i) Recognize need for & be able to engage in lifelong learning j) Know contemporary issues k) Use techniques, skills, modern tools for engineering practices	1. Objective tests 2. Essay questions tests 3. Peer tutoring based 4. Simulation based 5. Design oriented 6. Problem based 7. Experiential (project based) based 8. Lab work or field work based 9. Presentation based 10. Case Studies based 11. Role-play based 12. Portfolio based	A. Questions should have: B. Definitions, Principle of operation or philosophy of concept. C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference. D. Design oriented problems E. Trouble shooting type of questions F. Applications related questions G. Brain storming questions	

FUNDAMENTALS OF BIOLOGY

UNIT I: INTRODUCTION TO BIOLOGY

Life, Existence of life on earth, Diversity in biological systems, Difference between Prokaryotes & Eukaryotes. Kingdom systems Five-kingdom classification, General characters, Brief account on Ecology, Morphology, Nutrition, Locomotion and Reproduction

LO: To understand the diversity of biological systems

LA: Assessment of the biological system and kingdom classification.

UNIT II: INTRODUCTION TO CELL AND MICROBIOLOGY

Cell, Structure and functions, Classification of cells – Prokaryotes and Eukaryotes, Plasma membrane structure, Cytoskeletal Dynamics, Cell cycle, Cell division- Mitosis, Meiosis, Cell death-Apoptosis and necrosis

Components- Structure of Bacteria, Viruses, Algae, Fungi and Protozoans

LO: To assess the basics of cell structure in all microbes

LA: Understanding the anatomy of microbes.

UNIT III: INTRODUCTION TO BASIC MOLECULAR BIOLOGY

Genetics: DNA as genetic material, Structure of DNA, DNA replication, Transcription, Translation, Genes to proteins to protein function, Gene expression and regulation, Basic Recombinant DNA technology.

LO: To understand the concepts of molecular biology

LA: Assessment of the central dogma, gene expression and regulation

UNIT IV: INTRODUCTION TO PLANT BIOLOGY

Plant Biology: Concepts of Growth, Meristems. Development of different plant organs; Plant growth regulators; Photosynthesis: Plant & Bacterial photosynthesis; oxygenic and anoxygenic photosynthesis; chlorophyll as trapper of solar energy, photosynthetic reaction centers, Hill reaction, PS I & PS II, Photo phosphorylation - cyclic & noncyclic; Dark reaction & CO_2 fixation. Economic Importance of Plants.

LO: To understand the concepts of plant biology

LA: Assessment of the metabolisms in the

plants

UNIT V: INTRODUCTION TO ANIMAL BIOLOGY

Introduction of body as a whole, Cells and Tissue Organization, Electrolytes and Body fluids. Physiology: Digestive system, Circulatory systems & Blood, Respiratory system and Endocrine system, Neuromuscular system, Sensory systems - hearing, taste, smell and visual receptors.

LO: To understand the concepts of animal

biology **LA:** Assessment of the metabolisms in the animals

UNIT VI: APPLICATIONS OF BIOTECHNOLOGY

Drugs and Chemicals from Plants & Animals, Definition and importance (in general) of Biofuels, Bio-fertilizers, Bio-pesticides, Bio-indicators and Biosensors, Microbial Enzymes, Single Cell Protein (SCP), Monoclonal Antibodies, Introduction to Transgenic Plants & Animals.

LO: To understand the varied applications of biotechnology

LA: Assessment of the therapeutic products from the living source.

TEXT BOOKS:

1. The Cell, A Molecular Approach, Geoffrey M. Cooper, Robert E. Hausman Sinauer Associates Incorporated, 2013
2. Prescott's Microbiology by Joanne Willey, Linda Sherwood, Chris Woolverton, 2011
3. Introduction to biology and biotechnology, second edition, K.Vaitaidyanath, K. Pratap Reddy, and K.Satya Prasad, BS Publications. 2009

REFERENCES:

1. H.G. Rehen and G.Reed, biotechnology Volume I & 2, 1995
2. Anatomy and Physiology In Health and Disease, 12th ed, K.J.W. Wilison and A. Waugh, Churchill & Livingston. 2014
3. Plant Physiology F.B Salisbury & C.W. Ross 4th edition, 1991
4. Thomson Wadsworth, Dr. C.C. Chatterjee, Human Physiology (11th Edition) Vol I and II, Medical Allied Agency, Kolkata, 1987

I Year – II Semester

	L	T	P	C
	4	0	0	3

ENGINEERING PHYSICS

UNIT I: PHYSICAL OPTICS FOR INSTRUMENTS

Interface: Introduction – Interference in thin films by reflection – Newton's rings. Diffraction: Introduction – Fraunhofer diffraction Fraunhofer diffraction at double slit (qualitative) –Diffraction grating – Grating spectrum – Resolving power of a grating – Rayleigh's criterion for resolving power. POLARIZATION: Introduction – Types of Polarization – Double refraction – Quarter wave plate ad Half Wave plate.

LO: To design an instrument

LA: Designing an instrument and enhancing the resolution for its operation would be effective as achieved through study of application aspects of physical Optics

UNIT II: COHERENT OPTICS – COMMUNICATIONS AND STRUCTURE OF MATERIALS

Lasers: Introduction – coherent sources – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Three and Four level pumping schemes – Ruby laser –Helium Neon laser.

Fiber Optics: Introduction – Principle of Optical Fiber – Acceptance angle and acceptance cone – Numerical aperture. CRYSTALLOGRAPHY: Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices –Crystal systems – Structures and packing fractions of

SC,BCC and FCCX-RAY DIFRACTION Techniques: Directions and planes in crystals – Miller indices – Separation between successive [h k l] planes – Bragg's law.

LO: To understand the usage of lasers and fibre optics

LA: Lasers are trusted Non-linear coherent sources established for the fitness of instrumentation, establishing a structure property relationship for materials requires allotment of an equivalent footing in convening the physics knowledge base.

UNIT III: MAGNETIC, ELECTRIC FIELD RESPONSE OF MATERIALS & SUPERCONDUCTIVITY

"Objective many of the Electrical or Electronic gadgets are designed basing on the response of naturally abundant and artificially made materials, while their response to E-or H-fields controls their performance. Magnetic Properties: Magnetic permeability – Magnetization – Organ or magnetic moment – Classification of Magnetic materials – Dir, para, Ferro, anti ferro and ferrimagnetism– Hysteresis curve. Dielectric Properties: Introduction – Dielectric constant – Electronic, ionic and orientational polarization –internal fields – Clausius – Mossotti equation – Dielectric loss, Breakdown and Strength. Super-conductivity: General properties – Meissner effect – Type I and Type II superconductors – BCS Theory Flux quantization London's equations – Penetration depth – DC and AC Josephson effects – SQUIDS.

LO: To understand the design of the electrical and electronic gadgets

LA: Assessment that electrical or Electronic gadgets response to E-or H-fields controls their

performance.

UNIT IV: ACOUSTICS AND EM – FIELDS

Acoustics: Sound absorption, absorption coefficient and its measurements, Reverberations time – Sabine's formula, Eyring's formula. Electro-Magnetic Fields: Gauss and stokes theorems (qualitative) – Fundamental laws of electromagnetism– Maxwell's Electromagnetic Equations (Calculus approach).

LO: To understand the SHM and its consequences

LA: Assess the utility and nuances of ever pervading SHM and its consequences through Acoustics of Buildings, while vectorial concepts of EM fields paves the student to gear – up for a deeper understanding.

UNIT V: QUANTUM MECHANICS FOR ELECTRONIC TRANSPORT

Quantum Mechanics: Introduction to matter waves – Schrodinger Time Independent and Time Dependent wave equations – Particle in a box.

Free Electron Theory: Classical free electron theory – electrical conductivity – Mean free path – Relaxation time and drifty velocity – Quantum free electron theory – Fermi – Dirac (analytical) and its dependence on temperature– Fermi energy – density of states – derivations for current density.

Band Theory Of Solids: Bloch theorem (qualitative) – Kronig – Penney model – Origin of energy band formation in solids – Classification of materials into conductors, semi – conductors & insulators – Concepts of effective mass of electron concept of hole.

LO: To understand the Quantum Mechanics

LA: Assess the discrepancy between classical estimates and laboratory observations of physical properties exhibited by materials would be lifted out through understanding quantum picture of sub atomic world dominated by electron and its presence.

UNIT VI: SEMICONDUCTOR PHYSICS

In the wake of ever increasing demand for the space and power the watch word "small is beautiful", understanding the physics of electronic transport as underlying mechanism for appliances would provide a knowledgebase.

Introduction – Intrinsic semiconductor and carrier concentration – Equation for conductivity – Extrinsic semiconductor and carrier concentration – Drift and diffusion – Einstein's equation – Hall Effect – direct & indirect band gap semiconductors – Electronic transport Mechanism for LEDs, Photo conductors and solar cells.

LO: To understand the physics of electronics

LA: In the wake of ever increasing demand for the space and power the watch word "small is beautiful", understanding the physics of electronic transport as underlying mechanism for appliances would provide a knowledgebase.

TEXT BOOKS

1. Solid state Physics by A.J. Dekker (Mc Millan India Ltd), 2007
2. A text book of Engineering Physics by M.N. Avadhanulu & P.G. Kshirasagar (S. Chand publications)

3. Engineering Physics by M.R. Srinivasan, New Age international publishers, 2001
4. Textbook of Engineering Physics, Part 1 NEERAJ MEHTA PHI Learning Pvt. Ltd., 19-Sep-2008

REFERENCES
1. 'Introduction to solid state physics' by Charles Kittle (Willey India Pvt.Ltd)
2. 'Applied Physics' by T. Bhimasenkaram (BSP BH Publications)
3. 'Applied Physics' by M.Arumugam (Anuradha Agencies)
4. 'Engineering Physics' by Palanisamy (Scitech Publishers)
5. 'Engineering Physics' by D.K.Bhattacharya (Oxford University press)
6. 'Engineering Physics' by Mani Naidu S (Pearson Publications)
7. 'Engineering Physics' by Sanjay D Jain and Girish G Sahasrabudhe (University Press)
8. 'Engineering Physics' by B.K. Pandey & S. Chaturvedi (Cengage Learning)

I Year – II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**3**

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PROCESS ENGINEERING PRINCIPLES

</div>

UNIT I: INTRODUCTION TO UNIT OPERATIONS AND UNIT PROCESS
Application of engineering principles in biotech industries, Introduction to unit operations and unit process–application of transport phenomenon principles (momentum, mass and heat transfer) in bioprocessing.
LO: To study various parameters of transport phenomena.
LA: Assessment by application of unit operations.

UNIT II: UNITS AND DIMENSIONS
Units and dimensions, basic quantities and derived units, Conversion of units, Concept of mass and force, definition of go and its utility. Various equations of state including ideal gas law to evaluate PVT data, their application in process calculations by solving basics numerical problems.
LO: To study various gas laws, units & dimensions.
LA: Assessment by derivations and application of equation of state.

UNIT III: FLUID MECHANICS
Fluid mechanics– Properties of fluids, fluid statics energy balance in fluid flow through pipes and conduits, Bernoulli's equation and its application, calculation of power required for pumping fluids. Rheology of fluids–Newton's law of viscosity. Concept of Newtonian and non-Newtonian fluids–
Different types of non-Newtonian fluids with examples in bioprocessing. Measurement of viscosity using extrusion rheometer, plate and cone-viscometer, coaxial cylinder viscometer.
LO: To study various properties & mechanics of fluids.
LA: Assessment by derivations and calculations.

UNIT IV: RHEOLOGY OF FLUIDS
Flow through pipes, average velocity, flow regimes, boundary layer concept. Laminar and turbulent flow –characterization by Reynolds's number, pressure drop due to Skin friction and form friction,

friction factor chart, Hagen–Poiseuille equation. Brief introduction of flow of compressible fluids.
LO: To understand the various properties of fluid behavior.
LA: Assessment by derivations and calculations.

UNIT V: FLOW PAST IMMERSED BODIES
Flow past immersed bodies: Definition of drag and drag coefficient. Friction in flow through beds of solids, derivation of friction factor equations and pressure drop expressions. Introduction of the concept of packed-beds. Motion of particles through fluids, terminal velocity.
LO: To study various parameters of fluid flow under friction.
LA: Assessment by calculations and applications.

UNIT VI: FLOW MEASURING AND MONITORING SYSTEMS
Flow measuring and monitoring systems–valves, bends, elbows, prevention of leaks, mechanical seals, stuffing box. Flow measuring devices– Manometers, orifice meter, venture meter and rotameter. Fluid transportation machinery: Different types of pumps, positive displacement pumps, reciprocating pumps, diaphragm pumps, peristaltic pumps. Calculation of pump horse- power.
LO: To understand and monitor the measurement of fluid flow.
LA: Assessment by monitoring and calculations.

TEXTBOOKS:
1. G. Rao, Introduction to Biochemical Engineering Tata Mc Hill, 2005
2. Pauline M. Doran Bioprocess Engineering Principles, 2013
3. Engineering Principles, 2nd edition Academic press, 2012
4. Mc Cabe, W.L, Smith J.C and Harriot P,Unit operations of chemical engineering McgrawHill,3rdEd, 2003

REFERENCES:
1. Earle, R.L Unit operation in Food processing, 2nd edition, Pergamon Press, Oxford, 1983.

I Year – II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**3**

ENGINEERING DRAWING

UNIT I: BASICS OF DRAWING
Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.
LO: To study the basic constructions.
LA: Assessment of the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales.

UNIT II: ORTHOGRAPHIC PROJECTIONS
Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.
LO: To understand the orthographic projections

LA: Assessment of the orthographic projections and to project the points and lines parallel to one plane and inclined to other.

UNIT III: PROJECTIONS OF STRAIGHT LINES

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

LO: To understand the projections of lines

LA: Assessment of the projections of the lines inclined to both the planes.

UNIT IV: PROJECTIONS OF PLANES

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

LO: To draw the projection of planes

LA: assessment of the projections of the plane inclined to both the planes

UNIT V: PROJECTIONS OF SOLIDS

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

LO: To draw the projections of various solids

LA: Assessment to draw the projections of the various types of solids in different positions inclined to one of the planes.

UNIT VI: ISOMETRIC AND ORTHOGRAPHIC VIEWS

Conversion of isometric views to orthographic views and Conversion of orthographic views to isometric views.

LO: To understand the translations of isometric to orthographic views

LA: Assessment of ability 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.

TEXT BOOKS
1. Engineering Drawing by N.D. Butt, Chariot Publications, 50th Edition, 2011
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.2010
3. Engineering Graphics by PI Varghese, McGraw Hill Publishers, 2013

REFERENCES

1. Engineering Graphics for Degree by K.C. John, PHI Publishers, 2009
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers, 2008
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age, 2008

I Year – II Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

ENGLISH – COMMUNICATION SKILLS LAB – II

OBJECTIVE**:** To impart to the learner the skills of grammar as well as communication through listening, speaking, reading, and writing including soft, that is life skills.

ADVANCED COMMUNICATION SKILLS

UNIT 6 Body language
UNIT 7 Dialogues
UNIT 8 Interviews and Telephonic Interviews
UNIT 9 Group Discussions
UNIT 10 Presentation Skills
UNIT 11 Debates

TEXT BOOK
'Strengthen your Communication Skills' Part B by Maruthi Publications

REFERENCE BOOKS
1. INFOTECH English (Maruthi Publications)
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)

I Year – II Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

ENGINEERING PHYSICS LAB

OBJECTIVE: To equip the students with basic Physics principles practically.

List of Experiments
1. Determination of wavelength of a source Diffraction Grating Normal incidence
2. Newton's rings –Radius of Curvature of Plano Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination of Rigidity modulus of a material Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration-Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of stretched string – Sonometer.
8. Determination of velocity of sound – Volume resonator.
9. L C R Series Resonance Circuit
10. Study of I/V Characteristics of Semiconductor diode

11. I/V characteristics of Zener diode
12. Thermistor characteristics – Temperature Coefficient
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p-n junction.
15. Hall Effect for semiconductor.

REFERENCE:
1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links)
2. Physics practical manual, Lorven Publications.

I Year – II Semester	L	T	P	C
	0	0	2	0

ENGINEERING PHYSICS
Virtual Labs - Assignments

OBJECTIVE: To render the latest updates in physics along with visual aid.

List of Experiments
1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size

I Year – II Semester   **L   T   P   C**
                                                                  0   0   3   2

ENGINEERING WORKSHOP & IT WORKSHOP

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

Trade:
Carpentry
1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

Fitting
1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black Smithy
1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House Wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Tin Smithy
1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

IT WORKSHOP:
Objectives: Enabling the student to understand basic hardware and software tools through practical exposure
PC Hardware:
Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers. Troubleshooting Hardware and software _ some tips and tricks.
Internet & World Wide Web:
Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums .Awareness of cyber hygiene(protecting the personal computer from getting infected with the viruses), worms and other cyber-attacks.
Productivity tools crafting professional word documents; excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools

(Note: Student should be thoroughly exposed to minimum of 12
Tasks) PC Hardware
Task 1: Identification of the peripherals of a computer.
To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices
Task 2(Optional): A practice on disassembling the components of a PC and assembling them to back to working condition.
Task 3: Examples of Operating systems DOS,
MS Windows, Installation of MS windows on a PC.
Task 4: Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.
Task 5:
Hardware Troubleshooting (Demonstration):
Identification of a problem and fixing a defective PC(improper assembly or defective peripherals).
Software Troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues
Internet & Networking Infrastructure
Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DS Land Dialup Connection.
Orientation & Connectivity Boot Camp and web browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.
Task 7: **Search Engines & Netiquette:**
Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc). Students are acquainted to the principles of microblogging, wiki, collaboration using social networks, participating in online technology forums
Task 8: Cyber Hygiene (Demonstration): Awareness of various threats on the internet. Importance of security patch updates and antivirus solutions. Ethical Hacking, Firewalls, Multi

factor authentication techniques including Smartcard, Biometrics are also practiced

Word

Task 9: MS Word Orientation:

Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving

Task 10: Creating project : Abstract Features to be covered: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Excel

Task 11: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations

Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

LOOKUP/VLOOKUP

Task 12: Performance Analysis Features to be covered: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power Point

Task 13: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes: PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

Task 14: Focusing on the power and potential of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: Master Layouts(slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc.), Inserting –Background, textures, Design Templates, Hidden slides, OLE in PPT.

TEXT BOOK

Faculty to consolidate the workshop manuals using the following references

1. Computer Fundamentals, Anita Goel, Pearson
2. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson,2008
3. Information Technology Workshop,3e, G Praveen Babu, M V Narayana BS Publications
4. 4. Comdex Information Technology, Vikas Gupta, dream tech.

REFERENCE BOOK

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarulu.