UNIVERSITY OF CALCUTTA

Notification No. CSR/ 05 /19

It is notified for information of all concerned that the Syndicate in its meeting held on 10.12.2018 (vide Item No. 09) approved the revised **Regulations and Curriculum of following First Year (4-year 8-Semester) B.Tech.** Courses under this University, as laid down in the accompanying pamphlet.

The B.Tech. Courses are as follows:

1) **Chemical Engineering**
2) **Chemical Technology**
3) **Computer Science and Engineering**
4) **Electrical Engineering**
5) **Electronics and Communication Engineering**
6) **Information Technology**
7) **Instrumentation Engineering**
8) **Jute and Fibre Technology**
9) **Optics and Optoelectronics**
10) **Polymer Science and Technology**

The above shall be effective from the academic year 2018-2019.

(Dr. Soumitra Sarkar)
Registrar (Acting)

SENATE HOUSE
KOLKATA-700073
The 12th February, 2019

UNIVERSITY OF CALCUTTA
Faculty of Engineering & Technology

A. Regulation for 4-year 8-semester B. Tech. course
(with effect from the academic year 2018 – 2019)

1. The Faculty of Engineering and Technology, University of Calcutta shall provide instructions leading towards the 4-year, 8-semester B. Tech. degree in different **Engineering/ Technology** courses as mentioned below:

1. **Chemical Engineering**
2. **Chemical Technology**
3. **Computer Science and Engineering**
4. **Electrical Engineering**
5. **Electronics and Communication Engineering**
6. **Information Technology**
7. **Instrumentation Engineering**
8. **Jute and Fibre Technology**
9. **Optics and Optoelectronics Engineering**
10. **Polymer Science and Technology**

Each of the courses is of four (4) years duration comprised of eight (8) Semesters, each Semester being of six (6) months' duration.

2. Eligibility for Admission

(a) Category-1: For admission into the FIRST YEAR of 4-Year B.Tech. course in any stream, the candidates must have passed Class XII Examinations in the system of 10+2 under West Bengal Council of Higher Secondary Education or equivalent with Physics, Chemistry, Mathematics securing an average of at least 60% marks (or equivalent grade) in these subjects and **cleared West Bengal JEE.***The minimumrequirement of marks will however not be applicable for admission to Jute and Fibre Technology only in session 2017-18. After the academic year 2017-18 the minimum criteria of admission will be same for all the engineering streams.*

(b) Category-2: For admission of the B.Sc. (Hons.) qualified students into the SECOND YEAR of all B.Tech. courses **except the Jute and Fibre Technology course**, the candidates must have passed B.Sc. Honours with the subjects specified for different courses as given below. The selection will be strictly based on merit as adopted and invoked time to time by University of Calcutta.

Chemical Engineering: B.Sc. Honours in Chemistry

Chemical Technology: B.Sc. Honours in Chemistry

Computer Science and Engineering: B.Sc. Honours in Physics/ ComputerScience/Mathematics/ Statistics

Electrical Engineering: B.Sc. Honours in Physics

Electronics and Communication Engineering: B.Sc. Honours in Physics/Electronics

Information Technology: B.Sc. Honours in Computer Science/Physics/Electronics

Instrumentation Engineering: B.Sc. Honours in Physics

Optics & Optoelectronics Engineering: B.Sc. Honours in Physics/Electronics

Polymer Science and Technology: B.Sc. Honours in Chemistry

The 'Category-2' students (except Jute & Fiber Tech. course)' must have to attend and pass 'Workshop' and 'Engineering Drawing' subjects additionally arranged during THIRD to EIGHTH Semester curriculum (preferable to complete by THIRD/FOURTH semester). However, no credit points will be awarded and will not be included for SGPA calculation. In the main mark sheet, mention will be made (at the bottom) that he/she has qualified 'Workshop/Drawing' with grade ----.
The course of study for students admitted in the 2nd year will be of 6 Semesters (starting from third Semester) in three academic years.

(c) Category-3: Jute and Fibre Technology: For admission into the SECOND YEAR of B.Tech. course in Jute and Fibre Technology, the candidates should qualify JELET for lateral entry, and should have any one of the following degrees:
B.Sc. with Physics/Chemistry/Mathematics, B.Sc. in Textile and Clothing/ B.FAD OR Diploma in Mechanical Engineering/ Electrical Engineering/ Chemical Engineering/ Computer Engineering/Ceramic Engineering / Electronics/ Textile Technology/ Handloom Technology/ Apparel and Fashion Technology; Post B.Sc. 2-year PG Diploma in Jute Technology and Management.
The course of study for students admitted in the 2nd year will be of 6 Semesters (starting from third Semester) in three academic years.

(d) Any seat(s) remaining vacant at the end of Second Semester will be filled up by Category-2 candidates except for Jute and Fibre Technology (who might consider JELET qualified candidates) as per AICTE rules.

3. The award of the said B. Tech. Degrees will be conferred to students who are successful in all of the eight (8) / six (6) Semester examinations.

4. Attendance: A student **must attend 75%** of the theoretical and laboratory/ practical classes **and successfully complete sessional assessment** in order to appear at Semester examinations.

5 Credit based Evaluation

(a) The credit based examination system will be followed for all Semester examinations. Each course shall have a certain number of credits assigned to it depending upon the academic load of the course

assessed on the basis of *weekly contact hours* of lecture, tutorial and laboratory classes, assignments or field study and/or self study

Generally, each course shall have an integer number of credits reflecting its weight. The number of credits of a course in a semester shall ordinarily be calculated as under

(i) Lecture (L)/Tutorial (T): One lecture hour or tutorial hour shall normally be assigned one credit. For determining the credits of a theory course, lectures and tutorials shall be added.

(ii) Practical (P): Each laboratory hours shall be assigned 0.5 credits. Courses other than Lectures/Tutorials shall be treated as practical courses.

The course credits for each course shall be given as L-T-P. For example, 2-1-0 will mean that it is a lecture based course and has 2 lectures, 1 tutorial, and no practical assigned to it. Similarly, a course with 0-0-3 means that it is a practical course with 3 hours of practical work.

The 4-year course in any field of study will have subjects covering minimum of 160 credits.

There will be two components of examinations of theoretical papers i) Sessional assessment 30% i.e. 30 marks ii) End Semester examination 70% i.e. 70 marks

(b) The Sessional assessment components of theory papers are

Serial No	Type of evaluation	Marks
01	Sessional Assessments through Class Test/ Assignments	20
02	Active participation in routine classes	05
03	Overall conduct, attendance, manners, skills etc.	05

(c) Evaluation in Laboratory/ practical papers (for 1st and 2nd Semester)

Serial No	Type of evaluation	Marks
01	Report and results	20
02	Viva	20
03	Overall conduct, attendance, discipline, manners, skills etc.	10

(d) Eligibility of success/failure in a Semester Examination:

(i) A student admitted in 1st semester of B.Tech. course will get total 6 consecutive academic years from his year of admission to pass in all the 8 semesters.

A student admitted in 3rd semester of B.Tech. course will get total 5 consecutive academic years from his year of admission to pass in all the 6 semesters.

(ii)A student has to secure at least 50% marks i.e. Grade-D in all subjects individually in order to ***pass the examination.***

(iii) If a student don't secure at least 50% marks or absent in the end semester examination of theory subject need to appear in that paper in the examination of next academic session(s). In the case of for theoretical paper the marks of Sessional assessment would be retained.

(iv) A student will be eligible to take admission to the next immediate higher semester if the number of non-appeared paper in Theoretical examination does not exceed two. A student must have to appear in all the papers of the practical examination of the semester concerned.

(v)A student can appear in current semester and along with that could appear supplementary examination of maximum of 2 previous semesters of the corresponding even or odd semester. (e.g. A students has failed in a paper in 1st semester will get 2 additional chances in 3rd and 5th Semester).

(vi)Special supplementary examinations will be arranged only for*Semester 7 and 8*justafter the declaration of results of *7th and 8th Semester.* Students who could not secure 50% marks in Special supplementary examination will have to appear in next academic session. (Provided maximum 6 years span for 4 Year B.Tech. and 5 Years span for 3 Years B.Tech. kept intact).

(vii) Eligibility for a Degree: A student needs to pass in all the theoretical and practical papers to qualify for B.Tech. Degree.

'Category 1' student has to pass all the theoretical and practical papers of 8-Semesters in maximum of 6 year periods from admission to obtain B.Tech. degree in corresponding course.

'Category 2' student has to pass all the theoretical and practical papers of 6-Semesters starting from 3rd Semester in maximum of 5 year periods to obtain B.Tech. degree in corresponding course.

6. (a) On the basis of total marks (TA+CT+ESE) secured in each paper, **Grade (G)** and **Grade Point (GP)** shall be awarded to a student.

The equivalence between grades, grade points and the percentage marks is given by:

Percentage (%) of marks	Grade (G)	Grade Point (GP)
≥ 90	Ex	10
≥ 80 and <90	A	9
≥ 70 and <80	B	8
≥ 60 and <70	C	7
≥ 50 and <60	D	6
< 50	F	0

(b) Each paper shall carry **Credit (C)** according to the number of hours allotted per week and as indicated in the following table

Paper/subject	No. of hours/week	Credit (C) assigned
Theoretical	1	1
Tutorial	1	1*
Practical	1	(2/3)*

*: For fractional credit, calculation is to be made by rounding off.

(c) The course structure and the credits assigned to each semester of each course are provided by individual Departments.

(d) The performance of a candidate in n^{th} Semester examination, who earns all the Credit of that semester, will be assessed by the '**Semester Grade Point Average' (SGPA), 'S_n' to be computed as:**

$$SGPA\ [S_n\ ] = \frac{\sum_k [C_k GP_k\ ]}{\sum_K C_k}$$

where 'k' denotes the number of papers in a particular semester and and $\sum C_k$ denotes the total credits of a particular semester and GP_k is the grade point of k^{th} paper.

(e) On completion of the B.Tech. course, the overall performance of a candidate will be assessed by the '**Cumulative Grade Point Average' (CGPA)** to be computed as:

$$CGPA = \frac{\sum_n [C_n S_n\ ]}{\sum C_n}$$

where, $C_n = \sum C_k$ and $\sum C_n$ denotes total credits of all the semesters

(f) Each theory and each practical paper will be assessed by internal examiner(s). Project, and General Viva Voce examinations will be assessed by a board consisting of at least two (2) internal examiners and at least one (1) external examiner

7. Candidates appearing in a semester examination shall join classes in the next semester immediately, wherever applicable, after completion of the examination.

8. At the end of each Semester examination, a Grade-Sheet showing the Semester performance (Semester Grade Sheet) indicated by **SGPA** will be issued to the students. However, SGPA will not be calculated for those candidates who fail to earn all the credits in that Semester**.**

The Semester Grade Sheet should have the following basic information: The merit list will be prepared on the basis of the total marks obtained.

9. **(a)** A consolidated Grade-Sheet, showing the overall performance in the B. Tech course indicated by **CGPA**, will be issued only to those successful students who have passed all the theoretical and practical papers of all of the 8 semesters (for Category -1 student) or 6 semesters (for Category -2 student).

The consolidated grade sheet shall consist of two components. The first component will have the information of the final Semester as follows:

The

Paper	Details of courses	Full Marks	Marks obtained	Credit obtained	Grade	Grade Point	SGPA	Remarks

second component will have a **summary** of all the semesters having the following basic information:

Semester	Total credit	Credit obtained	SGPA	Full marks	Marks Obtained	Cumulative statement	
						Total credit	
						CGPA	
						Full marks (Total)	
						Marks obtained	
						Result	#

The hash (#) in the last row of last column will contain the information regarding the final achievement of the candidate in all the examinations. This box will contain only one (1) of the following three (3) information: '1st Class' / '2nd Class'.

(b) Candidates securing CGPA at least 7.5 in B. Tech. Examination shall be placed in the First Class and those securing 6.0 or more but less than 7.5 shall be placed in the 'Second Class'.

10. The Degree of **"Bachelor ofEngineering/Technology"** under the seal of the University shall be awarded to a successful candidate mentioning the grade and class he/she has obtained. The format will be as follows

UNIVERSITY OF CALCUTTA
LOGO

It is hereby certified that after satisfying all the conditions prescribed by the University

----------*(Name)* Was on the ---th day of ----(month), -----(year)
Duly admitted to the Degree of
Bachelor of ---------- Engineering/Technology
In the ---- Class

Vice Chancellor
Senate House

University of Calcutta
1st Year of Four Year B Tech Course

Course Structure / Curriculum and Syllabus

The new Syllabus will be in effect from 2018-19 Academic Season

Subjects/Departments

- Electrical Engineering (EE) / Applied Physics
- Electronics & Communication Engineering (ECE)/ Radio Physics & Electronics
- Instrumentation Engineering (IE) / Applied Physics
- Computer Science & Engineering (CSE) / Computer Science and Engineering
- Information Technology (IT)/ AKC School of Information Technology
- Optics and Optoelectronics (OOE) / Applied Optics & Photonics
- Chemical Engineering(CHE) / Chemical Engineering
- Chemical Technology (CHT) / Chemical Technology
- Polymer Science & Technology (PST)/ Polymer Science & Technology
- Jute & Fiber Technology(JFT) / Jute & Fiber Technology

Course Structure

1st Semester

Serial No.	Name	Code	Credit	Weekly Load			Total Load
				L	T	P	
1	Communication English, Management and Social Sciences	HU101	03	2	1	0	03
2	Physics-I	PH102	03	2	1	0	03
3	Chemistry-I	CH103	03	2	1	0	03
4	Engineering Mathematics-I	MA104	03	2	1	0	03
5	Basic Electrical Engineering	EE105	03	2	1	0	03
6	Language Lab	HU106	1.5	0	0	3	03
7	Physics Lab -I	PH107	1.5	0	0	3	03
8	Chemistry Lab -I	CH108	1.5	0	0	3	03
9	Basic Electrical Engineering Lab	EE109	1.5	0	0	3	03
	TOTAL		**21**	10	5	11	27

2nd Semester

Serial No.	Name	Code	Credit	Weekly Load			Total Load
				L	T	P	
1	Physics-II/ Chemistry-II#	PH201/CH201	03	2	1	0	03
2	Engineering Mathematics-II	MA202	03	2	1	0	03
3	Engineering Mechanics	ME203	03	2	1	0	03
4	Basic computer Science and Engineering	CS 204	03	2	1	0	03
5	Basic Electronics	BE205	03	2	1	0	03
6	Physics Lab –II/ Chemistry Lab–II#	PH206/CH206	01	0	0	2	02
7	Workshop Practice	ME 207	1.5	0	0	3	03
8	Engineering Drawing	ME 208	1.5	0	0	3	03
9	Computer Programming Lab	CS 209	1.5	0	0	3	03
10	Basic Electronics Lab	BE210	1.5	0	0	3	03
	TOTAL		**22**	10	5	14	29

Total credit in 1st Year considering both,1st and 2nd semester is 21+22=43

For students of Stream CE,CT,PST, JFT will be assigned CH 201& CH 206 and for students of Stream ECE,CSE,IE,EE, IT,OOE will be assigned PH 201&PH 206 in 2nd Semester only.

DETAILED SYLLABUS

SEMESTER- I

THEORETICAL PAPERS

COMMUNICATION ENGLISH, MANAGEMENT AND SOCIAL SCIENCES

Sub Code: HU101 **L-T-P: 3-0-0**

Total Lectures 40 hours + Contact Hours **Credit: 3**

1.1 COMMUNICATIVE ENGLISH (GRAMMAR): (18L)

Course Objective: The objective of the course is to enhance the understanding of the students on the principles, techniques and application of grammar and to acquire appropriate proficiency and skills in reading, writing, speaking and comprehension.

Module 1: (3L)

Sentences: Clauses,Phrases, Types of Sentences, Sentence Structures and Transformation, Correction of Errors in Sentences.

Module 2: (1L)

Misplaced Modifiers and Modals.

Module 3: (4L)

Vocabulary Building and Usage: Word Formations (by adding suffixes and prefixes),Root words from foreign languages and their use in English; Synonyms; Antonyms; One Word Substitution/Single Word for a group of Words, Standard abbreviations; Redundant Words/ Redundancies/Redundantism; Clichés.

Module 4: (3L)

Remedial Grammar: Noun Pronoun Agreement, Articles, Prepositions, Agreement of Subject and Verb; Fill in the blanks using correct Words.

Module 5: (1L)

Précis Writing.

Module 6: (1L)

Essay, Paragraph Writing.

Module7: (1L)

Comprehension Passage.

Module 8: (3L)

Rapid reading- 'Bill Moss, Tentmaker' by Robert Gannon.

Module 9: (1L)

Taking notes: Dictation.

1.2 COMMUNICATIVE ENGLISH (TECHNICAL COMMUNICATION) (6L)

Course Objective: The objective of the course is to enhance the understanding of the students on the principles of effective technical communication and their application in official or professional communication.

Module 1: (2L)

The Theory of Communication –Definition & Scope; Barriers of Communication; Effective Communication (Verbal / Nonverbal).

Module 2: (1L)

Job Application Letter; C.V./Bio-data/Resume.

Module 3: (3L)

Organizational Communication:Memorandum; Notice;Official Notes; Minutes;Report (Technical Report): Progress Report, Event Report;ProjectProposal;Brochures; Newsletters; Technical Articles; Manuals; Business LetterCircular, Agenda,Invitation, Seminars, Press Release, Newspaper Insertion.

1.3 MANAGEMENT AND SOCIAL SCIENCES (16L)

Course Objective: To understand the principles of management and their application to the functioning of an organization.

Module 1: (2L)

The Development of Management: Scientific Management - Organic Organization,

Networked organization, Postmodern Organization, Debureaucratization, Transformation of Management.

Module 2: (1L)

Labour Management: Fordism, Post-Fordism and the Flexible Firm.

Module 3: (1L)

Principles of management and their application to the functioning of an organization Contents: Definition of management, science or art.

Module 4: (1L)

Manager vs entrepreneur; Types of managers- managerial roles and skills.

Module 5: (1L)

Evolution of management- scientific, human relations, system and contingency approaches.

Module 6: (1L)

Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises.

Module 7: (1L)

Organization culture and environment.

Module 8: (1L)

Current trends and issues in management.

Module 9: (1L)

Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies.

Module 10: (1L)

Strategic Management, Planning Tools and Techniques, Decision making steps & processes.

Module 11: (1L)

Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning.

Module 12: (1L)

Recruitment selection, Training & Development, Performance Management, Career planning and Management.

Module 13: (1L)

Directing, individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment.

Module 14: (1L)

Leadership, types & theories of leadership, effective communication.

Module15: (1L)

Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Course Outcomes:

1. The students will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
2. The students will acquire proficiency in formal official communication skills.
3. Upon completion of this course, the students will get a clear understanding of management functions in an organization.

REFERENCE BOOKS:

1. Effective English Communication, by V. Syamala.
2. Best Science Writing: Reading and Insights edited by Robert Gannon prescribed text (Hyderabad: University Press (India) Limited, 1991).
3. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc Graw-Hill.2005
4. Pronunciation Practice Activities – Martin Hewings – Cambridge University Press
5. A Textbook of English Phonetics for Indian Students – T. Balasubhramanian- Macmillan Publications
1. Concise Oxford Dictionary
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. English For All edited by Nilanjana Gupta
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
7. . David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
8. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
9. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
10. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
11. Robins S.P. and Coulter M., Management, Prentice Hall India, 10th ed., 2009.
12. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004.
13. P.C. Tripathy& P.N. Reddy, Principles of Management, Tata McGraw Hill, 1999.

PHYSICS-I

Sub Code: PH-102 **L-T-P: 3-0-0**

Total Lectures 40 hours + Contact Hours **Credit: 3**

Course objectives:

The objective of the course is to enhance the understanding of the Students' on some basic philosophies and corresponding application based reasoning of Physics. To help the students in

acquiring the necessary skills to solve the application based problems useful for almost all branches of physics and engineering, on the basic of theoretical understanding.

1.1. Optics: [14L]

Module 1: [2L]

Introduction to interference and examples -Young's double slit experiment,Newton's rings (qualitative).

Module 2: [4L]

Diffraction: Introduction to diffraction, Fraunhofer andFresnel diffraction, Fraunhoffer diffraction due to single slit and plane diffraction grating, characteristics of diffraction grating and its applications.The Rayleigh criterion for limit ofresolution and resolving powerof Diffraction gratings.

Module 3: [3L]

Polarization– Polarisation by reflection,Brewster's law, polarisation by double refraction,polaroids, Malus Law, linearly, circularly and elliptically polarized light (qualitative), half wave and quarter wave plates, Optical activity

Module 4: [2L]

Fibre Optics: Introduction,total internal reflection,numerical aperture and various fibre parameters, stepand graded index fibres, application of optical fibres.

Module 5: [3L]

Lasers: Principles and working of Laser: population inversion, pumping, various modes, types of Laser (qualitative), application of Laser

1.2. Thermodynamics : [6]

Module 1: [2L]

Degrees of freedom and Equipartition of energy, Energy and Work,First Law of Thermodynamics.**Module 2: [4L]**

Second Law of Thermodynamics, Heat engines, Carnot's theorem, Entropy and equilibrium,Change in Entropy, Enthalpy, Free Energy, Chemical Potential, Gibb's function, Maxwell's relations(qualitative).

1.3. Quantum Mechanics- I: [12L]

Module 1: [5L]

Black body radiation, Planck's radiation law and its uniqueness, Compton effect and its significance-wavelength shift and recoil of electrons

Module 2: [4L]

Wave nature of Particles, De-Broglie hypothesis, Matter wave, Born interpretation of wave function, Uncertainty principle, Operators-Eigen value and Eigen function, operators and expectation values of some dynamical variables like momentum, total energy, angular momentum etc.

Module 3: [3L]

Schroodingerwave equation in three dimension and one dimension and its' significance, Time-dependent and timeindependent form, Application of Schroodingerwave equation in case of particle in one dimensional box (qualitative).

1.4. Dielectric and Magnetic Properties of Materials: [8L]

Module 1: [2L]

Divergence and Curl of electrostatic field, Gauss's law and its application, Laplace's and Poisson's equations for electrostatic potential

Module 2: [3L]

Dipole moments, electric field and potential due to dipole, Bound charges and Dielectric polarization, polar and non-polar dielectrics,Electric displacement vector, dielectric susceptibility, permittivity and dielectric constant,Boundary conditions,simple electrostatics problems inpresence of dielectrics

Module 3: [3L]

Magnetisation, magnetic field ***B*** and ***H***,permeability and susceptibility, classification of magnetic materials, discussion ofmagnetic field in presence of magnetic materials(qualitative).,

Course Outcomes:

I. Students will be enriched with some basic thoughts of Physics needed for advancement in Technology.
II. Developmentof the idea about the basic concepts of mechanics required for all branches of the engineering.

III. Students will be familiar with the idea about the most important physical phenomena corresponds to different wings of Physics and also will be knowledgeable about the logic behind those phenomena.

IV. Students will be able to utilize the concept which they gather in solving the problem having technological aspects.

Reference books:

1. Introduction to Optics by Hecht E. Addison-Wesley.

2. OPTICS by AjoyGhatak, 2nd edition,Tata McGraw Hill

3. Fundamentals of Optics by F. A. Jenkins and H.E. White, McGraw-Hill

4. Geometrical and Physical Optics by B K. Mathur

5. Principles of Optics by M. Born and E. Wolf, Cambridge University Press

6. Introduction to Electrodynamics by David Griffiths, Prentice Hall

7. Principles of Physics by David Halliday, Robert Resnick JearlWalker , 10ed,Wiley.

8. Electricity, Magnetism, and Light by Wayne M. Saslow, Academic Press.

9. Electromagnetism by Grant and Phillips, John Wiley.

10.Thermodynamics in Materials Science by Robert DeHoff, CRC Press.

11. A treatise on HeatBy M. N. Saha and B. N. Srivastava.The Indian Press.

12. Heat and Thermodynamics by Zemansky and Dittman, McGraw-Hill.

13. Fundamentals of Statistical and Thermal Physic byReif, Sarat Book Distributors.

14. Introduction to Quantum Mechanics by David J. Griffiths, Prentice Hall.

15. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles by Eisberg&Resnick, Wiley.

16. Introduction to Electrodynamics by David Griffiths, Prentice Hall.

17. Electricity, Magnetism, and Light by Wayne M. Saslow, Academic Press.

18. Electromagnetism by Grant and Phillips, John Wiley.

19. Web Platform: NPTEL, SWAYAM, Archive.org etc

University of Calcutta
1st Year of Four Year B Tech Course

CHEMISTRY –I

Sub Code: CH-103 **L-T-P: 3-0-0**

Total Lectures 40 hours + Contact Hours **Credit: 3**

Course Objective: The objective is to Impart in depth understanding of fundamental concepts in chemistry that have been introduced at the 10+2 levels in school and to develop analytical skill among students necessary to design and solve the new problems. The course will familiarize students with different analytical techniques used in present day chemistry and explore the relevance in engineering applications.

Module I: Atomic and molecular structure (12L)

Introduction to quantum theory: Schrodinger equation. Origin of quantization.Particle in a box and its applications with respect to conjugated molecules and nanoparticles.Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations.

Bonding in molecules: Valence bond theory, Molecular orbital theory.Bonding and plots of molecular orbitals for diatomic and polyatomic molecules.Pi-molecular orbitals of butadiene and benzene and aromaticity.

Crystal field theory: Bonding in octahedral complexes, tetrahedral, tetragonally distorted octahedral and square planar complexes. Magnetic properties of all types of complexes.Color of complexes.

Band structure of solids and the role of doping on band structures.

Module II: Intermolecular forces and real gases (4L)

Ionic, dipolar and van der Waals interactions.Deviation of real gas from ideal behavior.Equations of state of real gases and critical phenomena.

Module III: Spectroscopic techniques and applications (6L)

Principles of spectroscopy and selection rules.Electronic spectroscopy.Vibrational spectroscopy.Nuclear magnetic resonance spectroscopy.Applications.

Module IV: Electrochemistry (8L)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Electrochemical series and its application.Nernst equation and

applications of emf measurements. Potentiometric titrations: Acid base, oxidation reduction, precipitation titrations. Corrosion.

Module V: Stereochemistry (4L)

Representations of three dimensional structures.Structural isomers and stereoisomers. Symmetry. Chirality and optical activity. Enantiomers, diastereomers, racemates. Configuration.Geometrical and conformational isomerism.Conformations of cyclic and acyclic systems.

Module VI: Organic reactions (6L)

Electronic influencing effects, Reactive intermediates. Aromaticity.Introduction to reactions involving rearrangement, substitution, addition, elimination, oxidation-reduction, cyclization and ring opening.Synthesis of a commonly used drug molecule.

Course Outcome:

The students will be able to

1. Understand and apply the concepts of basic quantum chemistry and chemical bonding to explain the molecular structure and physical/electronic properties of molecules.
2. Apply fundamental principles of electronic, vibrational, rotational and nuclear magnetic resonance spectroscopy towards identifying the structure of organic molecule.
3. Understand and apply fundamental concepts of electrochemistry.
4. Apply basic principles of organic chemistry for analyzing reaction mechanism and to develop methodology for synthesis.

Reference Books:

1. Chemistry: Principles and Applications by M. J. Sienko and R. A. Plane
2. Concise Inorganic Chemistry by J.D. Lee
3. General & Inorganic Chemistry, Vol I and Vol II by R.P. Sarkar
4. Physical Chemistry by P. W. Atkins and J. de Paula
5. Fundamentals of Molecular Spectroscopy by C. N. Banwell
6. Organic Spectroscopy by W. Kemp.
7. Organic Chemistry by I. L. Finar
8. Organic Chemistry by J. Clayden and N. Greeves

9. Organic Chemistry by R. T. Morrison and R. N. Boyd
10. Organic Chemistry by T. W. G. Solomons and C. B. Fryhle
11. A Guidebook to Mechanism in Organic Chemistry by P. Sykes
12. Engineering Chemistry (NPTEL Web book) by B. L. Tembe, Kamaluddin and M. S. Krishnan
13. Engineering Chemistry by PrasanthRath

ENGINEERING MATHEMATICS-I

Sub Code: MA-104 **L-T-P: 3-0-0**

Total Lectures 40 hours + Contact Hours **Credit: 3**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and vector algebra. At the end of this course students will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Module 1: Differential calculus: [11 L]

Differential calculus: Successive differentiation, Leibnitz Rule. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

Multivariable Calculus:Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.

Module 2: Sequences and series: [12 L]

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval'stheorem.

Module 3: Vector Algebra: [7L]

Vector calculus: Brief review of vector algebra, scalar and vector triple products, Directional derivatives, gradient, divergence, curl, vector integration, statements and applications of Gauss's theorem, Green's theorem, Stokes' theorem, examples

Module 4: Integral Calculus (Integration): [10L]

Int. Calculus: Properties of definite integrals, Quadrature, Rectification, Double integral, Triple integrals,change of order of integration, change of variables, determination of length, area, volume.Applications of definite integrals to evaluate surface areas and volumes of revolutions

Course Outcome:

The students will learn:

- To Use Leibnitz Theorem to determine the nth derivative of product of functions. They will develop series expansion by Taylor's and Maclaurin's series. They will be examine the function for maxima and minima and discover its extreme value.
- To use the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To deal with functions of several variables that are essential in most branches of engineering.
- To recognize scalar and vector functions. They will evaluate Gradient, Divergence and Curl of a point function depending upon its nature.
- To apply the integral formulae to estimate length, surface area and volume of revolution of a curve.

Reference Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43nd Edition, 2015.
2. P.N. Wartikar& J.N .Wartikar, AppliedMathematics (Volume I and II) PuneVidyarthiGrihaPrakashan, 7th Edition 1994.
3. Erwin Kreyszig ,Advanced Engineering Mathematics, John Wiley & Sons Inc., 10th Edition, 2011
4. Peter V. O' Neil, Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition, 2011.
5. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
8. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

University of Calcutta
1st Year of Four Year B Tech Course

BASIC ELECTRICAL ENGINEERING

Sub Code: EE-105 **L-T-P: 3-0-0**

Total Lectures 40 hours + Contact Hours **Credit: 3**

Course Objective: The objective of the course is to enhance the understanding of the Students' on the basics of AC & DC circuits alongwithbasics of three phase circuits and to help the students to understand the basics of basic electrical machines, also helps the students understand the necessity of power system components.

Module -1 [L- 3]

D.C. Circuits: Network theorems – Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem. Star-Delta & Delta-Star transformation.

Module -1 [L- 3]

Magnetic Circuit: MMF, Flux ,Reluctance. B-H Loop.Hysteresis and Eddy current loss.Magnetic circuit analysis with air gap.

Module -2 [L- 3]

A.C. Fundamentals : Sinusoidal quantities, phase & phase difference, average & RMS values, form factor & peak factor, concept of Sinusoids, impedance & admittance, power & power factor,

Module -3 [L- 3]

A.C. Circuits: Series and parallel R-L-C Circuits, Form Factor, Peak. Factor.Phasor concept of Sinusoids.Impedance and Admittance.Power, Power Factor, V A, V AR.

Module -3 [L- 3]

Balanced 3-phase: 3-phase AC balanced circuits. Phase-sequence, Star and Delta connections.Connection of wattmeter in 1-ph circuit for power measurement & Connection of two wattmeters in 3-ph circuit for power measurement.

Module -4 [L- 2]

Power Factor Improvement: Causes & effect of low power factor, advantages of power factor improvement, methods of power factor improvement.

Module -5 [L- 7]

DC Machines: Construction, working, different types, EMF equation, characteristic (Generator & Motor), starting and speed control.

Module -6 [L- 7]

1-PhaseTransformer: Construction. EMF equation.Phasor diagram. Equivalent circuits.. Open circuit and Short circuit test. Losses and Efficiency

Module -7 [L- 7]

3-Phase Induction Machine: Types of induction machines. Rotating magnetic field, slip ,torque equation, torque speed curve .DOL starting and reduced voltage starting.

Module -8 [L- 1]

Power System Structure: Single line diagram of a power system structure.

Course Outcome:

1) The students will be able to understand the basic laws of electrical engineering & its application
2) Students knowledge will be enhanced about the basics of AC & DC circuits
3) Students will get an idea about the three phase system
4) Students will be able to analyses the basic electrical machines with the help of basic concepts of electrical engineering gathered.
5) Get an idea about the components of power system.

Reference Books:-

1. Basic Electrical Engineering By I.J.Nagrath ,Tata McGraw-Hill Publishing Co. Ltd
2. Basic Electrical Engineering By T.K. Nagsarkar& M.S. Sukhija, Oxford University Press
3. Electrical & Electronics Technology By Hughes, Dorling Kindersley India, New Delhi
4. Electrical Technology By H. Cotton, CBS Publisher, New Delhi
5. A course in Electrical Engineering Vol-I & II ByC.L.Dawes Publisher: McGraw-Hill Book Co. Inc

PRACTICAL PAPERS:

Language Lab

Sub Code: HU-106 **L-T-P: 0-0-3**

Total : 36 hours **Credit: 1.5**

1.1 LANGUAGE LAB (36L)

Course Objective: The objective of the practical classes is to make the students familiar with the applied aspects of the English language, pronunciation, behavioural strategies and realistic

dimensions of interpersonal interaction in the context of organizational communication. The practical exercises include the following topics:

EXERCISES:

- Group Discussion –Principle & Practice [Courtesy- Teaching Cohesion and Coherence strategies for handling criticism and adverse remarks. Teaching strategies of Turn- taking, timing, effective and creative intervention, formal and informal language, kinesics (use of body language), politeness and courtesies and all components of soft skills].
- Mock/Job Interview.
- Role Play/Conversation.
- Formal Presentation [power point presentation/extempore/ public speaking skills,Elementary Phonetics (theory): Pronunciation/ Stress/Intonation/ Rhythm/ Voice modulation/ Pitch and Accent of connected speech].
- Listening Comprehension: Audio File Analysis/Video File Analysis.

Course Outcomes:

1. The students will acquire skills on conflict management, presentation, decorum, grooming, courtesy, appropriate pronunciation.
2. The students will also acquire better verbal ability in Spoken English.

REFERENCE:

The manual corresponding to all the exercises will be provided to the students.

Physics Lab –I

Sub Code: PH-107 **L-T-P: 0-0-2**

Total :24 hours **Credit: 1**

Course objectives:

The objective of the practical classes is to make the students familiar with the technological features of theory as well as to provide hand-on experience of corroboration between model theory and it's practical aspect.

Experiments:

Experiments are based on modern optics-Lasers, general properties of matter, mechanics with advanced measurement techniques and Virtual lab

Reference:

The manual corresponds to all experiments will be provided to the students.

Chemistry Lab –I

Sub Code: CH-108 **L-T-P: 0-0-3**

Total :36 hours **Credit: 1.5**

Choiceof eight to tenexperimentsfromthefollowing:

- Titrations: Acid –base, Conductometric, pH-metric, Complexometric titrations.
- Estimation ofhardnessofwater.
- Determinationofchloridecontentofwater
- Colligativepropertiesusingfreezingpointdepression
- Determinationoftherateconstantofareaction
- Determinationofcellconstantandconductanceofsolutions
- Potentiometry-determinationofredoxpotentialsandemfs
- Determinationofthepartitioncoefficientofasubstancebetweentwoimmisciblleliquids
- Determinationofsurfacetensionandviscosity
- Thinlayerchromatography
- Synthesisofapolymer/drug
- Saponification/acidvalueofanoil
- Latticestructuresandpackingofspheres
- Modelsofpotentialenergysurfaces
- Chemicaloscillations-Iodineclockreaction
- Adsorptionofaceticacidbycharcoal

Electrical Engineering Lab–I EE- 109

Sub Code: EE-109 **L-T-P: 0-0-3**

Total : 36 hours **Credit: 1.5**

Course Objective:

The objective of this practical course is to familiarize the students to the various instruments & devices & its hand on use, to run the rotating electrical machines & to familiarize with the construction & use of single phase transformer.

Experiments on the following topic:

- Familiarization experiments (Variac, Potential divider, MCV.MIV,MCA,MIA &Wattmeter)
- Characteristics of Tungsten and Carbon filament lamps
- Experiments on DC circuits and DC machines
- Study of AC series R-L-C series circuit
- Experiments on Single phase Transformer
- Calibration of voltmeter, ammeter and energy meter
- Experiments on magnetic circuit principles

Course Outcome:

The students will be able to learn-

1) The use of different instruments & devices in a circuits
2) How to make an electrical circuit & the safety measures.
3) The practical application of basics of electrical engineering like AC/DC circuits.
4) The practical use of rotating & static electrical machines.