



**SRI VASAVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Accredited by NAAC & NBA (CSE, ECE, & ME)

Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada
Nandamuru-521369, Pedana Mandal, Krishna District, Andhra Pradesh, India

Minutes of the BOS Meeting –R23

The Board of studies meeting was held on 14th September, 2023 in the Department of Mathematics to discuss the following points for R-23.

Detailed discussion on the following has been done:

- The courses to be implemented under R-23 Regulations
- Discussion on syllabus for new regulations(R-23)
- Innovative teaching techniques

The following items were also discussed and approved.

- Course structure for I B.Tech I and II Semesters
- Detailed syllabus of I B.Tech I and II Semesters

The following are the courses were approved for I B.Tech:

I Semester – Linear Algebra & Calculus (Common to all Branches)

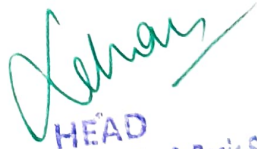
II Semester- Differential Equations & Vector Calculus (Common to all Branches)

Signatures of External Members with Names:

Names:

Signatures:

1. Dr.K.Sobhanbabu
Professor
Department of Mathematics
JNTUK,Narasaraopet
Andhrapradesh
INDIA
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Ksobhanjntu@gmail.com


HEAD
Department of Mathematics & Basic Sciences
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2. Dr.Ch.V.RamanaMurthy
Professor
Department of Mathematics
K.L.E.F
Greenfields
Vaddeswaram-Guntur

3. Dr.D.Rajani
Assistant Professor
Department of Mathematics
V.R.Siddartha College of Engineering
Vijayawada

Signatures of internal members with names:
Name:

Signature:

Subject Coordinator:
Dr .K.N.Swamy



Members:

Mr.M.L.L.Phanikanth



Mr.P.V.Naresh



Ms.G.Manasa



Mrs.B.Mounika



Signature of the Chairman:
Dr.A.V.Raghuram

Head of the Department
Department of Science & Humanities
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SYLLABUS FOR I.B.TECH I SEMESTER

L	T	P	C
3	0	0	3

**LINEAR ALGEBRA & CALCULUS
(Common to All Branches of Engineering)**

Course Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

CO1: Develop and use of matrix algebra techniques that are needed by engineers for practical applications.

CO2: Utilize mean value theorems to real life problems.

CO3: Familiarize with functions of several variables which is useful in optimization.

CO4: Learn important tools of calculus in higher dimensions.

CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT I

Matrices

Rank of a matrix by echelon form, normal form. Cauchy-Binet formulae (without proof). Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II

Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III

Calculus

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

UNIT IV

Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates, Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021)

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SYLLABUS FOR I.B.TECH II SEMESTER

L	T	P	C
3	0	0	3

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

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

CO1: Solve the differential equations related to various engineering fields.

CO2: Identify solution methods for partial differential equations that model physical processes.

CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO4: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT IV Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V Vector integration

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017


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Minutes of the BOS Meeting –R23

The Board of studies meeting was held on 16th September, 2023 in the Department of ENGLISH to discuss the following points for R-23 regulations of I B.Tech I & II Semesters.

Detailed discussion on the following has been done

- The courses to be implemented under R-23 Regulations
- Discussion on syllabus for new regulations(R-23)
- Innovative teaching techniques

A) The following items were discussed and approved.

- Course structure for I B.tech I & II Semesters of R-23 Regulations
- Discussion on syllabus for new regulations(R-23)
- ENGLISH Theory & Laboratory courses

The following are the courses approved for I / I & I / II semesters of I B.Tech

I- semester: COMMUNICATIVE ENGLISH &
COMMUNICATIVE ENGLISH LAB for CSE

II –Semester: COMMUNICATIVE ENGLISH &
COMMUNICATIVE ENGLISH LAB for AIML, CIVIL, ECE & MECH

Signature of external members with names:

Name:

1. Dr.K.Sree Ramesh
Professor
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Adikavi Nannaya University
Rajamahendravaram
Mob: 9490338466
Ramesh.khotti@fulbrightmail.org

Signature

2. Dr. M.V.Raghuram
Professor & Head
Department of English
Vasireddy Venkatadri Institute of Technology
Nambur

3. Dr.K.Ramachandra
Professor & Head
Department of English
Amritha University, Amaravathi

Signature of Internal members with names:

Subject coordinator:

Dr. A.V.Raghuram
Assoc.Professor



Members:

Dr.Ch.Sesha Sailaja



Mr.Sk.Hidayatullah



Chairman:

Dr.A.V.Raghuram



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SYLLABUS FOR I.B.TECH I SEMESTER

L	T	P	C
2	0	0	2

COMMUNICATIVE ENGLISH

(Computer science & Engineering)

Course Objectives:

The main objective of introducing this course, *Communicative English*, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes:

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.

CO2: Apply grammatical structures to formulate sentences and correct word forms.

CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.

CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.

CO5: Create a coherent paragraph, essay, and resume.

UNIT I

Lesson: HUMAN VALUES: Gift of Magi (Short Story)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

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

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

- Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
- Writing:** Structure of a paragraph - Paragraph writing (specific topics)
- Grammar:** Cohesive devices - linkers, use of articles and zero article; prepositions.
- Vocabulary:** Homonyms, Homophones, Homographs.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

- Listening:** Listening for global comprehension and summarizing what is listened to.
- Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed
- Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
- Writing:** Summarizing, Note-making, paraphrasing
- Grammar:** Verbs - tenses; subject-verb agreement; Compound words, Collocations
- Vocabulary:** Compound words, Collocations

UNIT IV

Lesson: INSPIRATION: The Toys of Peace by Saki

- Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
- Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
- Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
- Writing:** Letter Writing: Official Letters, Resumes
- Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice
- Vocabulary:** Words often confused, Jargons

UNIT V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

- Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
- Speaking:** Formal oral presentations on topics from academic contexts
- Reading:** Reading comprehension.
- Writing:** Writing structured essays on specific topics.
- Grammar:** Editing short texts -identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
- Vocabulary:** Technical Jargons

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
- 2.
3. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:**GRAMMAR:**

1. www.bbc.co.uk/learningenglish
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. www.eslpod.com/index.html
4. <https://www.learngrammar.net/>
5. <https://english4today.com/english-grammar-online-with-quizzes/>
6. <https://www.talkenglish.com/grammar/grammar.aspx>

VOCABULARY

1. <https://www.youtube.com/c/DailyVideoVocabulary/videos>
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA


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SYLLABUS FOR I.B.TECH I SEMESTER

L	T	P	C
0	0	2	1

COMMUNICATIVE ENGLISH LAB
(Computer science & Engineering)

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes:

CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.

CO5: Create effective Course Objectives:

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

- Walden Infotech
- Softx Communicative English lab software
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press. 2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed), Kindle, 2013

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>
8. <https://www.youtube.com/c/engvidAdam/featured>
9. <https://www.youtube.com/c/EnglishClass101/featured>
10. <https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists>
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. <https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp>



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Minutes of the BOS Meeting –R23

The Board of Studies meeting held on 14th September, 2023 in the Department of Chemistry and discussed the following items of R-23 regulations of I B.Tech

Detailed discussion on the following has been done:

- The courses to be implemented under R-23 Regulations
- Discussion on syllabus for new regulations(R-23)
- Innovative teaching techniques

A) The detailed syllabus for the following theory and lab courses are approved

- i) Chemistry theory and Chemistry Lab-(CSE Branch for I Semester & CSM, ECE Branches for II Semester)
- ii) In addition to JNTUK Syllabus we have added two more experiments in chemistry Lab.
- iii) Engineering Chemistry and Engineering Chemistry Lab-(CIVIL & MECH Branches for II Semester)

Signatures of external members with names:

Name:

Signature

1. Dr.M.Subbarao

Professor

Department of Chemistry

Acharya Nagarjuna University

Nagarjuna Nagar

Guntur


Prof. M. SUBBARAO
M.Sc., M.Phil., Ph.D.,
Chairman, BOS in Chemistry (PG)
Acharya Nagarjuna University
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2. Dr.P.Shyamala

Professor & Head

Department of Chemistry

Andhra University

Visakhapatnam

3. Dr.D.Ramasekhara reddy

Associate Professor

Department of Chemistry

Krishna University

Machilipatnam

iv) Signatures of the Internal members with names:

Name:

Signature

1.Mr.B.Srinivasarao



2.Ms.N.Harika Naga Bhavani



Signature of BOS Chairman with name

Dr.A.V.Raghuram



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SYLLABUS FOR I.B.TECH I SEMESTER

L	T	P	C
3	0	0	3

CHEMISTRY

(for Computer Science & Engineering)

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

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

CO1: Compare the materials of construction for battery and electrochemical sensors.

CO2: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.

CO3: Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.

CO4: Apply the principle of Band diagrams in the application of conductors and semiconductors.

CO5: Summarize the concepts of Instrumental methods.

UNIT I Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2 , particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O₂ and CO, etc. π -molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II Modern Engineering materials

Semiconductors – Introduction, basic concept, application

Super conductors-Introduction basic concept, applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.


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UNIT III Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting-plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT V Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmeyer Jr, 3rd Edition


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L	T	P	C
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CHEMISTRY LAB

(for Computer Science & Engineering)

Course Objectives: Verify the fundamental concepts with experiments,

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

CO1: Determine the cell constant and conductance of solutions.

CO2: Prepare advanced polymer Bakelite materials.

CO3: Measure the strength of an acid present in secondary batteries.

CO4: Analyse the IR spectra of some organic compounds.

CO5: Calculate strength of acid in Pb-Acid battery.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry
13. Determination of Hardness of water by EDTA method
14. Determination of HCL by using standard Na_2CO_3 method

Reference:

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

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Pedana Mandal, Krishna Dist., A.P.

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SRI VASAVI INSTITUTE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Accredited by NAAC & NBA (CSE, ECE, & ME)

Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada
Nandamuru-521369, Pedana Mandal, Krishna District, Andhra Pradesh, India

SYLLABUS FOR I.B.TECH II SEMESTER

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3	0	0	3

CHEMISTRY (for CSE(AI&ML) & ECE)

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

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

- CO1: Compare the materials of construction for battery and electrochemical sensors.
CO2: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
CO3: Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
CO4: Apply the principle of Band diagrams in the application of conductors and semiconductors.
CO5: Summarize the concepts of Instrumental methods.

UNIT I Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2 , particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O₂ and CO, etc. π -molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II Modern Engineering materials

Semiconductors – Introduction, basic concept, application

Super conductors-Introduction basic concept, applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

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Prof. H. Subba Rao ANU
BAS member

Prof. M. Suresh

UNIT III Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT V Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmeyer Jr, 3rd Edition


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CHEMISTRY LAB
(for CSE(AI&ML) & ECE)

Course Objectives: Verify the fundamental concepts with experiments.

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

- CO1: Determine the cell constant and conductance of solutions.
- CO2: Prepare advanced polymer Bakelite materials.
- CO3: Measure the strength of an acid present in secondary batteries.
- CO4: Analyse the IR spectra of some organic compounds.
- CO5: Calculate strength of acid in Pb-Acid battery.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry
13. Determination of Hardness of water by EDTA method
14. Determination of HCL by using standard Na₂CO₃ method

Reference:

"Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar.

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ENGINEERING CHEMISTRY
(for Civil & Mechanical Engineering)

Course Objectives:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

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

CO1: Demonstrate the corrosion prevention methods and factors affecting corrosion.

CO2: Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.

CO3: Explain calorific values, octane number, refining of petroleum and cracking of oils.

CO4: Explain the setting and hardening of cement.

CO5: Summarize the concepts of colloids, micelle and nanomaterials.

UNIT I Water Technology

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles - Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment - Specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

UNIT II Electrochemistry and Applications

Electrodes - electrochemical cell, Nernst equation, cell potential calculations.

Primary cells - Zinc-air battery, Secondary cells - Nickel-Cadmium (NiCad), and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electroless plating (Nickel and Copper).

UNIT III Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization.

Thermoplastics and Thermo-setting plastics:- Preparation, properties and applications of polystyrene. PVC Nylon 6,6 and Bakelite.

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.
Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value;
Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane
and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced
composites, properties and Engineering applications
Refractories- Classification, Properties, Factors affecting the refractory materials and
Applications.
Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils –
Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and
Applications.
Building materials- Portland Cement, constituents, Setting and Hardening of cement.

UNIT V Surface Chemistry and Nanomaterials

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle
formation, synthesis of colloids (Braggs Method), chemical and biological methods of
preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by
stabilizing agents, adsorption isotherm (Freundlich and Langmuir), BET equation (no
derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,
Oxford University Press, 2010.

Reference Books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry,
Butterworth-Heinemann, 1992.
3. Textbook of Polymer Science, Fred W. Billmeyer Jr, 3rd Edition


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ENGINEERING CHEMISTRY LAB
(for Civil & Mechanical Engineering)

Course Objectives:

- To verify the fundamental concepts with experiments

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

CO1: Determine the cell constant and conductance of solutions.

CO2: Prepare advanced polymer materials.

CO3: Determine the physical properties like surface tension, adsorption and viscosity.

CO4: Estimate the Iron and Calcium in cement.

CO5: Calculate the hardness of water.

List of Experiments:

- Determination of Hardness of a groundwater sample.
- Estimation of Dissolved Oxygen by Winkler's method
- Determination of Strength of an acid in Pb-Acid battery
- Preparation of a polymer (Bakelite)
- Determination of percentage of Iron in Cement sample by colorimetry
- Estimation of Calcium in port land Cement
- Preparation of nanomaterials by precipitation method.
- Adsorption of acetic acid by charcoal
- Determination of percentage Moisture content in a coal sample
- Determination of Viscosity of lubricating oil by Redwood Viscometer 1
- Determination of Viscosity of lubricating oil by Redwood Viscometer 2
- Determination of Calorific value of gases by Junker's gas Calorimeter

Reference:

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar


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