

BOARD OF STUDIES IN BASIC SCIENCES 2016-17

B.TECH. INDUSTRIAL BIOTECHNOLOGY

CBCS 2016 REGULATIONS

FIRST SEMESTER

Sl. No.	Course Code	Course Title	Category	Continuous Assessment Marks	End Sem Marks	Total Marks	Credits			
							L	T	P	C
		THEORY								
1	16BHS1Z1	Communication Skills in English	HS	50	50	100	2	2	0	3
2	16BBS1Z2	Engineering Mathematics I	BS	50	50	100	3	2	0	4
3	16BBS103	Applied Physics	BS	50	50	100	3	0	0	3
4	16BBS104	Chemistry for Biotechnology	BS	50	50	100	3	0	0	3
5	16BES105	Basics of Electrical and Electronics Engineering	ES	50	50	100	3	0	0	3
		PRACTICAL								
6	16BBS106	Physics Lab	BS	50	50	100	0	0	4	2
7	16BES107	Engineering Graphics	ES	50	50	100	2	0	4	4
		TOTAL		350	350	700				22

SECOND SEMESTER

Sl. No.	Course Code	Course Title	Category	Continuous Assessment Marks	End Sem Marks	Total Marks	Credits			
							L	T	P	C
		THEORY								
1	16BHS2Z1	Technical English	HS	50	50	100	2	2	0	3
2	16BBS2Z2	Engineering Mathematics II	BS	50	50	100	3	2	0	4
3	16BBS2Z3	Materials Science	BS	50	50	100	3	0	0	3
4	16BHS2Z4	Environmental Science and Engineering	HS	50	50	100	3	0	0	3
5	16BES2Z5	Programming in C	ES	50	50	100	3	0	0	3
6	16BES206	Engineering Mechanics	ES	50	50	100	3	2	0	4
		PRACTICAL								
7	16BBS207	Chemistry Lab	BS	50	50	100	0	0	4	2
8	16BES208	Workshop Practice	ES	50	50	100	0	0	4	2
9	16BES2Z9	Programming in C Lab	ES	50	50	100	0	0	4	2
		TOTAL		450	450	900				26


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16BHS1Z1

COMMUNICATION SKILLS IN ENGLISH

Common to all branches

Category : HS

L T P C

2 2 0 3

Course Objectives:

- o To make the learners understand the usage of basic grammar in English.
- o To enhance the learner's speaking skills through appropriate listening practice.
- o To instill reading habits to practice communicative tasks and comprehension
- o To improve the learner's writing skills through various means
- o To enrich the vocabulary of learners for speaking and writing

UNIT I

6+6 Periods

Listening - Listening to practice basic pronunciation at phonemic and word level, Listening to informal conversations of exchanging greetings and introducing oneself/others; **Speaking**- Introducing oneself, one's family / friend, speaking about one's place; **Reading**-Reading to practice stress and pause; **Writing**-Autobiographical writing, Letter to seek permission, Letter to issue certificates; **Grammar**- Use of Auxiliary Verbs, Adjectives and Adverbs; **Vocabulary**- Word formation, Synonyms and Antonyms of High frequency words.

UNIT II

6+6 Periods

Listening-Listening to Telephone Conversations for taking and leaving messages, making enquiries; **Speaking**—Role-play activities based on real life situations, Narrating daily routines; **Reading**— skimming and scanning, Reading for comprehension with exercises; **Writing**-Advertisements and slogan writing, Imperative instructions, Definitions; **Grammar** – Tenses, Prepositions; **Vocabulary**- Commonly confused words

UNIT III

6+6 Periods

Listening -Listening to give instructions, Making requests and responding to requests, Thanking someone and responding to thanks; **Speaking** -Group Discussion on chosen topics, Describing a simple process; **Reading**-Reading and interpreting visual material, Critical reading; **Writing** –Letter to the Editor of a Newspaper, Recommendations; **Grammar**- Impersonal Passive, Subject-verb agreement; **Vocabulary**- Collocation, Word Association

UNIT IV

6+6 Periods

Listening-Listening to accept/refuse invitation, Listening to apologize, Listening to congratulate; **Speaking** – Debates on current social affairs; **Reading** –Reading to make inference, Paraphrasing; **Writing**- Personal letter (Inviting your friend to a function, congratulating someone on his / her success, thanking one's friends / relatives); **Grammar** – 'Wh'-questions, Modal verbs; **Vocabulary** -Single word substitutes -Use of abbreviations & acronyms

UNIT V

6+6 Periods

Listening -Video Listening to different accents, Viewing Speeches, Viewing English songs, Viewing short films; **Speaking** -Giving impromptu talks, Making presentations on given topics; **Reading** –Extensive reading; **Writing** – Writing General Article, Writing Short Stories; **Grammar** - Common Errors in English; **Vocabulary** –Word Pairs with Repetitive meaning.

LECTURE: 30 PERIODS - TUTORIAL:30 PERIODS- PRACTICAL: 0 PERIODS - TOTAL: 60 PERIODS ✓

TEXT BOOKS**AUTHOR NAME****TITLE OF BOOK****PUBLISHER,****YEAR OF PUBLICATION**

*Department of English, Anna
University. Mindscape
Sadanand, Kamlesh & Punitha,
Susheela*

*English for Technologists and
Engineers
Spoken English: A Foundation
Course (Part 1)*

*Orient Blackswan, Chennai. 2012
Orient Blackswan, Hyderabad. 2014*

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
Raman, Meenakshi & Sangeetha Sharma	Technical Communication: Principles and Practice	Oxford University Press, New Delhi. 2011
Vijay, Anbazhagan.J, & Jaishree.N	Technical English-I	Global Publishers, Chennai, 2016
Rizvi, Ashraf. M.	Effective Technical Communication	Tata McGraw-Hill, New Delhi. 2005
Rutherford, Andrea. J	Basic Communication Skills for Technology	Pearson, New Delhi. 2001
Redston, Chris, Cunningham, Gillie	Face 2 Face: Elementary Student's Book	Cambridge University Press, New Delhi. 2009

EXTENSIVE READING

(Not for Examination)

Kalam, Abdul. A.P.J Wings of Fire. Universities Press, Hyderabad. 1999.

Websites

1. <http://www.usingenglish.com>
2. <http://www.uefap.com>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** The learner will be able to understand basic grammar and the learner will have sufficient command over language by training his tongue and tuning his ear through apt listening tasks.
- CO2:** Reading tasks will enable the learner practice phonological and linguistic aspect of learning, help comprehend and create interest in extensive reading.
- CO3:** The learner shall be able to write appropriately for a given context and use the right word at the right place.

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16BBS1Z2

ENGINEERING MATHEMATICS I*Common to all branches***Category : BS**

L T P C

3 2 0 4

Course Objectives:

- o To familiarize techniques of matrix algebra including properties of eigen values and eigen vectors.
- o To gain the knowledge of hyperbolic functions and application problems in differential calculus.
- o To familiarize with functions of several variables and Functions of two variables including extremum problems, Jacobian and Leibnitz rule of integration.
- o To perform double and triple integration with relevant to surface area and volume of solid.

UNIT I MATRICES 9 + 6 Periods

Eigen values and Eigen vectors of a real matrix-Characteristic equation-Properties of Eigen values and eigen vectors-Cayley Hamilton theorem - Diagonalization of matrices-Reduction of a quadratic form to canonical form by orthogonal transformation-Nature of quadratic forms.

UNIT II HYPERBOLIC FUNCTIONS AND DIFFERENTIAL CALCULUS 9 + 6 Periods

Hyperbolic and Inverse Hyperbolic functions-Identities- Real and Imaginary parts-Solving Problems using Hyperbolic functions.

Curvature and radius of curvature-Cartesian and polar coordinates- center of curvature and Evolutes- Envelopes and Evolute as envelope of normal.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9 + 6 Periods

Functions of two variables- Taylor's theorem (statement only) and expansions-Maxima and Minima-Constrained extremum by Lagrange's multiplier method-Jacobians-Differentiation under integral sign

UNIT IV INTEGRAL CALCULUS 9 + 6 Periods

Definite and Indefinite integrals-Substitution rule-Techniques of Integration-Integration by parts-Trigonometric substitutions-Integration of rational function by partial fractions-Integration of irrational functions-Improper integrals.

UNIT V MULTIPLE INTEGRALS 9 + 6 Periods

Beta and Gamma integrals and properties. Double Integrals-Change of order of integration-Double integrals in polar coordinates-Area enclosed by plane curves-Triple integrals-Volume as a triple integral-Transformation to Polar, Cylindrical and Spherical polar coordinates.

LECTURE: 45 PERIODS TUTORIAL: 30 PERIODS PRACTICAL: 0 PERIODS TOTAL: 75 PERIODS

TEXT BOOKS**AUTHOR NAME****TITLE OF BOOK****PUBLISHER,****YEAR OF PUBLICATION**

Veerarajan T

*Engineering Mathematics for
Semesters I and II*

*Tata McGraw Hill Publishing Co.,
New Delhi, 2015.*

*Kandasamy P, Thilagavathy K and
Gunavathy K*

*Engineering Mathematics for 1 year
B.E/B.Tech.*

*S.Chand & Co, Ramnagar, New Delhi,
Reprint 2013.*

*S. Narayanan and Manicavachagom
Pillai T.K.*

Calculus, Vol.I, II and III,

*S. Viswanathan, Printers and
Publishers Pvt. Ltd, Chennai, 2009.*

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REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Erwin Kreyszig</i>	<i>Advanced Engineering Mathematics</i>	<i>Wiley & sons (Asia) Ltd, 10th Edition, 2015.</i>
<i>Ray Wylie.C and Louis Barrett</i>	<i>Advanced Engineering Mathematics</i>	<i>Tata McGraw Hill Company, New Delhi, 2004.</i>
<i>Grewal B. S</i>	<i>Higher Engineering Mathematics</i>	<i>Khanna Publishers, New Delhi, 43rd Edition, 2014.</i>
<i>Ramana B V</i>	<i>Higher Engineering Mathematics</i>	<i>Tata McGraw Hill Co. Ltd, NewDelhi, 11th Print, 2010.</i>
<i>Bali N., Goyal M and Watkins C</i>	<i>Advanced Engineering Mathematics</i>	<i>Firewall Media (An Imprint of Laxmi Publications Pvt Ltd), New Delhi, 7th Edition, 2009.</i>
<i>Bali N.P and Goyal M</i>	<i>A text book of Engineering Mathematics</i>	<i>University Science Press (An Imprint of Laxmi Publications Pvt Ltd), New Delhi,2014</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Acquire knowledge of eigen values and eigen vectors including properties through matrix theory.
- CO2:** Understand the hyperbolic functions and applications of differential calculus.
- CO3:** Acquire fluency in partial differentiation and solving problems related to maxima and minima for more independent variables.
- CO4:** Understand the standard types of integration and solution to various integrals.
- CO5:** Understand the multiple integrals and their applications to engineering problems.

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16BBS103

APPLIED PHYSICS*Common to Civil, Mechanical, Production
and Industrial Biotechnology branches***Category: BS**L T P C
3 0 0 3**Course Objectives:**

To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology. Upon completion of this course the students will be familiar with:

- Concepts, types of lasers and its applications, fibre optic principles and its applications.
- Basics of properties of matter & thermal physics
- Origin of quantum physics, Schrödinger's equation and applications.
- Principles of acoustics, ultrasonics and their industrial applications.
- Fundamentals of vacuum science, production and measurement.

UNIT I LASERS & FIBRE OPTICS 9 Periods

Introduction- Principle of laser action - characteristics of laser - Spontaneous emission and Stimulated emission -Einstein's coefficients - population inversion - methods of achieving population inversion -Optical Resonator -Types of Lasers - Principle, construction and working of Nd-YAG, CO₂, Semiconductor laser - applications of laser-Hologram.

Introduction - Basic Principles involved in fiber optics- Total internal reflection - Structure of optical fiber -Propagation of light through optical fiber -Derivation for Numerical Aperture and acceptance angle - fractional index change - Classification of optical fiber based on materials, refractive index profile and Modes - Fiber optical communication links-Fiber optic sensors- displacement

UNIT II PROPERTIES OF MATTER & THERMAL PHYSICS 9 Periods

Elasticity- Hooke's law- stress-strain diagram - Factors affecting elasticity - Bending moment - Depression of a cantilever - Young's modulus by uniform bending - I shaped girders.

Thermal expansion - thermal stress - thermal conductivity - heat conduction in solids - flow of heat through compound media - Forbe's and Lee's disc method: theory and experiment.

UNIT III QUANTUM PHYSICS AND APPLICATIONS 9 Periods

Limitations of classical Physics - Introduction to Quantum theory - Dual nature of matter and radiation- de-Broglie wavelength in terms of voltage, energy, and temperature -Heisenberg's Uncertainty principle - verification - physical significance of a wave function- Schrödinger's Time independent and Time dependent wave equations -- Particle in a one dimensional potential well - Scanning Electron Microscope (SEM)- Transmission Electron Microscope (TEM).

UNIT IV ACOUSTICS & ULTRASONICS 9 Periods

Classification of sound - loudness and intensity - Weber-Fechner law - standard intensity and intensity level - decibel - reverberation - reverberation time - sound absorbing materials - Determination of absorption coefficient - factors affecting acoustics of buildings.

Introduction - properties of ultrasonic waves - production of ultrasonic waves; Magnetostriction effect- Magnetostriction generator- Piezoelectric effect- Piezoelectric generator- Acoustic grating - Determination of wavelength and velocity of ultrasonics-cavitation - applications- ultrasonic drilling- ultrasonic welding- ultrasonic soldering and ultrasonic cleaning-Non- destructive Testing- Pulse echo system

UNIT V VACUUM SCIENCE 9 Periods

Introduction - Importance of vacuum in industries - Pumping speed and throughput - Types of pumps-Rotary vane type Vacuum pump(oil sealed), Diffusion Pump and Turbo Molecular Pump - Measurement of High Vacuum-McLeod Gauge-Pirani Gauge-Penning Gauge - Application to thin film technology.

LECTURE: 45 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 0 PERIODS TOTAL: 45 PERIODS

TEXT BOOKS
AUTHOR NAME

TITLE OF BOOK

PUBLISHER,
YEAR OF PUBLICATION

<i>Arumugam M</i>	<i>Engineering Physics</i>	<i>Amuradha Publishers, 2010.</i> <i>(Unit I & Unit III)</i>
<i>P.K.Palanisamy</i>	<i>Engineering physics-I</i>	<i>SciTech Publications (India) Pvt.</i> <i>Ltd,2015. (Unit II & Unit IV)</i>
<i>Ganesan S and Iyandurai N</i>	<i>Applied Physics</i>	<i>KKS Publishers, Chennai, 2007.(Unit V)</i>

REFERENCE BOOKS

AUTHOR NAME

TITLE OF BOOK

PUBLISHER,
YEAR OF PUBLICATION

<i>Avadhanulu MN and</i> <i>Kshirsagar P G</i>	<i>A Textbook of Engineering Physics</i>	<i>S.Chand and Company Ltd, New Delhi,</i> <i>2010.</i>
<i>Gaur R.K. and Gupta S.L</i>	<i>Engineering Physics</i>	<i>Dhanpat Rai Publishers, 2009.</i>
<i>K.Rajagopal</i>	<i>Engineering Physics</i>	<i>PHI Learning Private limited, New</i> <i>Delhi,2015.</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Analyze the construction and working of Nd-YAG, CO₂, Semiconductor lasers. Explain fiber optics and classify fibers based on index profiles and modes. [Familiarity]
- CO2:** Acquire knowledge in properties of matter and thermal Physics [Application]
- CO3:** Analyze the dual nature of matter using Heisenberg's Uncertainty principle, Schrodinger's time independent and dependent wave equations. [Assessment]
- CO4:** Apply piezoelectric detector method for industrial applications. [Usage and Assessment]
- CO5:** Production & Measurement of vacuum. [Familiarity]

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16BBS104

CHEMISTRY FOR BIOTECHNOLOGY

Category: BS

L T P C

3 0 0 3

Course Objectives:

- The course is aimed at imparting knowledge of organic chemistry topics which would be useful for students to understand chemistry applied in Biotechnology.

UNIT I POLYMER TECHNOLOGY 9 Periods
 Polymers - definitions of monomer, polymer, functionality, degree of polymerisation – Free radical mechanism - Individual polymers - PVC, PMMA, Teflon, polyamide, poly carbonate, epoxy, polyurethane - preparation, properties and their end users - compounding of plastics - components and functions - fabrication techniques - compression, injection, extrusion and blow moulding - Conducting polymers - structures of polypyrrole, polyaniline and poly acetylene - conduction mechanism of polyacetylene only - Biodegradable polymers – polylactide, starch and cellulose.

UNIT II STEREOCHEMISTRY AND HETEROCYCLIC COMPOUNDS 9 Periods
 Stereoisomerism - types of stereoisomerism - configurational isomers - enantiomers and diastereoisomers - chirality, optical activity - Fischer projections - optical isomerism - configurations – D & L, R & S systems – Geometrical – E & Z nomenclature - applied to cyclic structures- conformational isomerism – ethane, n-butane and cyclo hexane. Hetero cyclic compounds- pyrrole, pyridine, quinoline, isoquinoline, indole - aromaticity, synthesis and reactions of the compounds.

UNIT III INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS 9 Periods
 Electromagnetic radiation - characteristics (wave length, wave no, frequency and energy) – Molecular spectroscopy - electronic spectra - Beer Lambert law – deviations - analysis of ferrous iron, nucleic acids, electronic transitions in organic molecules - Woodward – Fischer rules for calculating absorption maximum in dienes and unsaturated ketones - IR spectroscopy – principle - fundamental vibrations, finger print region - simple instrumentation and sampling, interpretation of simple compounds (ethanol, benzene and benzoic acid).

UNIT IV BASIC REACTION MECHANISM IN ORGANIC CHEMISTRY 9 Periods
 Bonding in organic molecules - carbanion, carbocation and free radicals - inductive effect, electronic effect and resonance effect - Nucleophilic substitution – S_N1 and S_N2 – evidences - Electrophilic- substitution – aromatic and aliphatic - Elimination – E1 and E2 substitution – applied to simple reactions.

UNIT V NANOCHEMISTRY 9 Periods
 Nano materials – definitions of 1D, 2D and 3D structures -general methods of synthesis and characterisation - bottom up and top down approaches - wet chemical, CVC, laser ablation and ball milling techniques - self assembled structures – Characteristics – classification - dendrimers – applications in Biotechnology.

LECTURE: 45 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 0 PERIODS TOTAL: 45 PERIODS

TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
Jain P.C. and Monica Jain	Engineering Chemistry	Dhanpat Rai Publications. Pvt. Ltd, New Delhi, 16 th Edition, 2015.
ArunBhal and Bahl.B.S	Advanced Organic Chemistry	S. Chand & Company Ltd, New Delhi, 2014.

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Vairam S, Subha Ramesh</i>	<i>Engineering Chemistry</i>	<i>Wiley India, 2015.</i>
<i>O.P. Aggarwal, Avinash Aggarwal</i>	<i>Engineering Chemistry</i>	<i>Khanna Publishers, 2010.</i>
<i>Kuriakose J.C., and Rajaram J</i>	<i>Chemistry in Engineering and Technology, Vol.1 & II</i>	<i>Tata Mc Graw Hill Publishing company Pvt. Ltd, New Delhi, 2010.</i>
<i>I.L. Finar</i>	<i>Organic Chemistry</i>	<i>EBS Publications, 2013.</i>
<i>B. Sivasankar</i>	<i>Engineering Chemistry</i>	<i>Tata McGraw Hill Publications, 2008.</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Understand the mechanism of organic reactions and apply them in synthesis of biomolecules.
- CO2:** Learn the principles of stereoisomerism, configurations in simple organic molecules and extend the knowledge to biomolecules and the properties of heterocyclic compounds.
- CO3:** Be familiar with the various instrumental methods used for the analysis of simple compounds and interpretation of biomolecules.
- CO4:** Know about the different types of polymeric materials, properties and fabrication which match the specific applications.
- CO5:** Gain the knowledge about fundamental of nanomaterials, synthesis, structures and application in Biotechnology field.

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16BES105 **BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING** **Category : ES**
 Common to Mechanical, Production and **L T P C**
 Industrial Biotechnology branches **3 0 0 3**

Course Objectives:

- o To study the basic concepts of electric circuits, electronic devices and communication engineering.
- o To know the fundamental of energy conversion, construction, principle of operation, characterization of DC machines and AC machines.

UNIT I **ELECTRICAL CIRCUITS & MEASUREMENTS** **9 Periods**
 Ohm's Law – Kirchoff's Laws – Steady State Solution of DC circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.
 Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II **ELECTRICAL MACHINES** **9 Periods**
 Construction, Principle of Operation, Basic Equations and Types, Characteristics and Applications of DC Generators, DC Motors, Single Phase Transformer, Single Phase induction motor.

UNIT III **SEMICONDUCTOR DEVICES AND APPLICATIONS** **9 Periods**
 Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers - Voltage Regulation.
 Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Working principle and Characteristics of FET, JFET, MOSFET – Characteristics and Simple Application of SCR, DAC, TRIAC & UJT – Elementary Treatment of Small Signal Amplifier.

UNIT IV **DIGITAL ELECTRONICS** **9 Periods**
 Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders - Flip-Flops – Registers and Counters – A/D and D/A Conversion (Simple concepts).

UNIT V **FUNDAMENTALS OF COMMUNICATION ENGINEERING** **9 Periods**
 Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.
 Communication Systems: Radio, TV, Microwave, Satellite, RADAR and Optical Fibre (Block Diagram Approach only).

LECTURE: 45 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 0 PERIODS TOTAL: 45 PERIODS

TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Muthusubramanian R, Salivahanan S and Muraleedharan K A</i>	<i>Basic Electrical and Electronics Engineering</i>	<i>Tata McGraw Hill, Second Edition, (2009).</i>
<i>Mittle.V.N and Arvind Mittal</i>	<i>Basic Electrical Engineering</i>	<i>Tata McGraw Hill, Second Edition, New Delhi, 2005.</i>
<i>Sedha R.S</i>	<i>A Text book of Applied Electronics</i>	<i>S. Chand & Co., 2008.</i>

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REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Nagsarkar T K and Sukhija M S</i>	<i>Basics of Electrical Engineering</i>	<i>Oxford Press (2005).</i>
<i>Mehtra V.K and Rohit Mehta</i>	<i>Principles of Electrical Engineering and Electronics</i>	<i>S. Chand & Co. 2nd Edition 2015.</i>
<i>Mahmood Nahvi and Joseph A. Edminister</i>	<i>Electric Circuits, Schaum' Outline Series</i>	<i>McGraw Hill, Sixth edition (2014)</i>
<i>Premkumar N and Gnanavadivel J</i>	<i>Basic Electrical and Electronics Engineering</i>	<i>Anuradha Publishers, 4th Edition (2008).</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

CO1: Analyze simple DC and AC Circuits.

CO2: Understand the significance of Electrical machines.

CO3: Apply knowledge on semiconductor devices and Integrated circuits.

CO4: Understand the concepts of communication engineering.

CO5: Design simple circuits using electronic components for specific applications.

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16BBS106

PHYSICS LAB

Category : BS

*Common to Civil, Mechanical, Production
and Industrial Biotechnology branches*L T P C
0 0 4 2**Course Objectives:**

- o To have a practical knowledge about the concepts behind physics and the need to apply in the emerging technology.

LIST OF EXPERIMENTS

1. Spectrometer - Diffraction Grating Normal Incidence Method
2. Air Wedge –Determination of thickness of a paper
3. Young's Modulus – Cantilever Bending - Koenig's Method
4. a. Laser - Particle size Determination
b. Optical fiber - Determination of NA & Acceptance angle
5. Ammeter and Voltmeter Calibration – Low Range
6. Resistance Of The Given Coil Of Wire – Carey Foster's Bridge
7. Determination of Band gap Energy of Semiconductor
8. Ultrasonic Interferometer - Velocity of sound & Compressibility of liquids.
9. Transistor Characteristics
10. Torsional pendulum –Determination of Rigidity Modulus & Moment of Inertia

LECTURE: 0 PERIODS TUTORIAL:0 PERIODS PRACTICAL: 60 PERIODS TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this practical classes, the students will be able to

CO1: Determinate all physical properties of any matter, basic idea of calibrating electrical measuring instruments and thereby effectively using it for particular applications.**CO2:** Experiment intrinsic characteristic features of electronic devices for electrical and electronic applications.

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COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Represent planes and solids as per international standards.
- CO2:** Generate and interpret multiple views through development, interpretation and sectional views.
- CO3:** Generate and interrupt orthographic views.
- CO4:** Generate and interrupt pictorial views and interpenetration.
- CO5:** Generate and interrupt perspective views.
- CO6:** Apply the concept of AUTOCAD in engineering graphics.

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16BHS2Z1

TECHNICAL ENGLISH
Common to all branches

Category : HS
L T P C
2 2 0 3

Course Objectives:

- To make learners acquire guided listening and speaking skills in both formal and informal contexts.
- To help them develop reading skills by familiarizing them with different types of reading tasks and strategies
- To make them understand advance level of grammar and equip them with writing skills needed for academic as well as workplace contexts.
- To explore the learner to Technical English and Technical Vocabulary.

UNIT I

6+6 Periods

Listening - Listening to ask for/ give opinions, Listening to persuade/dissuade people, Listening to make complaints, Listening to transfer information; **Speaking** –Role play activities on a formal/corporate context, Delivering Welcome Address- **Reading** – Reading to infer lexical and contextual meaning; **Writing** - Effective use of SMS on Whatsapp/ Hike/ Messenger, Writing E-mails on a business context, Technical style; **Grammar** – Use of relative / reflexive pronouns, Discourse Markers; **Vocabulary**- Homonyms and Homophones

UNIT II

6+6 Periods

Listening - Listening to express regrets/sympathy/condolences, Listening and Note-taking; **Speaking** – Addressing at an official meeting to deal with problems/ sensitive issues, Discussion on a movie with a poignant social message/ or on a recently read book; **Reading** - Reading a short story or an article from newspaper; **Writing** - Writing a review of a book/movie/music concert/sports event, Graph Description; **Grammar** – Noun/Adjective/Adverbial phrases, Cause and effect expressions; **Vocabulary** - Using phrasal verbs in sentences, Jargon

UNIT III

6+6 Periods

Listening - Listening to a talk about using quantities, Listening to describe manner and frequency, Listening to expressions of assumptions/inference, Listening to make comparisons; **Speaking** –Making conversation to practice stress, pause, pronunciation and intonation, Introducing the chief-guest; **Reading** - Speed reading – reading passages with time limit - **Writing** – Notice, Agenda and Minutes of meetings; - Elements of Writing Technical articles –**Grammar** - Numerical expressions, Conditional clauses; **Vocabulary** - Same word used as different parts of speech, Register

UNIT IV

6+6 Periods

Listening - Listening to talks about future events/plans, Listening to a talk about making arrangements, Listening to language of reporting, Viewing a model discussion; **Speaking** – Discussion on a formal/corporate context, Proposing vote of thanks; **Reading** - Reading the job advertisements and the profile of the company concerned; **Writing** - Process Description, Applying for a job with résumé; **Grammar** - Direct and indirect speech; **Vocabulary** - Idioms

UNIT V

6+6 Periods

Listening – Listening to expressions of possibility, Listening to expressions of obligations, Listening to expressions of ability, Viewing model interviews; **Speaking** - Mock interview; **Reading** - Note making, Intensive reading; **Writing** – Checklist, - Feasibility / Project report; **Grammar** – Time Statements and Contracted Time Statements; **Vocabulary** – Nominal Compounds

LECTURE: 30 PERIODS - TUTORIAL:30 PERIODS- PRACTICAL: 0 PERIODS' TOTAL: 60 PERIODS /

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TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Department of English, Anna University. Mindscapes</i>	<i>English for Technologists and Engineers.</i>	<i>Orient Blackswan, Chennai. 2012</i>
<i>Sadanand, Kamlesh & Punitha, Susheela</i>	<i>Spoken English: A Foundation Course (Part 2).</i>	<i>Orient Blackswan, Hyderabad. 2014</i>

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Raman, Meenakshi & Sangeetha Sharma</i>	<i>Technical Communication: Principles and Practice</i>	<i>Oxford University Press, New Delhi. 2011</i>
<i>Vijay, Anbazhagan.J, & Jaishree.N</i>	<i>Technical English-II</i>	<i>Global Publishers, Chennai, 2016</i>
<i>Rizvi, Ashraf. M. Herbert, A.J</i>	<i>Effective Technical Communication Structure of Technical English</i>	<i>Tata McGraw-Hill, New Delhi. 2005 The English Language Society, London. 1971</i>
<i>Michigan, E.A</i>	<i>Word Power and Speed Reading: English Improvement Series</i>	<i>Infinity Books, New Delhi, 2007</i>
<i>Rajendrapal & Korlahalli. J.S</i>	<i>Essentials of Business Communication</i>	<i>Sultan Chand & Sons</i>

WEBSITES

1. <http://www.usingenglish.com>
2. <http://www.uefap.com>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** The learners will be able to speak convincingly at work place and social contexts through guided listening tasks and different genres and strategies of reading.
- CO2:** The learner will understand advance level of grammar and write professionally to a larger Extent for workplace and general contexts.
- CO3:** The learners will familiarize themselves with Technical Vocabulary and Technical English.

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16BBS2Z2

ENGINEERING MATHEMATICS II
Common to all branches

Category : BS
L T P C
3 2 0 4

Pre-Requisites: Basics of - trigonometry- differential and integral formulae.

Course Objectives:

- o To acquire knowledge of techniques of ordinary differential equations leading to engineering problems.
- o To acquire knowledge of vector Calculus with engineering applications.
- o To gain standard techniques of complex variable applicable to fluid dynamics, heat conduction, and elasticity.
- o To develop skill of solving transforms leading to engineering applications.

UNIT I **ORDINARY DIFFERENTIAL EQUATIONS** **9 + 6 Periods**
Second and Higher order Differential Equations, Method of variation of parameters- Method of undetermined coefficients-Homogeneous equations of Euler's and Legendre's type-System of Simultaneous first order Linear equations with constant coefficients - Method of reduction of order.

UNIT II **VECTOR CALCULUS** **9 + 6 Periods**
Gradient and directional derivative, Divergence and Curl – Irrotational and Solenoidal fields- Vector identities - Line, Surface and Volume Integrals – Green's Theorem in a Plane , Gauss Divergence and Stoke's Theorems (Statements only) –Verifications and Applications.

UNIT III **COMPLEX DIFFERENTIATION** **9 + 6 Periods**
Functions of a Complex variable-Analytic functions- Cauchy Riemann equations and sufficient conditions (excluding proof)–Harmonic conjugates–Construction of analytic functions-Conformal mappings: $w=z+a$, $az, 1/z, z^2, e^z, \sin z$, $\cos z$ and Bilinear Transformation.

UNIT IV **COMPLEX INTEGRATION** **9 + 6 Periods**
Cauchy's integral theorem, Cauchy's integral formula -Taylor's and Laurent's theorems (Statements only) and expansions – Poles and Residues – Cauchy's Residue theorem – Contour integration – Circular and semi circular contours with no pole on real axis.

UNIT V **LAPLACE TRANSFORMATIONS** **9 + 6 Periods**
Laplace transforms- Properties and standard transforms-Transforms of unit step, unit Impulse and error functions – Transforms of periodic functions- Inverse Laplace transforms- Initial and Final value theorems- Convolution theorem (Statement only) and applications - Applications to Solution of Linear differential equations of second order with constant coefficients.

LECTURE: 45 PERIODS TUTORIAL:30 PERIODS PRACTICAL: 0 PERIODS TOTAL: 75 PERIODS

TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
Veerarajan T	Engineering Mathematics for Semesters I and II	Tata McGraw Hill Publishing Co., New Delhi, 2015.
Kandasamy P, Thilagavathy K and Gunavathy K	Engineering Mathematics for I year B.E/B.Tech	S.Chand & Co, Ramnagar, New Delhi, Reprint 2013.
S. Narayanan and Manicavachagom Pillai T.K.	Calculus-Vol.III	S. Viswanathan, Printers and Publishers Pvt. Ltd, Chennai, 2009.

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Erwin Kreyszig</i>	<i>Advanced Engineering Mathematics</i>	<i>Wiley & sons(Asia) Ltd, 10th Edition, 2015.</i>
<i>Ray Wylie.C and Louis Barrett</i>	<i>Advanced Engineering Mathematics</i>	<i>Tata McGraw Hill Company, New Delhi, 2004.</i>
<i>Grewal B. S</i>	<i>Higher Engineering Mathematics</i>	<i>Khanna Publishers, New Delhi, 43rd Edition, 2014.</i>
<i>Ramana B V</i>	<i>Higher Engineering Mathematics</i>	<i>Tata McGraw Hill Co. Ltd, NewDelhi, 11th Print, 2010.</i>
<i>Bali N., Goyal M and Watkins C</i>	<i>Advanced Engineering Mathematics</i>	<i>Firewall Media (An Imprint of Laxmi Publications Pvt Ltd), New Delhi, 7th Edition,2009.</i>
<i>Bali N.P and Goyal M</i>	<i>A text book of Engineering Mathematics</i>	<i>University Science Press (An Imprint of Laxmi Publications Pvt Ltd), New Delhi,2014.</i>

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

- CO1:** Understand the kinds of differential equations and their solutions in the field of engineering.
- CO2:** Evaluate gradient, divergence and curl and also line, surface and volume integrals in cartesian form and simple coordinate systems and calculate integrals applying Greens, stokes and Gauss theorems.
- CO3:** Understand the concepts of analytic functions and conformal mappings.
- CO4:** Evaluate contour integrals using calculus of residues.
- CO5:** Apply Laplace transform methods to solve differential equations.

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16BBS2Z3

MATERIALS SCIENCE
Common to all branches

Category : BS
L T P C
3 0 0 3

Course Objectives:

To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology. Upon completion of this course the students will be familiar with:

- The properties of conducting materials.
- The application of magnetic and super conducting materials.
- Application and properties of dielectric and ferro electric materials.
- Applications and properties of Modern engineering materials.
- Nano materials and its properties.

UNIT I CONDUCTING MATERIALS 9 Periods
Introduction to Conductors – classical free electron theory of metals – Draw backs of classical theory – quantum theory - Electrical and Thermal conductivity of Metals – Derivation for Wiedeman – Franz law – Lorentz number – Fermi distribution function - effect of temperature – density of energy states – calculation of Fermi energy-carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS AND DEVICES 9 Periods
Introduction – Properties – elemental and compound semiconductors - Intrinsic and extrinsic semiconductors – properties - Carrier concentration in intrinsic Semiconductor - variation of Fermi level with temperature and carrier concentration - Electrical Conductivity – band gap determination - extrinsic semiconductors - Carrier concentration in P- type and N-type semiconductors – variation of Fermi level with temperature and impurity concentration – Hall effect- Determination of Hall Co-efficient in N type and P type Semiconductor - Applications.

UNIT III MAGNETIC AND SUPER CONDUCTING MATERIALS 9 Periods
Introduction - Origin of magnetic moment - Bohr magneton - Dia, Para, and Ferro magnetic materials - Domain theory of ferromagnetism - Hysteresis - Hard and Soft magnetic materials. Ferrites - structure and applications. - Magneto optical recording and readout – Superconductivity - Types of superconductors - BCS theory of superconductivity (qualitative) - properties- High Tc superconductors, Applications of superconductors- SQUID, Cryotron, Magnetic levitation.

UNIT IV DIELECTRICS AND FERROELECTRICS 9 Periods
Introduction to dielectric materials – Electric polarization and Dipole moment - Electrical susceptibility – dielectric constant – Various polarization mechanisms in dielectrics - electronic, ionic, orientational and space charge polarization– frequency and temperature dependence of polarization – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – Applications of dielectric materials - Ferro electric materials –Ferro electric materials -BaTiO₃ – Applications- Ferro electric energy converter.

UNIT V MODERN ENGINEERING MATERIALS 9 Periods
Metallic glasses- preparation of metallic glasses - properties – applications of the metallic glasses - Shape Memory Alloys (SMA) - Characteristics, properties of NiTi alloy - applications of the Shape memory alloys - advantages and disadvantages of SMA - Nanomaterials-synthesis –chemical vapour deposition – Sol Gel – ball Milling – properties of nanoparticles and applications of nanoparticles – Carbon Nanotubes (CNT) – structure – properties – applications of CNTs.

LECTURE: 45 PERIODS / TUTORIAL: 0 PERIODS / PRACTICAL: 0 PERIODS / TOTAL: 45 PERIODS /

TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>P.K.Palanisamy</i>	<i>Engineering Physics–II</i>	<i>Scitech Publications (India) Pvt. Ltd 2015 (Unit I, Unit III & Unit IV)</i>
<i>Dr.Jayakumar .S</i>	<i>Materials science</i>	<i>R.K.Publishers,2008.(Unit II & IV)</i>
<i>Dr.V.Rajendran</i>	<i>Material Science</i>	<i>Tata McGraw Hill Publications, NewDelhi, 2011.</i>

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Charles P.Poole, Jr; Frank J.Owens</i>	<i>Introduction to Nanotechnology</i>	<i>Wiley India, 2012.</i>
<i>Gaur R.K. and Gupta S.L</i>	<i>Engineering Physics</i>	<i>Dhanpat Rai Publishers, 2009.</i>
<i>K.Rajagopal</i>	<i>Engineering Physics</i>	<i>PHI Learning Private Ltd, New Delhi, 2015.</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Analyze the properties of conducting materials. [Familiarity]
- CO2:** List and analyze the properties of Semiconducting materials and Devices. [Familiarity]
- CO3:** Identify, analyze the properties and applications of magnetic & super conducting materials. [Familiarity]
- CO4:** List and analyze the properties of dielectric Ferro electric materials. [Familiarity & Application]
- CO5:** List the properties and applications of modern engineering materials. [Familiarity & Application]

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16BHS2Z4

ENVIRONMENTAL SCIENCE AND ENGINEERING
Common to all branches

Category : HS
L T P C
3 0 0 3

Course Objectives:

- o The course is aimed at creating awareness among students and also to inculcate the critical ideas of preserving environment.

UNIT I ENVIRONMENTAL RESOURCES 9 Periods

Natural resources -Forest – benefits, over exploitation, deforestation & consequences – Water - unique features, hydrological cycle & over exploitation – Food -effect of modern agriculture, fertilizers, pesticides, eutrophication & biomagnifications - Energy resources - renewable & non-renewable resources - wind, solar and tidal - harnessing methods.

UNIT II ECO SYSTEM AND BIODIVERSITY 9 Periods

Ecology - ecosystem, physical and chemical components of ecosystem, biological components of ecosystem - forest ecosystem, desert ecosystem and pond ecosystem, Energy flow in ecosystem, nitrogen cycle and carbon dioxide cycle, food pyramid, ecological succession, Biodiversity - types, values of biodiversity, hot spots of biodiversity, endangered and endemic species, conservation of biodiversity – in situ – ex situ conservation.

UNIT III ENVIRONMENTAL POLLUTION 9 Periods

Air pollution, classification of air pollutants – sources, effects and control of gaseous pollutants SO₂, NO_x, H₂S, CO, CO₂ and particulates, control methods - cyclone separator and electrostatic precipitator - Water pollution - classification of water pollutants, organic and inorganic pollutants, sources, effects and control of water pollutants Soil pollution - sources, effects and control - Noise pollution - decibel scale, sources, effects and control.

UNIT IV ENVIRONMENTAL THREATS 9 Periods

Acid rain, greenhouse effect, global warming and ozone depletion, disaster management, flood, drought, earthquake and tsunami, Threats to biodiversity - destruction of habitat, habit fragmentation - hunting, over exploitation and man - Wildlife conflicts, The IUCN red list categories, status of threatened species.

UNIT V SOCIAL ISSUES AND ENVIRONMENT 9 Periods

Sustainable development - sustainable technologies, need for energy and water conservation, rain water harvesting, water shed management, waste land reclamation, Pollution control Act, Wild life protection act, Forest conservation act, population growth - exponential and logistic growth, variation in population among nations, population policy, women and child welfare programs, role of information technology in human and health, HIV/AIDS - effects and preventive measures.

LECTURE: 45 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 0 PERIODS TOTAL: 45 PERIODS

TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
Sharma J.P	<i>Environmental Studies, 3rd Edition</i>	University Science Press, New Delhi 2009.
Anubha Kaushik and C.P. Kaushik	<i>Environmental Science and Engineering, 3rd Edition</i>	New age International Publishers, New Delhi, 2008.

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REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>R.K. Trivedi</i>	<i>Hand book of Environmental laws, Rules, Guidelines, Compliances and Standards, Vol.I&II,</i>	<i>Environ Media, 2006.</i>
<i>G. Tyler Miller Jr</i>	<i>Environmental Science, 10th Edition</i>	<i>Thomson Brooks/Cole Publishing, 2004.</i>
<i>Gilbert M. Masters</i>	<i>Introduction to Environmental Engineering and Science, 2nd Edition</i>	<i>Pearson Education, 2004.</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** To know about the various environmental resources, the effective utility and problems accompanied in over exploitation.
- CO2:** To acquire knowledge about the interaction of biosphere with environment and conservation methods of bio diversity.
- CO3:** To be aware of the source of various types of pollution, their ill effects and preventive methods.
- CO4:** To understand the environmental threats, Acid rain, Green house effect and Ozone depletion and natural disasters.
- CO5:** To create an idea about sustainable development and social issues.

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16BES2Z5

PROGRAMMING IN C
Common to all branches

Category : ES

L T P C
3 0 0 3 -**Course Objectives:**

Upon completion of this course, the students will be familiar with,

- o The Computer and Programming fundamentals
- o Data types in C and Flow control statements
- o Functions, Arrays, Pointers And Strings
- o Bitwise Operators, Preprocessor Directives, Structures and Unions
- o Structures, List Processing, Input And Output

UNIT I COMPUTER AND PROGRAMMING FUNDAMENTALS 9 Periods

Computer fundamentals – Evolution, classification, Anatomy of a computer: CPU, Memory, I/O – Introduction to software – Generation and classification of programming languages – Compiling – Linking and loading a program – Translator – loader – linker – develop a program – software development – Introduction to OS –Types of OS – Algorithms – Structured programming concept.

UNIT II DATA TYPES AND FLOW OF CONTROL 9 Periods

An overview of C – Programming and Preparation – Program Output – Variables – Expressions, and Assignment, The use of #include, printf(), scanf() – Lexical elements, operators and the C systems – The fundamental data types – Flow of control

UNIT III FUNCTIONS, ARRAYS, POINTERS AND STRINGS 9 Periods

Functions and storage classes - 1D Arrays – Pointers – Call by reference – Relationship between Arrays and Pointers – Pointer arithmetic and element size – Arrays as function argument – Dynamic memory allocation – Strings – String handing functions – Multidimensional Arrays.

**UNIT IV ARRAY OF POINTERS, BITWISE OPERATORS, 9 Periods
 PREPROCESSOR DIRECTIVES**

Arrays of Pointers – Arguments to main () - Ragged Arrays – Functions as Arguments – Arrays of Pointers to Functions - Type qualifiers.-Bitwise operators and expressions – Masks – Software tools – Packing and unpacking – Enumeration types – The preprocessor directives.

UNIT V STRUCTURES AND UNIONS, I/O AND FILE OPERATIONS 9 Periods

Structures and Unions – Operator precedence and associativity – Bit fields – Accessing bits and bytes - Input and Output functions – File Processing Functions – Environment variables – Use of make and touch.

LECTURE: 45 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 0 PERIODS TOTAL: 45 PERIODS

TEXT BOOKS**AUTHOR NAME****TITLE OF BOOK****PUBLISHER,****YEAR OF PUBLICATION**

Pradip Dey, Manas Ghosh

Computer Fundamentals and
Programming in C, Second Edition

Oxford University Press, 2013.

Al Kelley, Ira Pohl

A Book on C-Programming in C,
Fourth Edition

Addison Wesley, 2001.

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REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>Stephen G. Kochan</i>	<i>Programming in C-A complete introduction to the C programming language, Third Edition</i>	<i>Sams Publication, 2004.</i>
<i>Yashavant P. Kanetkar</i>	<i>Let Us C, 13th edition</i>	<i>BPB Publications, 2013.</i>
<i>Brian W. Kernighan and Dennis Ritchie</i>	<i>The C Programming Language”, Second Edition</i>	<i>Prentice Hall Software Series, 1988.</i>
<i>Stephen Prata</i>	<i>C Primer Plus, Fifth Edition</i>	<i>Sams Publishing, 2005.</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Articulate the programming environment [Familiarity]
- CO2:** Write algorithm for solving the given problem statement [usage]
- CO3:** Use right data types and flow control statement [Assessment]
- CO4:** Write programs using functions, arrays, pointers and strings [Usage]
- CO5:** Use right storage classes, preprocessor directives, bitwise operators in programs [Assessment]
- CO6:** Use structures, unions and files [Usage]

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16BES206

ENGINEERING MECHANICS*Common to all except ECE, CSE and IT branches*

Category : ES

L T P C
3 2 0 4**Course Objectives:**

- o To analyze the force systems, friction and to study the dynamics of particles, impulse and momentum.

UNIT I INTRODUCTION TO MECHANICS AND FORCE CONCEPTS 9 + 6 Periods

Principles and Concepts – Laws of Mechanics – system of forces – resultant of a force system – resolution and composition of forces – Lami's theorem – moment of a force – physical significance of moment- Varignon's theorem – resolution of a force into force and couple – forces in space – addition of concurrent forces in space – equilibrium of a particle in space.

UNIT II FRICTION 9 + 6 Periods

Frictional resistance – classification of friction- laws of friction – coefficient of friction-angle of friction – angle of repose — cone of friction – free body diagram-advantages-equilibrium of a body on a rough inclined plane – non-concurrent force system - ladder friction – rope friction – wedge friction.

UNIT III GEOMETRICAL PROPERTIES OF SECTION 9 + 6 Periods

Centroids – Determination by integration – moment of inertia – theorems of moment of inertia –Product of Inertia – Principal moment of inertia of plane areas - radius of gyration.

UNIT IV BASICS OF DYNAMICS - KINEMATICS 9 + 6 Periods

Kinematics and kinetics – displacements, velocity and acceleration - Equations of motion – Rectilinear motion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves – motion under gravity – relative motion – curvilinear motion of particles – projectiles – angle of projection – range – time of flight and maximum height.

UNIT V BASICS OF DYNAMICS - KINETICS 9 + 6 Periods

Newton's second-law of motion – linear momentum – D'Alembert's principle, Dynamics equilibrium — work energy equation of particles– law of conservation of energy – principle of work and energy. Principle of impulse and momentum – Equations of momentum – Laws of conservation of momentum. Impact – Time of compression, restitution, collision – Co-efficient of restitution – types of impact – collision of elastic bodies by direct central impact and oblique impact – collision of small body with a massive body – Kinetic energy of a particle.

LECTURE: 45 PERIODS TUTORIAL:30 PERIODS PRACTICAL: 0 PERIODS TOTAL: 75 PERIODS

TEXT BOOKS**AUTHOR NAME****TITLE OF BOOK****PUBLISHER,
YEAR OF PUBLICATION***S.S. Bhavikatti and K.G.**Engineering Mechanics**New Age International Pvt Ltd. 1999.**Rajasekarappa**Engineering Mechanics**Umesh Publications, 5-B north market,
Naisarak, Delhi, 2002.**S.C. Natesan*

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REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
<i>F.B. Beer and E.R. Johnson</i>	<i>Vector Mechanics for Engineers</i>	<i>Tata Mc.Graw Hill Pvt Ltd, 10th Edition, 2013.</i>
<i>S. Timoshenko and Young</i>	<i>Engineering Mechanics</i>	<i>Mc.Graw Hill, 4th Edition, 1995.</i>
<i>Irving Shames and Krishna Mohana Rao</i>	<i>Engineering Mechanics</i>	<i>Prentice Hall of India Ltd, Delhi, 2006.</i>
<i>Domkundwar V.M and Anand V. Domkundwar</i>	<i>Engineering Mechanics (Statics and Dynamics)</i>	<i>Dhanpat Rai and Co. Ltd, 1st Edition, 2006.</i>
<i>Suhas Nitsure</i>	<i>Engineering Mechanics</i>	<i>Technical Publications, Pune, 1st edition, 2006.</i>
<i>R.C. Hibbeler</i>	<i>Engineering Mechanics</i>	<i>Prentice Hall of India Ltd, 13th Edition, 2013.</i>
<i>Vela Murali</i>	<i>Engineering Mechanics</i>	<i>Oxford university Press, 1st Edition, 2010.</i>

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

CO1: Analyze the problems related to force systems and friction

CO2: Apply concepts of centre of gravity and moment of inertia

CO3: Solve problems on dynamics, momentum and impulse

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16BBS207

CHEMISTRY LAB
Common to Civil, Mechanical, Production
and IBT branches

Category: BS
L T P C
0 0 4 2

Course Objective:

- o The course is aimed at imparting knowledge of experimental techniques which would be useful for students to apply the practical principles relevant conventional engineering field.

LIST OF EXPERIMENTS

1. Estimation of hardness by EDTA method.
2. Estimation of chloride by Argentometric method.
3. Determination of dissolved oxygen by Winkler's method.
4. Conductometric titration of mixture of strong acid and weak acid using strong base.
5. Potentiometric titration of ferrous iron by dichromate.
6. Estimation of copper in brass by EDTA method.
7. Estimation of Iron by Spectrophotometry
Estimation of HCl by pH titration.

LECTURE: 0 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 60 PERIODS TOTAL: 60 PERIODS

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
A.O. Thomas, Jeffery G H, Basset J. Menthom J, Denney R.C.	Practical Chemistry Vogel's Text book of quantitative analysis, 5 th Edition	Scientific Book Centre, Cannanore, 2003. EBS, 1988.

COURSE OUTCOMES:

Upon completion of this practical classes, the students will be able to

- CO1:** Understand the nature of hardness, chloride level, pollution level using dissolved oxygen content, iron present in water and analyse them in water.
- CO2:** Apply the EMF and conductometric measurements in quantitative analysis of substances.

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16BES208

WORKSHOP PRACTICE
*Common to Civil, Mechanical, Production
 and Industrial Biotechnology branches*

Category : ES

L T P C
 0 0 4 2

Course Objectives:

- To make various basic prototypes in the carpentry trade such as Lap joint, Lap Tee joint, Dove tail joint, Mortise & Tenon joint and Cross-Lap joint.
- To make various welding joints such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint.

LIST OF EXPERIMENTS

1. Introduction to use of tools and equipments in Carpentry, Welding, Foundry and Sheet metal
2. Safety aspects in Welding, Carpentry and Foundry
3. Half lap Joint and Dovetail Joint in Carpentry
4. Welding of Lap joint, Butt joint and T-joint
5. Preparation of Sand mould for cube, conical bush, pipes and V pulley
6. Fabrication of parts like tray, frustum of cone and square box in sheet metal
7. Electrical wiring – simple house wiring
8. Plumbing

LECTURE: 0 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 60 PERIODS TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this practical classes, the students will be able to

- CO1:** Use tools and equipments used in Carpentry, Welding, Foundry and Sheet metal.
CO2: Make half lap joint and dovetail joint in carpentry.
CO3: Make welded lap joint, butt joint and T-joint.
CO4: Prepare sand mould for cube, conical bush, pipes and V pulley.
CO5: Fabricate parts like tray, frustum of cone and square box in sheet metal
CO6: Carry out minor works/repair related to electrical wiring and plumbing.

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16BES2Z9

PROGRAMMING IN C LAB
*Common to all branches*Category : ES
L T P C
0 0 4 2**Course Objectives:**

- o Data types in C and Flow control statements
- o Functions, Arrays, Pointers And Strings
- o Dynamic memory allocation and command line arguments
- o Bitwise Operators, Preprocessor Directives, Structures and Unions
- o Structures, List Processing, Input And Output

PRACTICALS**EXERCISES ILLUSTRATING THE FOLLOWING CONCEPTS:**

1. Operators , Expressions and IO formatting
2. Decision Making and Looping
3. Arrays and Strings
4. Functions and Recursion
5. Pointers
6. Dynamic Memory Allocation
7. Structures
8. Unions
9. Files
10. Command line arguments
11. Mini Project

LECTURE: 0 PERIODS TUTORIAL:0 PERIODS PRACTICAL: 60 PERIODS TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this practical classes, the students will be able to

- CO1:** Use appropriate data types and flow control statements [Usage]
- CO2:** Write programs using functions, arrays, pointers and strings [Usage]
- CO3:** Write programs using dynamic memory allocation [Usage]
- CO4:** Implement programs using right storage classes, preprocessor directives, bitwise operators [Usage]
- CO5:** Work with command line arguments, structures, unions and files [Usage]
- CO6:** Develop applications using C [Usage]

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16BOC1Z1

HUMAN VALUES I
Common to all branches

Category : OC
L T P C
1 0 0 1

Course Objectives:

- Essential complementarily between 'values' and 'skills' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- The development of a Holistic perspective among students towards life, profession and happiness based on a correct understanding of the Human reality and the rest of existence, which forms the basis of Value based living in a natural way.
- The plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with nature.

UNIT I **INTRODUCTION TO VALUE EDUCATION** **5 Periods**
Introduction- Need, Basic Guidance, Content and Process for Value Education- Basic human Aspirations – Prosperity and happiness – Methods to fulfill human aspirations - Understanding and living in harmony at various levels.

UNIT II **HARMONY IN THE HUMAN BEING** **5 Periods**
Coexistence – Happiness and convenience – Appraisal of Physical needs – Mental and Physical health – Human relationship – Mutual Trust and Respect.

UNIT III **ETHICS** **5 Periods**
Morals, Values and Ethics - Integrity - Work Ethics - Service Learning - Civic Virtue – Caring – Sharing - honesty- Courage – Empathy – Self Confidence -Ethical Human Conduct- Basis for humanistic Education, Constitution and universal order – Competence in professional ethics – Strategy for transition from the present state to Universal human order.

LECTURE: 15 PERIODS TUTORIAL: 0 PERIODS PRACTICAL: 0 PERIODS TOTAL: 15 PERIODS

TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
R.R. Gaur, R. Singal, G.P. Bangaria	Foundation Course in Human Values and Professional Ethics, 2009	Excel Book Private Ltd., New Delhi.

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
S. K. Chakraborty and Dabangshu Chakraborty	Human Values and Ethics: Achieving Holistic Excellence	ICFAI University Press, 2006.
A.N. Tripathy	Human Values	New Age International publishers, 2003.
M. Govindarajan, S. Natarajan and V.S. Senthil kumar	Engineering Ethics(including human values)	Eastern Economy Edition, Printice Hall of India Ltd., 2004.
E.G. Seebauer and Rober. L. Berry	Fundamentals of Ethics for Scientists and Engineers	Oxford University Press, 2000.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Start exploring themselves, get comfortable to each other and to the teacher and start finding the need and relevance for the course.
- CO2:** See that their practice in living is not in harmony with their natural acceptance most of the time and able to refer to their natural acceptance to remove this disharmony.
- CO3:** Aware of their activities like understanding, desire, thought and selection and start finding their focus of attention at different moments.
- CO4:** Able to see that respect is right evaluation and only right evaluation leads to fulfillment in relationship.
- CO5:** Develop an understanding of the whole existence and interconnectedness in nature.

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16BOC202

HUMAN VALUES AND PROFESSIONAL ETHICS*Common to all branches*

Category : OC

L T P C

1 0 0 1

Course Objectives:

- Engineering Ethics and Human Values
- Social responsibility of an Engineer
- Ethical dilemma while discharging duties in Professional life.

UNIT I ENGINEERING ETHICS 5 Periods

Senses of Engineering Ethics -variety of moral issues – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's Theory – Gilligen's Theory – Consensus and controversy – Models of Professional roles – theories about right actions – Self interest – customs and religion – uses of ethical theories – Valuing time-cooperation-commitment.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 5 Periods

Engineering as experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – the challenger case study - engineers as managers – consulting engineers - Moral leadership .

UNIT III SAFETY, RESPONSIBILITIES, RIGHTS AND GLOBAL ISSUES 5 Periods

Safety and risk – assessment of safety and risk – risk benefit analysis and reducing risk – the three mile island and chernobyl case studies.– Environmental ethics – computer ethics – weapons development- Multinational corporations - engineers as expert witnesses and advisors.

LECTURE:15 PERIODS TUTORIAL:0 PERIODS PRACTICAL: 0 PERIODS TOTAL: 15 PERIODS

TEXT BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
Mike Martin and Roland Schinzinger	<i>Ethics in Engineering</i>	McGraw Hill, New York,1996.
M. Govindarajan,S. Natarajan and V.S. Senthil kumar	<i>Engineering Ethics (including human values)</i>	Eastern Economy Edition, Printice Hall of India Ltd., 2004.

REFERENCE BOOKS

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, YEAR OF PUBLICATION
Charles D.Fleddermann	<i>Engineering Ethics</i>	Pearson Education, 2004.
Edmund G Seebauer and Robert L. Berry	<i>Fundamentals of Ethics for Scientists and Engineers, 2001</i>	Oxford University Press
Charles E. Harris, Michael S. Protchard and Michael J. Rabins	<i>Engineering Ethics – Concepts and Cases</i>	Thomson Learning, 2000.
John R. Boatright	<i>Ethics and Conduct of Business</i>	Pearson Education,2003.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- CO1:** Understand and appreciate Human values, exhibit self confidence and develop good character
- CO2:** Sense engineering ethics, professional roles and valuing time, co-operation and commitment
- CO3:** Understand and practise code of ethics.
- CO4:** Assess safety and risk and capable of doing risk benefit analysis.
- CO5:** Develop and exhibit moral leadership qualities in exercising Engineering Consultations without compromising environmental, legal and ethical issues

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GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE - 641 013
OFFICE OF THE CONTROLLER OF EXAMINATIONS

BRANCH : INDUSTRIAL BIOTECHNOLOGY

CURRICULUM : III SEMESTER

S.NO	COURSE CODE	COURSE TITLE	CA T	CA Marks	End Sem Marks	Total Marks	L	T	P	Credits
THEORY										
✓	16BBS3Z1	ENGINEERING MATHEMATICS III	BS	50	50	100	3	2	0	4
2.	16BES302	PROCESS CALCULATIONS	ES	50	50	100	2	2	0	3
3.	16BPC303	BASICS OF INDUSTRIAL BIOTECHNOLOGY	PC	50	50	100	3	0	0	3
4.	16BPC304	CELL BIOLOGY	PC	50	50	100	3	0	0	3
5.	16BPC305	MICROBIOLOGY	PC	50	50	100	3	0	0	3
6.	16BPC306	BIOCHEMISTRY	PC	50	50	100	3	0	0	3
PRACTICALS										
7.	16BEE307	COMMUNICATION SKILLS AND TECHNICAL SEMINAR	EEC	50	50	100	0	0	4	2
8.	16BPC308	MICROBIOLOGY LABORATORY	PC	50	50	100	0	0	4	2
9.	16BPC309	BIOCHEMISTRY LABORATORY	PC	50	50	100	0	0	4	2
TOTAL				450	450	900	17	4	12	25



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29.04.2017
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COURSE OUTCOMES:

- CO1: Understand the concepts of Fourier series and its construction when discrete and continuous form is known
 CO2: Acquire fluency in Fourier transforms in order to solve improper integrals.
 CO3: Understand the standard and special types of partial differential equations.
 CO4: Gain fluency in solving boundary value problems.
 CO5: Understand the Z transform methods to find solutions of difference equations.

Course Articulation Matrix for 16BBS3Z1 ENGINEERING MATHEMATICS III

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3....
CO1	H	H	H							H			H	M	
CO2	M	H	M							M			H	M	
CO3	H	M								L			M	M	L
CO4	H	H	M			M				M	M		L	M	L
CO5	M	M	M										H		H
16BBS3Z1	H	H	H		M		L			H	L	M	M	L	M

M. Anand

Course Objectives:

- * To understand the importance of stoichiometry – material and energy balances.
- * To deal with the laws of conservation of mass and energy.
- * To apply chemical engineering principles in problem solving.

UNIT I	OVERVIEW OF PROCESS INDUSTRY	7 Periods
	Systems of units - Fundamental and derived quantities, unit conversion, composition conversion - Atomic weight, molecular weight, equivalent weight, molar concept, mole percent, weight percent, volume percent, molarity, molality, normality etc., Basics of unit operations and unit processes involved in biotechnology industries and its applications.	
UNIT II	BEHAVIOUR OF IDEAL GAS	7 Periods
	Ideal and real gas law – Gas constant – Calculation of pressure, volume and temperature using ideal gas law – Use of partial pressure and pure component volume in gas calculations – Applications of real gas relationship in gas calculations.	
UNIT III	MATERIAL BALANCE	12 Periods
	Stoichiometric principles – Applications of material balance to unit operations, material balance with and without chemical reactions – Limiting reactant and excess reactant – Conversion and yield – Recycle, bypassing and purging.	
UNIT IV	ENERGY BALANCE	12 Periods
	Fundamentals of energy balance calculations – Concepts of heat capacity, latent heat, sensible heat, vapor pressure and internal energy – Energy balance with and without chemical reactions.	
UNIT V	FUELS AND COMBUSTION	7 Periods
	Types of fuels - Solid, liquid & gaseous fuels - Ultimate and proximate analysis. Determination of composition by orsat analysis of products of combustion of solid, liquid and gas fuels – Calculations of excess air from orsat techniques – Problems on combustion process.	

Contact Periods:

Lecture: 30 Periods

Tutorial: 30 Periods

Total : 60 Periods

TEXT BOOKS:

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, EDITION, YEAR OF PUBLICATION
McCabe Smith Harriott	Unit Operations of Chemical Engineering	McGraw-Hill company 7 th edition 2005
Himmelblau MD James B. Riggs	Basic principles and calculations in Chemical Engineering	Prentice Hall PTR 8 th edition 2004

REFERENCE BOOKS:

1. Perry's W.H., "Chemical Engineering Handbook", McGraw-Hill Company, 2008.
2. Bhatt B.I and Vora S.M. "Stoichiometry" Tata McGraw-Hill, New Delhi, 4th Edition. 2004.
3. K.V. Narayanan, B.Lakshmikutty, "Stoichiometry and Process calculations", Prentice hall of India, 2nd edition. 2017.

COURSE OUTCOME:

Upon completion of the course, the students will be able to

CO1: Present an overview of industrial chemical Bioprocesses.

CO2: Develop a fundamental understanding of the basic principles of chemical engineering processes and calculations.

CO3: Apply the gas laws to solve problems related to ideal gases and mixtures.

CO4: Establish mathematical methodologies for the computation of material balances and energy balances.

CO5: Perform calculations on combustion systems using chemical engineering principles.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	-	-	-	-	L	M	L	L	L	L	L	H	M
CO2	M	M	H	-	-	-	-	-	M	M	-	M	H	M
CO3	L	L	M	L		-	L	-	H	M	-	M	H	H
CO4	M	H	H	H	M	-	L	-	M	M	-	M	H	H
CO5	M	M	M	M	M	-	-	-	H	H	-	M	H	H

L – Low, M – Moderate (Medium), H – High

L	T	P	C
3	0	0	3

Course Objectives:

- * To understand the basics of traditional and modern industrial fermentation process.
- * To gain the knowledge about the primary and secondary microbial metabolites.
- * To learn about the production process of pharmaceutically important bioproducts.

UNIT I	INTRODUCTION TO INDUSTRIAL BIOPROCESS	9 Periods
Biotechnology: Scope and importance, Commercial potential of Biotechnology in India. Historical overview of industrial fermentation process - Traditional and modern Biotechnology. Industrial Fermentation - Microorganisms, mode of operation, fermentation processes - Pictorial representation.		
UNIT II	PRODUCTION OF PRIMARY METABOLITES	9 Periods
A brief outline of processes for the production of some commercially important organic acids (citric acid, lactic acid & acetic acid); amino acids (glutamic acid & tryptophan) and alcohols (ethanol & butanol).		
UNIT III	PRODUCTION OF SECONDARY METABOLITES	9 Periods
Production processes for various classes of secondary metabolites: antibiotics: (penicillin streptomycin & erythromycin), vitamins (Vit B ₁₂ and Vit B ₂) and steroid biotransformation.		
UNIT IV	PRODUCTION OF ENZYMES AND OTHER PRODUCTS	9 Periods
Production of industrial enzymes (proteases & amylases), Production of biopesticide, Biofertilizers, biopreservative (Nisin), biopolymers (xanthan gum & PHB), cheese, SCP.		
UNIT V	PRODUCTION OF MODERN BIOTECHNOLOGY PRODUCTS	9 Periods
Production of recombinant proteins having therapeutic and diagnostic applications (insulin, human growth hormone), Production of recombinant vaccines (Hepatitis B vaccine, cholera vaccine), production of monoclonal antibodies.		

Contact Periods:

Lecture: 45 Periods

Total: 45 periods

TEXT BOOKS:

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, EDITION, YEAR OF PUBLICATION
WulfCruger AnnelieseCruger	<i>A Textbook of Industrial Microbiology</i>	Panama Publishing Corporation, 2 nd Edition, 2005.
Michael J. Waites, Neil L.Morgan, John.S. Rokey and Grey Higon	<i>Industrial Microbiology: An Introduction</i>	Blackwell, 2001.

REFERENCE BOOKS:

1. Casida Jr, L. E., "Industrial Microbiology", Wiley, 1968.
2. Prescott and Dunn's "Industrial Microbiology", CBS Publisher, 1987.
3. Okafor, N., "Modern Industrial Microbiology and Biotechnology", CRC Press, 2007

COURSE OUTCOME:

Upon completion of the course, the students will be able to

CO1: Understand the basics of fermentation process which helps to develop new microbial product.

CO2: Gain the knowledge about the steps and operations involved in microbial primary metabolites production.

CO3: Illustrate the secondary metabolites production with flow-sheeting.

CO4: Acquire knowledge about the industrially relevant microbial strains and processes for production of enzyme, biopolymer and food products.

CO5: Learn about the use of recombinant technology in pharmaceutically important microbial bioproducts production.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M	M	-	M	L	-	-	-	-	-	M	H	H
CO2	M	M	-	M	H	-	-	-	-	-	-	-	M	M
CO3	M	M	-	-	M	-	-	-	-	-	-	-	M	H
CO4	M	M	-	-	M	-	-	-	-	-	-	-	M	H
CO5	M	-	-	M	M	L	M	L	-	-	-	-	M	H

L – Low, M – Moderate, H- High

16BPC304 CELL BIOLOGY

PC

L	T	P	C
3	0	0	3

Course Objectives:

- * Gain the knowledge related to the basics of different types cell structure and morphology
- * Understand the biomolecules transport mechanism across the biomembranes and functions of receptor in cell signaling process
- * Get familiarize the cell signaling and signal transduction process inside and outside the cell
- * Know the basics of different types of cell culture

UNIT I	CELL STRUCTURE AND FUNCTION OF THE ORGANELLES	9 Periods
	Structure of Prokaryotic and Eukaryotic cells and brief on their organelles, principles of membrane organization, membrane proteins, extra cellular matrix, cytoskeleton structures, cell junction and cell adhesions, types of cell division, mitosis & meiosis, cell cycle and molecules that control cell cycle.	
UNIT II	TRANSPORT ACROSS BIO MEMBRANES	10 Periods
	Osmosis and reverse osmosis, Passive & active transport, permeases, sodium potassium pump, Ca ²⁺ ATPase pumps, voltage and ligand gated channels, lysosomal and vacuolar membrane ATP dependent proton pumps, Co- transport - Symport, antiport, Endocytosis and exocytosis. Entry of virus and toxins into cells.	
UNIT III	RECEPTORS AND MODES OF CELL SIGNALLING	8 Periods
	Cytosolic, nuclear and membrane bound receptors with examples, autocrine, paracrine and endocrine modes of action, quantification and characterisation of receptors.	
UNIT IV	SIGNAL TRANSDUCTION	9 Periods
	Signal amplification, role of secondary messengers - Cyclic AMP, inositol tri phosphates and cyclic GMP; G proteins - Role in signal transduction, calcium ion flux and its role in cell signaling, role of protein kinases - Serine - Threonine kinases, tumor necrosis factor receptor families.	
UNIT V	BASICS OF CELL CULTURE	9 Periods
	Cell line, generation of cell lines, maintenance of stock cells, characterization of cells, morphological analysis techniques in cell culture, primary cultures, contamination, differentiation, three dimensional cultures, role of matrix in cell growth.	

Contact Periods:

Lecture: 45 Periods

Total: 45 periods

TEXT BOOKS:

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, EDITION, YEAR OF PUBLICATION
Darnell J, Lodish H, Baltimore D	<i>Molecular Cell Biology</i>	W.H.Freeman; 8 th edition, 2016
Brai De Robertis & De Robertis,	<i>Cell Biology</i>	Lippincott Williams & Wilkins, 8 th edition, 2010
Geoffrey M. Cooper and Robert E. Hausman	<i>The Cell: A Molecular Approach</i>	ASM Press and Sinauer Associates, 5 th edition, 2009.

REFERENCE BOOKS:

1. Kimball T.W., "Cell Biology", Wesley Publishers; 3rd edition, 1984.
2. James D. Watson, "Molecular Biology of the Cell". 3rd edition, 2004.
3. Channarayappa, "Cell biology," Universities Press, 2010.
4. Rastogi.S.C, "Cell biology," New Age International publishers, 2005.

COURSE OUTCOME:

Upon completion of the course, the students will be able

CO1: Understand the mechanisms and role of cell in human body system.

CO2: Obtain the knowledge related to the transport mechanisms involved in the activation of cell Signalling.

CO3: Describe the receptor and ligand complex molecules for the activation cell signalling.

CO4: Illustrate the mechanisms of secondary messengers in signal transduction.

CO5: Get familiarized the basics of cell culture.

COURSE ARTICULATION MATRIX:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	M	-	L	-	L	--	L	-	-	L	-	H	M
CO2	L	M	L	-	L	L	--	-	L	-	-	-	H	M
CO3	L	L	L	-	L	L	-	L	-	-	-	-	M	H
CO4	L	L	-	L	-	-	-	-	-	-	-	L	H	M
CO5	L	-	-	-	L	-	L	-	M	-	-	L	H	H

L – Low, M – Moderate, H- High

L T P C
3 0 0 3

Course Objectives:

- * Understand the basics of classification, types of microbes and its existence
- * Perform staining, examine and identify microbes by understanding its structure
- * Understand the requirements of bacteria for its growth and will be able to quantify it by various techniques and methods of controlling it.
- * Learn the application of microbes in industries and other bioremediation strategies.

UNIT I	INTRODUCTION	9 Periods
	History of microbiology, Microbial existence - Soil, Water and Air; classification and nomenclature of microorganism, microscopic examination of microorganisms, light and electron microscopy; principles of different staining techniques like gram staining, acid fast staining, capsular staining, flagella staining, Spore staining.	
UNIT II	MICROBES-STRUCTURE AND MULTIPLICATION	9 Periods
	Colony morphology and arrangement of bacterial cells; Structure and multiplication of bacteria, fungi (Rhizopus) and viruses (TMV); life history of mycoplasma, actinomycetes (Streptomyces), yeast, and bacteriophage - T-even. Lambda phages.	
UNIT III	MICROBIAL NUTRITION, GROWTH AND METABOLISM	9 Periods
	Nutritional requirements of bacteria and different media used for bacterial culture; growth curve and different methods to quantify the bacterial growth, aerobic and anaerobic bioenergetics and utilization of energy for biosynthesis of important molecules.	
UNIT IV	APPLIED MICROBIOLOGY	9 Periods
	Microbes in wastewater treatment - Aerobic and anaerobic digestion; biogas; bioremediation; leaching of ores by microorganisms. Applications of microbial enzymes in dairy industry, Microbial production of Plastics (PHB, PHA).	
UNIT V	CONTROL OF MICROORGANISMS	9 Periods
	Host-microbe interactions, clinically important microorganisms; Physical and chemical control of microorganisms; anti-bacterial, anti-fungal and anti-viral agents, mode of action of antibiotics and its resistance.	

Contact Periods:

Lecture: 45 Periods

Total : 45 Periods

TEXT BOOKS:

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, EDITION, YEAR OF PUBLICATION
Pelczar MJ Chan ECS Krein NR	Microbiology	McGraw Hill Education 5th Edition 2001.
Prescott LM Harley JP Klein DA	Microbiology	Wm. C. Brown Publishers 10th Edition 2016.

REFERENCE BOOKS:

1. Kathleen Park Talaro and Barry Chess, "Foundations in Microbiology", McGraw Hill Education, 9th Edition. 2015.

COURSE OUTCOME:

Upon completion of the course, the students will be able to

CO1: Understand the Morphology, cell structure, growth and metabolism of Micro organisms

CO2: Demonstrate the ubiquity and diversity of microorganisms in the human body and the environment.

CO3: Differentiate the various types of microorganisms and the major diseases they cause.

CO4: Explore the routes of transmission of infection and the methods used to control the spread of infection

CO5: Identify the importance of microbes in applied microbiology and biotechnology.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	-	-	-	-	L	M	M	M	M	-	M	H	L
CO2	L	M	-	-	-	L	M	M	M	M	-	M	H	L
CO3	H	L	-	-	-	M	H	M	M	M	-	M	H	M
CO4	M	L	-	-	-	-	H	M	M	M	-	M	H	L
CO5	M	-	H	M	M	H	H	H	H	M	-	M	H	H

L – Low, M – Moderate (Medium), H – High

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16BPC306 BIOCHEMISTRY

PC

L	T	P	C
3	0	0	3

Course Objectives:

- * To understand structural, functional properties, synthesis of carbohydrates and proteins, lipids and nucleic acids
- * To understand structural, functional properties and metabolic pathways of nucleic acids and lipids.
- * To learn basic information and the mechanisms of structural and cytoskeletal proteins involved organelle movements

UNIT I	CARBOHYDRATES	10 Periods
Carbohydrates - Classification, Structure and Properties of Carbohydrates (Mono, Di, Oligo& polysaccharides) - Mutarotation, Conjugated carbohydrates, Metabolism concepts - Glycolysis, TCA cycle, pentose phosphate shunt and Respiratory chain - ATP synthesis.		
UNIT II	PROTEINS	10 Periods
Classification of Amino acids, Structure and Properties of Amino acids - Peptide bond - Classification of Proteins - Primary - Secondary - Tertiary and Quaternary structure of proteins - Fibrous and globular proteins, Conjugated proteins, Metabolism concepts - Nitrogen metabolism and urea cycle, Biosynthesis of six essential amino acids (Met, Thr, Lys, Ile, Val, Leu) and aromatic amino acids.		
UNIT III	NUCLEIC ACIDS	7 Periods
Nucleic Acids - Structure of Purines - Pyrimidines - Nucleosides - Nucleotides - Ribonucleic acids - Deoxyribonucleic acids - Nucleoprotein complexes, Metabolism concepts - Biosynthesis of nucleotides, denovo and salvage pathways for purines and pyrimidines.		
UNIT IV	LIPIDS	10 Periods
Structure and properties of Lipids - Classification, (Fatty acids, Glycerolipids, Phospholipids, Glycolipids, Sphingolipids, Steroids), Metabolism concepts - Fatty acid synthesis and oxidative degradation, Triacylglycerol, phospholipid biosynthesis and degradation, Cholesterol biosynthesis.		
UNIT V	METABOLIC DISORDERS	8 Periods
Metabolic disorders associated with carbohydrates, branched chain and aromatic amino acid degradation, nucleic acids and lipids.		

Contact Periods:

Lecture: 45 Periods

Total: 45 periods

TEXT BOOKS:

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, EDITION, YEAR OF PUBLICATION
David L. Nelson and Michael M. Cox	Lehninger's - Principles of Biochemistry	Macmillan, 6 th Edition, 2013
Lubert Stryer	Biochemistry	WH Freeman & Co., 5th Edition, 2002.
Voet and Voet	Biochemistry	John Wiley & Sons Inc., 3rd Edition, 2004.

REFERENCE BOOKS:

1. Murray, R.K., Granner, B.K., Mayes, P.A., Rodwell. V.W., —Harper's Biochemistry, Prentice Hall, 2006.
2. Salway, J.G., "Metabolism at a Glance", 2nd Edition, Blackwell Science Ltd., 2000.

COURSE OUTCOMES

Upon completion of the course, the students will be able to

CO1: Understand the structural, functional properties of carbohydrates and its metabolism

CO2: Understand about basics of amino acids, biosynthesis and structure of protein

CO3: Acquire knowledge about nucleic acids and its synthesis pathways.

CO4: Classify the lipids and to understand the metabolic pathways of lipids.

CO5: Describe the metabolic disorders associated with the biomolecules

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M	-	-	-	-	-	-	-	-	-	M	H	M
CO2	M	M	-	-	-	L	-	-	-	-	-	-	H	M
CO3	M	-	L	-	-	-	-	-	-	-	-	-	H	M
CO4	M	-	-	-	-	-	-	-	M	M	-	-	H	M
CO5	M	-	-	L	-	-	-	-	-	-	-	L	M	H

L – Low, M – Moderate, H- High

L T P C
0 0 4 2

Pre-Requisites:

1. 16BHS1Z1- Communication Skills in English
2. 16BHS2Z1- Technical English

Course Objectives:

- * To enable the students to present the basic technical concepts and ideas, in a clear and efficient manner with an effective using of different teaching aids.
- * To enable the students to gain confidence in facing the placement interviews.

DESCRIPTION

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. Three periods per week are to be allotted and 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

Contact Periods:

Practical: 60 periods

Total: 60 periods

COURSE OUTCOME:

Upon completion of the course, the students will be able to

CO1: Establish inter personal skills and be an effective goal oriented team player.

CO2: Re-engineer attitude and understand its influence on behavior.

CO3: Develop into professionals with idealistic, practical and moral values

CO4: Progress in communication and problem solving skills.

CO5: Gain confidence in expressing the views and thoughts in a confident and consoling manner

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	H	H	H	M	L	H
CO2	-	-	-	-	-	-	L	M	M	L	M	L	L	H
CO3	-	-	-	-	-	M	-	H	L	L	L	L	L	H
CO4	-	-	-	-	-	-	-	-	H	H	M	L	L	M
CO5	-	-	-	-	-	-	-	-	M	H	M	L	L	M

L – Low, M – Moderate, H- High

Course Objectives:

- * To identify & demonstrate the proper safety procedures concerning lab safety.
- * To identify the parts & function of microscope.
- * To demonstrate the ability to prepare the slides for microscopic examinations.
- * To identify the purpose & principle associated with different media types used in lab.
- * To identify the purpose of using biochemical test in determining the metabolic differences between microbes.

LIST OF EXERCISES

1. Laboratory safety and sterilization techniques.
2. Microscopic methods in the identification of microorganisms.
3. Preparation of culture media – nutrient broth and nutrient agar.
4. Culturing of microorganisms – isolation, identification of microorganisms from different sources in broth and in plates (pour plates, streak plates, isolation and preservation of bacterial cultures).
5. Staining techniques – simple and grams.
6. Motility Test – Hanging drop technique.
7. Antibiotic sensitivity assay – Disc Diffusion method.
8. Growth Kinetics – Growth curve of Bacteria and Yeast.
9. Biochemical Tests.
10. Phage Assay.

Contact Periods:

Practical: 60 Periods

Total: 60 Periods

REFERENCE BOOKS:

1. James G. cappuccino & Natalie, "Microbiology, A Laboratory manual", Pearson Education publishers, 11th edition. 2016.

COURSE OUTCOME:

Upon completion of the course, the students will be able to

CO1: Identify & demonstrate the proper safety procedures concerning lab safety.

CO2: Identify the parts & function of microscope.

CO3: Demonstrate the ability to prepare the slides for microscopic examinations.

CO4: Identify the purpose & principle associated with different media types used in lab.

CO5: Identify the purpose of using biochemical test in determining the metabolic differences between Microbes.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	M	M	-	-	-	M	H	H
CO2	M	M	-	-	L	-	M	-	M	H	-	M	H	L
CO3	M	M	-	-	L	-	M	-	M	H	-	M	H	L
CO4	L	M	M	-	-	-	L	-	M	L	-	L	H	M
CO5	M	M	H	-	M	L	L	L	M	M	-	M	M	L

L – Low, M – Moderate (Medium), H – High

Pre-Requisites:

1. 16BBS104 - Chemistry for Biotechnology
2. 16BBS207 – Chemistry Laboratory

Course Objectives:

- * To provide firm foundation of basic laboratory techniques.
- * To provide hands on training on the simple experiments for identification, quantification of bio molecules and preparation of bio active compounds.

LIST OF EXERCISES

1. Units, Volume/Weight measurements, concentrations, pH measurements, Preparation of buffers, Sensitivity, Specificity, precision and Accuracy.
2. Qualitative tests for carbohydrates
3. Quantitative tests for reducing sugars by Benedict's method.
4. Qualitative tests for Amino Acids
5. Protein estimation - Biuret, Folin and Bradford Assay
6. Extraction of lipids and Saponification of Fats
7. Synthesis of Aspirin
8. Preparation of oleic acid from tartaric acid
9. Isolation of lycopene from tomato
10. Isolation and estimation of starch from potato tubers

Contact Periods:

Practical: 60 Periods

Total: 60 Periods

TEXT BOOKS:

AUTHOR NAME	TITLE OF BOOK	PUBLISHER, EDITION, YEAR OF PUBLICATION
David. T. Plummer	<i>An Introduction to Practical Biochemistry</i>	McGraw – Hill 3 rd edition 2006
Vogel A.I, Tatchell A.R, Fummis B.S., Hannaford A.J., Smith P.W.G	<i>Text Book of Practical Organic Chemistry</i>	Prentice Hall 5 th edition 1996

COURSE OUTCOME:

Upon completion of the course, the students will be able to

CO1: Prepare reagents accurately and reproducibly for experiments.**CO2:** Operate pH meter, weighing balance, colorimeter and spectrophotometer.**CO3:** Do the experiments for isolation and extraction of any bioactive compounds.**CO4:** Identify and quantify the bio molecules (Carbohydrate, Protein, Nucleic acid, Lipids) in any Sample.**CO5:** Understand the practical accession behind preparation and separation of various pharmaceutical and other organic chemicals.**COURSE ARTICULATION MATRIX**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	H	-	-	-	-	-	-	-	-	M	H	H
CO2	M	L	H	-	H	-	-	-	-	-	-	M	H	H
CO3	M	L	H	-	L	-	-	-	-	-	-	M	M	H
CO4	M	L	H	-	L	-	-	-	-	-	-	M	M	H
CO5	M	L	H	-	-	-	-	-	-	-	-	M	L	M

L – Low, M – Moderate, H- High

