RCC INSTITUTE OF INFORMATION TECHNOLOGY

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A UNIT OF RCC INSTITUTE OF TECHNOLOGY AN AUTONOMOUS SOCIETY OF DEPARTMENT OF HIGHER EDUCATION, GOVT. OF WEST BENGAL

COURSE BOOKLET

B.TECH,1ST YEAR

(2018-2022)BATCH

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

RCC INSTITUTE OF INFORMATION TECHNOLOGY

CANAL SOUTH ROAD, BELIAGHATA

KOLKATA - 700 015, WEST BENGAL, INDIA

This revised version of Course booklet is being published in accordance with OutcomeBased Education (OBE) policy approved by Program Assessment Committee (PAC), Departmental Advisory Board(DAB), Department of Electronics and Communication Engineering (ECE).

Department of Electronics and Communication Engineering

All faculty members associated with Department of Electronics and Communication Engineering, RCCIIT, concerned faculty members of Basic Science and Humanities and the honorable members of DAB, Electronics and Communication Engineering of RCCIIT are acknowledged for their timely support and relevant inputs towards the preparation of this booklet.

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About Department:

Department of Electronics and Communication Engineering is successfully running since 2006 with a intake of 60 seats. In 2010 intake increased to 120; from 2012 the department also started 2 years full time PG program in Tele Communication to make a significant contribution in the field of higher studies.

The Department used to organize seminars, development programs, and workshops for faculties, staffs and students in support of incessant development. A pool of competent faculty member of the Department constantly motivates the students to get placed by means of job, research and higher studies; and the outcomes reflect in the achievement.

The pass out students of the ECE Department now associated with pioneer Institutions like North Dakota State University (USA), University of Regina (Canada), College of Medicine Swansea University (UK), University of Illinois, Chicago (USA), University of Buffalo (USA), Texas Tech University, different IITs (Kharagpur, Kanpur, Roorkee, Guwahati), IIM (Kozhikode), IIEST, ISM, Jadavpur University etc. Moreover the students of this Department are also allied with prestigious organizations like BSNL, ECIL, WBSEB, AAI, INTERRA SYSTEM, TCS, CTS, INFOSYS, IBM, ACCENTURE, TECH MAHINDRA, ERICSSON L&T etc. The Department is also involved actively in the frontier research, corroborated by a significant number of research papers in various national and international journals and conferences.

Vision of the Department

Graduates of this department will be part of global academia/industry through sincere professional commitments, research and innovations by ethically considering environmental impacts and societal benefits in the multidisciplinary culture for sustainable development of civilization throughout their career.

Mission of the Department

Mission No.	Mission Statements
M1	Be able to develop sustainable solutions of problems related to electronics and communication engineering as individual or part of a team maintaining professional ethics and environmental aspects.
M2	Be competent to perceive higher studies through research, innovation and managerial skills for integrated life-long learning..
M3	Create leadership qualities through learning beyond classroom, effective communication, inter-personal skill, technological development and innovation for benefit of society

Program Outcome (POs) of the Department

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend andwrite effective reports and design documentation, make effective presentations, and giveand receive clear instructions.

11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:**Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs) of the Department

PEO No.	Program Educational Objectives Statements
PEO1	Be competent to solve electronics and communication engineering related problems by applying fundamental principles of natural sciences, domain knowledge using modern tools, techniques and inter-personal skills for early employment in industry/academia.
PEO2	Be part of diverse multinational sectors by continuously interpreting global professional development through innovative research and self-study in subject domain and allied fields as a part of life-long learning.
PEO3	Be qualified to construct professional work using acquired domain knowledge as individual or team-member in global environment pertaining to electronics fulfilling ethical, societal and environmental issues.

Program Specific Outcomes (PSOs)

PSO No.	Program Specific Outcome(PSOs) Statements
PSO1	Investigate the design/development of intra and interdisciplinary complex problems/systems through acquired technical knowledge in the field of electronics and communication engineering using state-of-the-art hardware and software tools.
PSO2	Estimate every multidisciplinary project in the light of professional ethics for societal welfare prior to implementation and keeping the environment safe through teamwork or individual means.
PSO3	Invent novel technical solutions applicable for academia/industry relevant to electronics and communication engineering through complex engineering activities maintaining specified constraints with possible life-long impact.

Correlation between PEOs and Mission of the Department of Electronics & Communication Engineering, RCCIIT

PEO No.	PEO statements	M1	M2	M3
PEO1	Be competent to solve electronics and communication engineering related problems by applying fundamental principles of natural sciences, domain knowledge using modern tools, techniques and inter-personal skills for early employment in industry/academia.	3	2	2
PEO2	Be part of diverse multinational sectors by continuously interpreting global professional development through innovative research and self-study in subject domain and allied fields as a part of life-long learning.	1	3	3
PEO3	Be qualified to construct professional work using acquired domain knowledge as individual or team-member in global environment pertaining to electronics fulfilling ethical, societal and environmental issues.	2	2	3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Odd Semester(I)

Sl.No.	Paper Code	Paper Name	Credit
1.	BS-CH101	Chemistry 1	4
2.	BS-M102	Mathematics –IB	4
3.	ES-EE101	Basic Electrical Engineering	4
4.	BS-CH191	Chemistry-I Laboratory (Gr-B)	1.5
5.	ES-EE191	Basic Electrical Engineering Laboratory	1
6.	ES-ME191	Engineering Graphics &Design(Gr-B)	3

EvenSemester(II)

Sl.No.	Paper Code	Paper Name	Credit
1.	BS-PH201	Physics-I (Gr-B)	4
2.	BS M202	Mathematics –IIB	4
3.	ES-CS201	Programming for Problem Solving	3
4.	HM-HU201	English	2
5.	BS-PH291	Physics-I Laboratory (Gr-B)	1.5
6.	ES-CS291	Programming for Problem Solving	2
7.	ES-ME292	Workshop/Manufacturing Practices(Gr-B)	3
8.	HM-HU291	Language Laboratory	1

Odd Semester(I) Articulation Matrix

Paper Code	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO 1	PSO 2	PSO 3
BS-CH101	3	1.6666	1	1	-	-	-	-	-	-	-	-	2	-	-
BS-M102	2.83	2.33	2.5	2.33	-	-	-	-	-	-	1.66	3	2	1.5	.00
ES-EE101	2.17	2	2.75	2	2.6	-	-	-	-	-	-	1.25	1	-	1
BS-CH191	1	1.5	2	3	-	-	-	-	-	-	-	-	1.50	-	-
ES-EE191	1.83	2	2.5	1	2.4	-	-	-	2.4	-	-	-	1	-	-
ES-ME191	1.5	1.83	1.83	1	0	1	0	0	0	1.4	0	0	1	0	0

EvenSemester (II) Articulation Matrix

Paper Code	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
BS-PH201	1.8	2.3	1.8	1.0	0	0	0	0	0	0	0	-	2.00	0	0
BS M202	2.833	2.6667	2.33	1.833	-	--	--	1.00	--	2	1.667	1.00	2	1.4	1.00
ES-CS201	2	2	2	2	0	0	0	0	0	0	0	2	2	2	2.3333
HM-HU201	1.25	2.17	1.33	1.83	1	2	1.67	1.83	2.17	3	1	1.67	1.00	2.50	1.50
BS-PH291	1.67	2.5	1.8	1.5	0	0	0	0	0	0	0	0	2	0	0
ES-CS291	2	2	2	2	0	0	0	0	0	0	0	2	2	1	2.3333
ES-ME292	1	0	0	0	0	1	2	1	1.75	1	1.333	1	0	1	0
HM-HU291	1.8	1.6666667	1.8	1.4	1.5	1.833	1.5	1.833	2.333	3	1.2	2	1.20	2.17	1.83

Course Title: Chemistry-I	**Code: BS-CH-101**
Type Of Course: Theory	**Course Designation: Compulsory**
Semester: 1st	**Contact Hours: 3L+T/week**
Continuous Assessment: 25 Marks (4 CA:CA1/CA2/CA3/CA4) Attendance : 5 Marks	**Final Exam: 70 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: Overall knowledge of basic concepts of Chemistry as covered in Std XI & XII,Analytical & mathematical approach towards Chemistry

COURSE OBJECTIVE:

BSCH101:COb1:- Be able to understand the use of free energy in chemical equilibrium and electrochemical reactions and apply in the field of water technology.

BSCH101:COb2:- Be able to apply the fundamental knowledge of spectroscopic techniques in the field of science and engineering

BSCH101:COb3:- Be able to understand the theoretical aspects of bonding and molecular structure of organic and inorganic molecules including drugs or macromolecules.

BSCH101:COb4:- Be able to solve scientific problem related to engineering chemistry.

COURSE OUTCOMES (COs) of BS-CH-101

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
BSCH101.CO1	**Rationalize** periodic properties such as ionization potential , electronegativity, oxidation states and electronegativity and electron affinity	Analysis (Level IV)
BSCH101.CO2	**Analyse** microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.	Analysis (Level IV)
BSCH101.CO3	**Rationalise** bulk properties and processes using thermodynamic considerations	Analysis (Level IV)
BSCH101.CO4	**Distinguish** the ranges of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.	Analysis (Level IV)
BSCH101.CO5	**Evaluate** structure , colour and magnetic properties of co-ordination complexes	Evaluating (Level V)
BSCH101.CO6	**List** major chemical reactions that are used in the synthesis of molecules and **explain** isomerism considering the stereochemical aspect	Analysis (Level IV) Understanding (Level II)

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	3	1	1	1	-	-	-	-	-	-	-	-	2	-	-
CO6	3	1	1	1	-	-	-	-	-	-	-	-	2	-	-
AVG.	3	1.6666	1	1	-	-	-	-	-	-	-	-	2	-	-

University Syllabus :

Module	Content	Hrs/Unit	Related CO's
1	**Atomic and molecular structure (10L)** Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H2). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.	12	CO 2 , CO 5
2	**Spectroscopic techniques and applications** Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.	03	CO4
3	**Intermolecular forces and potential energy surfaces** Ionic, dipolar and vander Waals interactions. Equations of state of real gases and critical phenomena.	04	CO 2
4	**Use of free energy in chemical equilibria**	06	CO3

	First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.		
5	**Periodic properties** Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries. hard soft acids and bases, molecular geometries.	05	CO 1
6	**Stereochemistry** Representations of 3 dimensional structures, structural isomers and stereoisomers. configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.	05	CO6
7	**Organic reactions and synthesis of a drug molecule** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.	07	CO6

GATE syllabus (If applicable for GATE): NA

RESOURCES:

1. University chemistry, by B. H. Mahan

2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell

4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

5. Physical Chemistry, by P. W. Atkins

Course Title: Basic science course	**Code: BSM 102**
Type Of Course: Theory	**Course Designation: Compulsory**
Semester: 1st	**Contact Hours: 4L/week**
Continuous Assessment: 25 Marks **Attendance : 5 Marks**	**Final Exam: 70 Marks**
Writer: Course Coordinator	**Approved by HoD**

Pre-requisites: Fundamental knowledge on Physics and Electronics

Course Objective (COb's) of Basic science course

BSM 102:COb1: Be able to apply the concept and techniques of differential integral calculas to determine the curvature andevaluation of different types of improper integrals.

BSM 102:COb2: Be able to understand the domain of application of mean value theorem to engineeringproblems.

BSM 102:COb3: Be able to learn different types of matrices,concept of rank,method of matrix inversion and to know the application of sequence in human life.

BSM 102:COb4: Be able to understand the linear spaces,it'sdimension,basis and application to the field of computer science.

BSM 102:COb5: Be able to learn the concept of eigen values, eigenvectors,diagonalisation of matrices for understanding physical and engineering problems.

BSM 102:COb6: Be able to apply the knowledge of sequence and series in real life problems.

Course Outcome (CO's) of Basic science course

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
BSM102:CO1	**Learn** basic mathematical tools to deal with problems in engineering science.	**K3:**Applying
BSM 102:CO2	Understand properties and application of calculas.	**K3:**Applying
BSM 102:CO3	Develop the concept of convergent of sequence and series.	**K4:**Analyzing
BSM 102:CO4	**K**now the application of Rolle'stheorem,lagrange mean value theorem and relative extremum of afunction.	**K4:**Analyzing
BSM 102:CO5	**A**pply integration,limit and continuity in real life problems.	**K4:**Applying
BSM 102:CO6	**C**lassify ensembles and different between real analysis and linear algebra.	**K5:**Evaluating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	--	--	--	--	--	--	--	3	3	2	--
CO2	3	3	3	3	--	--	--	--	--	--	--	3	2	1	--
CO3	3	3	3	2	-	--	--	--	--	--	--	3	2	1	--
CO4	3	1	2	1	-	--	--	--	--	--	1	3	2	2	--
CO5	2	2	2	2	-	--	--	--	--	--	2	3	1	-	1
CO6	3	2	2	2	-	--	--	-	--	--	2	3	-	-	1
AV	2.83	2.33	2.5	2.33	-	--	--	-	--	--	1.	3	2	1.5	1.00

University Syllabus:

Module	Content	Hrs/Unit
1.Calculas(integration)	Evalutes,involutes definition and proper examples [2L] Improper integrals,Beta and Gamma function and their properties[2L] Application of definite integrals to evaluate surface areas and volume of revolutions.[2L]	6
2.Calculas(differentiation)	Rolle's theorem ,Mean value theorem [1L] Taylors theorem and it'sapplication[2L] Maclaruins theorem with remainder [2L] L Hospital's rules [1L] Maxima and minima[2L]	8
3.Sequence and series	Connvergence of sequence and series.[2L] Test of convergence [1L] Power series and Taylor series[2L] Series of exponential,trigonometric and logarithm function[2L] Fourier series,half range sine and cosine series[2L] Perseval's theorem [2L]	11
4.Multivariate calculus	Limit,continuity[2L] Partial derivatives,Directional derivatives[2L] Total derivatives [1L] Tangent plane,normalline,maxima,minima,saddle points[2L] Method of lagrangemultiplyer,curl and divergence[2L]	9
5.Matrices.	Inverse,rank of a matrix[1L] Rank-Nullity theorem,system of linearequations[2L] Symmetric,skew-symmetric and orthogonal matrix[1L] Determonants,eigenvalues,eigen vectors[2L] Diagonalization of a matrix,Cayley-Hamilton theorem[1L] Orthogonal transformation[1L]	8

GATE syllabus mapping:

GATE syllabus content	Mapping unit of university syllabus
Calculas.	Module1,2,4
Linear algebra	Module 5
Sequence and series	Module 3

RESOURCES:

T.1. ReenaGarg, Engineering Mathematics-I, Khanna Publishers.
T.2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
T.3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
T.4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
T.5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning. 6. Veera Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
T6. Real analysis by S.K Mapa

Course Title: Basic ElectricalEngineering	**Code: ES EE-101**
Type Of Course: Theory	**Course Designation: Compulsory**
Semester: 1st	**Contact Hours: 3L+1T/week**
Continuous Assessment: 25 Marks **Attendance : 5 Marks**	**Final Exam: 70 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

COURSE OUTCOMES (COs) of ES EE-101

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
ES-EE101.CO1	To understand and analyze basic electric and magnetic circuits.	understand / analyze	Understand / Analyze
ES-EE101.CO2	To study the working principles of electrical machines and power converters.	study	Remember
ES-EE101.CO3	To introduce the components of low voltage electrical installations.	introduce	Remember
ES-EE101.CO4	To understand the general structure of electrical power system.	understand	Understand
ES-EE101.CO5	To understand the construction and operation of single-phase transformer.	understand	Understand
ES-EE101.CO6	To explain the working principle of power converters.	explain	Understand

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	1	-	-
CO2	2	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO3	2	-	3	1	-	-	-	-	-	-	-	1	1	-	-
CO4	2	-	2	2	3	-	-	-	-	-	-	2	1	-	1
CO5	2	2	-	2	3	-	-	-	-	-	-	1	1	-	-
CO6	2	1	3	3	3	-	-	-	-	-	-	1	1	-	-
AVG	2.17	2	2.75	2	2.6	-	-	-	-	-	-	1.25	1	-	1

University Syllabus:

Unit	Content	Hrs/Unit
1	DC Circuits (8 hours) Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.	8
2	AC Circuits (8 hours) Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	8
3	Transformers (6 hours) Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.	6
4	Electrical Machines (8 hours) Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.	8
5	Power Converters (6 hours) DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation	6
6	Electrical Installations (6 hours) Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.	6

RESOURCES:

1. RituSahdev, Basic Electrical Engineering, Khanna Book Publishing Co. (P) Ltd., Delhi.

2. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.

3. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.

Course Title: Chemistry-I	**Code: BSCH-191**
Type Of Course: Laboratory	**Course Designation: Compulsory**
Semester: 1st	**Contact Hours: 3P/week**
Continuous Assessment: 36 Marks **Attendance : 4 Marks**	**Final Exam: 60 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: 1. Overall Knowledge about the basic concepts of chemistry as covered in class 11th& 12th Standard. Analytical & mathematical approach towards Chemistry.

COURSE OBJECTIVE:

BSCH191:COb1: Be able to understand basic principles of chemical analysis

BSCH191:COb2: Be able to apply the fundamental knowledge of science and engineering and skill to solve scientific problems

COURSE OUTCOMES (Cos) of BSCH-191

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
BSCH191.CO1	Determine the strength of an acid using conductometric method.	Evaluate (Level V)
BSCH191.CO2	Determine the strength of an acid using pH-metric methods	Evaluate (Level V)
BSCH191.CO3	Determine partition coefficient of a substance between two immiscible liquids and evaluate the amount of acetic acid adsorbed by charcoal	Evaluate (Level V)
BSCH191.CO4	Determine some physical properties like surface tension and viscosity of different solutions at room temperature	Evaluate (Level V)
BSCH191.CO5	Estimate the amount of an ion present in a given solution using argentometric method and amount of dissolved Oxygen (mg/L) present in a given water sample using volumetric method	Evaluate (Level V)
BSCH191.CO6	Determine the cell constat and conductance of electrolytes	Evaluate (Level V)

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	3	-	-	-	-	-	-	-	-	1	-	-
CO2	1	1	2	3	-	-	-	-	-	-	-	-	1	-	-
CO3	1	1	2	3	-	-	-	-	-	-	-	-	1	-	-
CO4	1	2	2	3	-	-	-	-	-	-	-	-	2	-	-
CO5	1	2	2	3	-	-	-	-	-	-	-	-	2	-	-
CO6	1	2	2	3	-	-	-	-	-	-	-	-	2	-	-
AVG.	1	1.5	2	3	-	-	-	-	-	-	-	-	1.50	-	-

University List of Experiments

1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
2. pH-metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
3. Determination of dissolved oxygen present in a given water sample.
4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5. Determination of surface tension and viscosity
6. Thin layer chromatography
7. Ion exchange column for removal of hardness of water
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry-determination of redox potentials and emfs
11. Saponification/acid value of an oil
12. Chemical analysis of a salt
13. Determination of the partition coefficient of a substance between two immiscible liquids
14. Adsorption of acetic acid by charcoal
15. Use of the capillary viscometers to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

GATE syllabus (If applicable for GATE): NA

RESOURCES:

1. Quantitative and qualitative analysis, by A.I. Vogel
2. Engineering Chemistry Practical by Sudha Rani

Course Title: Basic Electrical Engineering Laboratory	Code: ES EE-191
Type Of Course: Practical	Course Designation: Compulsory
Semester: 1st	Contact Hours: 2P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks
Writer: Course Coordinator	Approved by HoD (Convenor of DAB)

COURSE OUTCOMES (COs) of ES EE-191

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
ES-EE191.CO1	To calibrate Ammeter and Wattmeter	calibrate	**Apply**
ES-EE191.CO2	To demonstrate the measuring instrument and electrical machines	demonstrate	**Apply**
ES-EE191.CO3	To conduct open circuit and short circuit test of single-phase transformer	conduct	**Understand**
ES-EE191.CO4	To measure 3 phase power using two wattmeters	measure	**Evaluate**
ES-EE191.CO5	To identify the components of LT switchgear	identify	**Remember**
ES-EE191.CO6	To understand the characteristic of RLC series and parallel circuit	understand	**Understand**

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	CC	-	-	-	3	-	-	-	2	-	-	-	1	-	-
CO2	2	3	3	1	2	-	-	-	3	-	-	-	1	-	-
CO3	2	2	3	-	-	-	-	-	2	-	-	-	1	-	-
CO4	2	-	2	-	3	-	-	-	3	-	-	-	1	-	-
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	-	-
CO6	2	1	2	1	3	-	-	-	2	-	-	-	1	-	-
AVG	1.83	2	2.5	1	2.4	-	-	-	2.4	-	-	-	1	-	-

University Syllabus:

Choose 10 experiments from the following:

Unit	Content
1	First activity: Introduction to basic safety precautions and mentioning of the do's and Don'ts. Noting down list of experiments to be performed, and instruction for writing the laboratory reports by the students. Group formation. Students are to be informed about the modalities of evaluation.
2	Introduction and uses of following instruments : (a) Voltmeter (b) Ammeter (c) Multimeter (d) Oscilloscope Demonstration of real life resistors, capacitors with colorcode , inductors and autotransformer.
3	Demonstration of cut-out sections of machines: DC machine, Induction machine, Synchronous machine and single phase induction machine.
4	Calibration of ammeter and Wattmeter.
5	Determination of steady state and transient response of R-L, R-C and R-L-C circuit to a step change in voltage.
6	Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of impedance and power factor.
7	Determination of resonance frequency and quality factor of series and parallel R-L-C circuit.
8	(a) Open circuit and short circuit test of a single-phase transformer (b) Load test of the transformer and determination of efficiency and regulation
9	Demonstration of three phase transformer connections. Voltage and current relationship, phase shifts between the primary and secondary side.
10	Measurement of power in a three phase unbalanced circuit by two wattmeter method.
11	Determination of Torque –Speed characteristics of separately excited DC motor.
12	Determination of Torque speed characteristics and observation of direction reversal by change of phase sequence of connection of Induction motor.
13	Determination of operating characteristics of Synchronous generator.
14	Demonstration of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for speed control of an Induction motor.
15	Demonstration of components of LT switchgear.

Course Title: Engineering Graphics & Design	Code: ES-ME191
Type Of Course: Practical	Course Designation: Compulsory
Semester: 1st	Contact Hours: (1L+4P)/week
Continuous Assessment: 35 Marks Attendance : 5 Marks	Final Exam: 60 Marks
Writer: Course Coordinator	Approved by HoD (Convenor of DAB)

Pre-requisites: Basic Mathematics.

COURSE OBJECTIVE:

- Able to apply drawing instruments properly.
- Able to visualize and understand any engineering drawing.
- Design any object through CAD.

COURSE OUTCOMES (COs) of ES-ME191

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
ME291.CO1	**Understand** the utility of drawing instruments, dimensions and lines in technical drawing.	Understanding (Level II)
ME291.CO2	**Know** the Standard conventions and Construction of various Scales and Engineering curves	Understanding (Level II)
ME291.CO3	**Apply** fundamentals of theory of projections and draw orthographic projections of points, lines and surfaces.	Apply (Level III)
ME291.CO4	**Sketch** the orthographic projections of regular solids and their sectional views.	Apply (Level III)
ME291.CO5	**Comprehend** and apply the theory of development of surfaces	Understanding (Level II)
ME291.CO6	**Apply** basic concepts of CAD to develop and construct accurate 2D geometry through creation of basic geometric constructions.	Apply (Level III)

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	2	-	-	-	-	-
CO2	2	1	1	-	-	1	-	-	-	-	-	-	-	-	-
CO3	1	2	-	-	-	-	-	-	-	2	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	-	1	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	1	-	-	-	-	-
CO6	3	3	2	1	-	-	-	-	-	1	-	-	1	-	-
AVG.	1.5	1.83	1.83	1	0	1	0	0	0	1.4	0	0	1	0	0

University Syllabus:

Sl No	Content	Hrs/Unit
Theoretical Part	Introduction to Lines, Lettering, Dimensioning, Scales	1L
	Geometrical Construction and Curves	1L
	Projection of Points, Lines and Surfaces	1L
	Projection of Solids	1L
	Combination of regular solids, Floor plan	1L
	Isometric Projection	1L
	Sections and sectional views of right angular solids	1L
	Overview of computer graphics, customisation & CAD Drawing	1L
	Annotations, layering & other functions	2L
Practical Part	LINES, LETTERING, DIMENSIONING, SCALES; Plain scale, Diagonal scale.	4hrs
	GEOMETRICAL CONSTRUCTION AND CURVES; Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archemedian Spiral.	4hrs
	PROJECTION OF POINTS, LINES, SURFACES; Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes.	4hrs
	PROJECTION OF SOLIDS; Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).	4hrs
	COMBINATION OF REGULAR SOLIDS, FLOOR PLANS: Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.	4hrs
	ISOMETRIC PROJECTIONS: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;	4hrs
	SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS: Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)	4hrs
	OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION& CAD DRAWING: listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;	4hrs
	ANNOTATIONS, LAYERING & OTHER FUNCTIONS: applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computeraided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises.	8hrs

	Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;	
	DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT: Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM)	8hrs

RESOURCES:

1. Narayana, K.L. and Kannaiah, P. Text Book of Engineering Drawing"Engineering Graphics", Scitech Publication
2. Bhatt, N.D. "Elementary Engineering Drawing", Charotar Book Stall, Anand, 1998
3. Lakshminarayanan, V. and VaishWanar, R.S., "Engineering Graphics", Jain Brothers, New Delhi, 1998
4. Chandra, A.M. and Chandra Satish, "Engineering Graphics", Narosa, 1998
5. Jolhe, "Engineering Graphics", Tata McGraw-Hill- WBUT Series
6. Gill, P.S., "A Text Book of Engineering Drawing", Katson Publishing House (Kataria and Sons)
7. Venugopal, K., "Engineering Drawing & Graphics + AutoCAD", New Age International
8. Ventaka Reddy K., "Text Book of Engineering Drawing (2nd Edition)", BS Publication.

Course Title: Physics I	**Code: BSPH 201**
Type Of Course: Theory	**Course Designation: Compulsory**
Semester: 2nd	**Contact Hours: 3L/week**
Continuous Assessment: 25 Marks **Attendance : 5 Marks**	**Final Exam: 70 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: Fundamental knowledge on Physics at 10+2 level

Course Objective (COb's) of Physics I:

BSPH201: COb1: Be able to solve various kinds of problems related to Mechanics,
BSPH201:COb2: Be able to solve different kinds of problems related to physical optics and LASER system
BSPH201:COb3: Be able to construct problems related to di electric and magnetic properties.
BSPH201:COb4: Be able to apply EM theory by using Maxwell's equations
BSPH201:COb5: Be able to analyze important aspects of Wave-Particle Duality in quantum mechanics
BSPH201:Cob6: Be able to derive of MB, BE and FD statistical distribution to engineering problem

Course Outcome (CO's) of Physics I:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
BS-PH101.CO1	Apply basic concepts of mechanics	**K3:** Applying
BS-PH101.CO2	Discuss Physical optics andinterpretprinciples of lasers with applications	**K2:** Understanding
BS-PH101.CO3	Categorize dielectric and magnetic properties of materials leading to Electromagnetic laws	**K4:** Analyzing
BS-PH101.CO4	Differentiate between Classical Physics and Quantum Physics by introducing Planck's law	**K4:** Analyzing
BS-PH101.CO5	Evaluate simple quantum mechanicalproblems	**K5: E**valuating
BS-PH101.CO6	Discriminateclassical and Quantum statistical mechanics	**K4:** Analyzing

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO2	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO3	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO4	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO5	**1**	**3**	**2**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO6	**-**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
AVG	**1.8**	**2.3**	**1.8**	**1.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.00**	**-**	**-**

University Syllabus:

Module	Content	Hrs/Unit
Module 1 Mechanics	Mechanics: Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function F = -grad V, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.	06
Module 2 Optics & Laser System	Optics:Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max;min, & intensity and qualitative discussion of fringes); diffraction grating(resolution formulac only), characteristics of diffration grating and its applications. Polarisation: Introduction, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity. Lasers: Principles and working of laser: population inversion, pumping, various modes, and threshold population inversion with examples.	08
Module 3 Electromagnetism and Dielectric Magnetic Properties of Materials	Electromagnetism and Dielectric Magnetic Properties of Materials: Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar dielecrrics, internal fields in a solid, Clausius-Mossottiequation(expression only), applications of dielectrics. Magnetisation, permeability and susceptibility, classificationof magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications	08
Module 4	Quantum Mechanics: Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.	10
Module 5 Statistical Mechanics	Statistical Mechanics: Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics	04

RESOURCES:

Text Books:

T1.Principles of Physics, 10ed, David Halliday, Robert ResnickJearlWalker , Wiley
T2.An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
T3.Textbook of Physical Optics, B. Ghosh, Laxmi Publications
T4.Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
T5.Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley

Reference Books:

R1.Classical mechanics, Narayan Rana, PramodJoag, McGraw Hill Education
R2. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
R3.Optics, Ghatak, McGraw Hill Education India Private Limited
R4.Concepts of Modern Physics, A. Beiser,McGraw Hill Education; Seventh edition
R5.Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors

Course Title: Mathematics II B	**Code: BSM 202**
Type Of Course: Theory	**Course Designation: Compulsory**
Semester: 2ND	**Contact Hours:4L/week**
Continuous Assessment: 25 Marks **Attendance : 5 Marks**	**Final Exam: 70 Marks**
Writer: Course Coordinator	**Approved by HoD**

Pre-requisites: Knowledge from BSM 102

Course Objective (COb's) of Mathematics II B

BSM 202:COb1: Be able to apply the concept and techniques of double and triple integrals to determine**Ar**eas, volumes, center of mass, surface areas, flux.

BSM 202:COb2: Be able to understand the applications of exact differential equations and Bernoulli's **Equations.**

BSM 202:COb3: Be ableto find out the particular integrals using D-operator.

BSM 202:COb4: Be able to understand the application of variation of parameters, Bessel functions and **L**egendre polynomials.

BSM 202:COb5: Be able to evaluate Harmonic conjugates and to understand the applications of Conformal maps, Mobius transformations.

BSM 202:COb6: Be able to learn the application of casuchytheorem,residues theorems and liouvell's theorems.

Course Outcome (CO's) of Mathematics II B

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
BSM 202:CO1	Learn basic Mathematical tools to deal with problems with engineering science.	**K3:**Applying
BSM 202: CO2	Learn the method for evaluatingmultiple integrals and their application to different physical problems	**K3:**Applying
BSM 202:CO3	Understand different tecgniques to solve first and second order ordinary differential equations with it's formulation to address the modelling of systems and problems of engineering science.	**K4:**Analyzing
BSM 202:CO4	Learn different tools of differentiation and integration of functions of complex variables that are used with various othe techniques for solving engineering problems	**K4:**Analyzing
BSM 202:CO5	Apply different types of transformations between 2-dimensional planes for analysis of physical and engineering problems.	**K3: Applying**
BSM 202:CO6	Learn the difference between real analysis and complex analysis.	**K4: Analyzing**

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	--	--	--	--	--	--	--	--	3	2	--
CO2	3	3	3	3	--	--	--	--	--	--	--	--	2	1	--
CO3	3	3	2	2	-	--	--	--	--	--	--	--	2	1	--
CO4	3	2	2	1	-	--	--	--	--	2	1	1	2	2	1
CO5	2	2	2	1	-	--	--	--	--	2	2	1	` 1	-	1
CO6	3	3	2	1	-	--	--	1	--	2	2	1	2	1	1
AVG	2.833	2.6667	2.33	1.8333	-	--	--	1.00	--	2	1.66	1.00	2	1.4	1.00

University Syllabus:

Module	Content	Hrs/Unit
1.Multivariate calculas (Integration)	Double integration(Cartesian),change of order of integration in double integral[2L] Change of variable (Cartesian to polar)[1L] Areas and volume,Center of mass and gravity(constant and variable density)[2L] Triple integrals(Cartesian) ,Orthogonal curve linear coordiantes,simple application involving cubes,sphere,rectangular parallelepipeds[2L] Scaler line integrals,vector line integrals[2L] Scaler surface integrals,vector surface integrals,Green'stheorem,Gauss and stokes theorems[2L]	11
2.First order differential equation	Exact, linear and Bernoulli's equation [2L] Equation not of first degree,equation solvable for P,Solvable for y,solvable for x[2L] Claurits equations[1L]	5
3.Ordinary differential equation of higher orders.	Second order linear differential equation with constant coefficients[1L] Use of D –operator,second order linear differential equation with variable coefficients[2L] Method of variation of parameter,Cauchy –Euler equation[2L] Power series solution ,Legendre polynomials[2l] Bessel function of the first kind and their properties[2L]	9
4.Complex variables – Differentiation.	Differentiation of complex function,Cauchy –Riemann equations[2L] Analytic function,Harmonicfunctions,determination of Harmonic conjugate[2L] Elementary analytic function and their properties,Conformal mappings[1L] Mobius transformation and their properties.[1L]	6
5.Complex variables-Integrations.	Contour integrals,Cauchy –Goursat theorem(without proof),Cauchy integral formulae(without proof)[2L] Liouville's theorem and maximum modulastheorem(without proof)[2L] Taylor series,zeros of an analytic functions,singularities[1L] Laurent series,Residues,Cauchy Residues theorem(without proof),evaluation of definite integrals invoving sine and cosine[2L] Evaluation of certain improper integrals using the Bromwich contour[2L]	9

GATE syllabus mapping:

GATE syllabus content	Mapping unit of university syllabus
First order equations(linear and non linear),higher order linear differential equations,Cauchy and euler'sequations,complementaryfunctions,particular integrals.	Module2,3
Method of solution using variation of parameter,partial differential equation, variable separable method,initial and boundary value priblems.	Module 3
Analytic functions,Cauchy integral theorem,Cauchy integral formulae.	Module 4,5
Taylor and Laurent series, Residue theorem.	Module 5

RESOURCES:

1. ReenaGarg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers. 2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning
6 .Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.
7. E. L. Ince, Ordinary Differential Equations, Dover Publications.
8. J. W. Brown and R. V. Churchill, Complex Variables and Applications, Mc-GrawHill.

Course Title: Programming for Problem Solving	**Code: ES-CS 201**
Type of Course: Theory	**Course Designation: Compulsory**
Semester: 2nd	**Contact Hours: 3L/week**
Continuous Assessment: 25 Marks **Attendance : 5 Marks**	**Final Exam: 70 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: NA

Course Objective:

1.Be able to formulate algorithms for problems.

2. Be able to translate the algorithms to C programs.

Course Outcomes of ES CS201:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
ES CS 201:CO1	To formulate algorithms for problems.	Analyze (K4)
ES CS 201:CO2	To translate the algorithms to programs (in C language).	Translate (K2)
ES CS 201:CO3	To learn correct syntax of logical expression, branch instruction, iteration,	Understand(K2)
ES CS 201:CO4	To learn the use of array, pointer.	Apply (K3)
ES CS 201:CO5	To learn the use of function, recursion.	Understand (K2)
ES CS 201:CO6	Enhance analytical skill.	Build (K6)

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO11	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
CO2	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
CO3	2	2	2	2	-	-	-	-	-	-	-	2	2	2	3
CO4	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
CO5	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
CO6	2	2	2	2	-	-	-	-	-	-	-	2	2	2	3
AVG	2	2	2	2	0	0	0	0	0	0	0	2	2	2	2.3333

University Syllabus:

Unit	Content	Hours
1	Introduction to Programming Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) . Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical	4
2	Arithmetic expressions and precedence	2
3	Conditional Branching and Loops Writing and evaluation of conditionals and consequent branching Iteration and loops	12
4	Arrays Arrays (1-D, 2-D), Character arrays and Strings	6
5	Basic Algorithms Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)	6
6	Function Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference	5
7	Recursion Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	4
8	Structure Structures, Defining structures and Array of Structures	4
9	Pointers Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)	2
10	File handling (only if time is available, otherwise should be done as part of the lab)	2

RESOURCES:

1.R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Course Title: English	**Code: HM-HU201**
Type of Course: Theory	**Course Designation: Compulsory**
Semester: 2nd	**Contact Hours: 2L/week**
Continuous Assessment: 25 Marks **Attendance : 5 Marks**	**Final Exam: 70 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: NA

Course Objective:

By the end of the course, students will be able to acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Course Outcomes of HM-HU201:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
HMHU201:CO1	**Comprehend** word formation process in English and apply them to build vocabulary	**K2:**Understanding
HMHU201:CO2	**Apply** Rules of English Grammar Skill for Writing correctly	**K3:**Applying
HMHU201:CO3	**Apply** Rules of English Grammar Skill for Speaking correctly	**K3:**Applying
HMHU201:CO4	**Identify, analyze and avoid** common errors in English	**K4:**Analyzing
HMHU201:CO5	**Apply** LSRW Skills for Business English Communication	**K3:**Applying
HMHU201:CO6	**Demonstrate** English Language Skill for Technical Writing	**K2:**Understanding

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO11	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	1	2	1	1	2	3	1	2	-	1	1
CO2	-	2	1	2	1	2	2	2	2	3	1	2	1	3	2
CO3	-	2	1	2	1	2	2	2	2	3	1	2	1	3	1
CO4	1	3	2	2	1	1	1	1	2	3	-	1	-	2	1
CO5	2	2	2	2	1	3	2	3	3	3	1	2	-	3	3
CO6	1	2	1	2	1	2	2	2	2	3	1	1	1	3	1
AVG	1.25	2.17	1.33	1.83	1	2	1.67	1.83	2.17	3	1	1.67	1.00	2.50	1.50

University Syllabus:

Module	**Content**	**Hrs/Unit**
Module 1: **Vocabulary Building**	The concept of Word Formation: Compounding, Backformation, Clipping, Blending; Root words from foreign languages and their use in English; Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives; Synonyms, antonyms, and standard abbreviations: Acronyms	06
Module 2: **Basic Writing Skills**	Sentence Structures & Types: Simple, Compound, Complex; Use of phrases and clauses in sentences: Transformation of sentences, active, passive, narration; Importance of proper punctuation; Creating coherence: Arranging paragraphs & Sentences in logical order; Creating Cohesion: Organizing principles of paragraphs in documents; Techniques for writing precisely	08
Module 3: **Identifying Common Errors in Writing**	Subject-verb agreement; Noun-pronoun agreement; Misplaced modifiers; Articles; Prepositions; Redundancies; Clichés	06
Module 4: **Nature and Style of sensible Writing**	Describing; Defining; Classifying; Providing examples or evidence; Writing introduction and conclusion]	04
Module 5: **Writing Practices**	Comprehension; Précis Writing; Essay Writing; Business Letter, Cover Letter & CV; E-mail	10

RESOURCES:

1. Kulbushan Kumar, R S Salaria. *Effective Communication Skills*, Khanna Publishing House, Delhi.
2. Michael Swan. *Practical English Usage*. OUP. 1995.

3. F.T. Wood. *Remedial English Grammar*. Macmillan.2007

4. William Zinsser. *On Writing Well.* Harper Resource Book. 2001

5. Liz Hamp-Lyons and Ben Heasly. *Study Writing.* Cambridge University Press. 2006.

6. Sanjay Kumar and PushpLata. *Communication Skills.* Oxford University Press. 2011.

7. *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press

8. Prof. Prasad. *Universal English.*Kataria Publications, 2019.

9. NiraKonar. *Communication Skills for Professionals.* Prentice Hall of India 2nd edition, New Delhi, 2011

10. Gajendra Singh Chauhan, SmitaKashiramka and L. Thimmesha. *Functional English.* Cengage, 2019.

11. Laurie Bauer. *English Word-Formation.* Cambridge University Press.

12. Timothy J. Fitikides. *Common Mistakes in English.* Pearson Education Ltd

Course Title: Physics I	**Code: BSPH 291**
Type Of Course: Laboratory	**Course Designation: Compulsory**
Semester: 2nd	**Contact Hours: 3L/week**
Continuous Assessment: 40 Marks	**Final Exam: 60 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: Fundamental knowledge on Experimental Physics at 10+2 level

Course Objective (COb's) of Physics I:

BSPH291: COb1: Be able to understand the measurement procedure for different types of vernier scales
BSPH291:COb2: Be able to solve different kinds of problems related to electrical circuitry
BSPH291:COb3: Be able to understand the general properties of matter
BSPH291:COb4: Be able to visualize optical spectra using multiple optical tools
BSPH291:COb5: Be able to understand basics of semi-conductor physics
BSPH291:COb6: Be able to evaluate different quantum physical parameters

Course Outcome (CO's) of Physics I:

On completion of the course students will be able to

CO Number	CO statement	Action Verb	Knowledge level
BS-PH291.CO1	Observe and read data in slide calliper's, screw gauge. Calculate different modulus of elasticity to apply basic knowledge Physics of Elasticity and apply viscosity principle of streamline motion of water to calculate its viscosity coefficient required in fluid mechanics	Examine	K1
BS-PH291.CO2	Arrange sequential connection in electrical experiment to verify principles of Kirchhoff's law to verify passive elements of electrical circuit	Design	K6
BS-PH291.CO3	Operate optical instruments to illustrate physical properties of light and to observe spectral lines of light to verify medium specific characteristics. Calculate Rydberg constant by studying Hydrogen spectrum to visualize visible spectra and to assess this empirical fitting parameter as a fundamental physical constant	Analyze	K4
BS-PH291.CO4	Determine Band Gap and Hall coefficient of a given intrinsic semiconductor and distinguish between different intrinsic semiconductors. Determine the dielectric constant of different capacitors to correlate their usage like insulator and limitation of their usage as a dielectric material.	Implement	K3

BS-PH291.CO5	Apply concepts of quantum mechanics to verify Bohr's atomic orbital theory	Design	K6
BS-PH291.CO6	Determine Planck's constant and Stefan's constant applying modern Physics	Analyze	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO11	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	-	-	-	-	-	-	-	-	2	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	2	3	1	-	-	-	-	-	-	-	-	2	-	-
CO5	-	2	1	3	-	-	-	-	-	-	-	-	2	-	-
CO6	-	3	1	2	-	-	-	-	-	-	-	-	2	-	-
AVG	1.67	2.5	1.8	1.5	0	0	0	0	0	0	0	0	2	0	0

List of experiments (As per university syllabus) :

Unit	Content	Hrs/Unit	Related COs
1	Determination of Young's Modulus of elasticity of the material of a bar by the method of Flexure, Determination of modulus of rigidity of the material of a rod by static method. Determination of rigidity modulus of the material of a wire by dynamic method 1/2.	3.0 Hrs	CO1
2	Determination of co-efficient of viscosity by Poiseuille's capillary flow method	3.0Hrs	CO1
3	Determination of wavelength of a monochromatic light by Newton's ring method Determination of wavelength of the given laser source by diffraction method.	3.0Hrs	CO3
4	Determination of dispersive power of the material of a given prism	3.0Hrs	CO6
5	Determination of resistivity of material of the wire & unknown resistance using Carey- Foster's Bridge. Determination of dielectric constant of a given dielectric material.	3.0Hrs	CO2
6	Determination of Stefan-Boltzmann constant using vacuum tube diode. Determination of Planck constant using photocell. Determination of Band gap of semiconductor by four probe method.	3.0Hrs	CO4, CO6

7	Determination of Rydberg constant by studying Hydrogen spectrum.	3.0Hrs	CO3
8	Verification of Bohr's atomic orbital theory by Franck - Hertz Experiment	3.0Hrs	CO5

RESOURCES:

Text Books:

T1. Practical Physics, Prof. B. Ghosh
R1. Lab manual
R2. Amrita vlab

Course Title: Programming for Problem Solving	**Code: ES-CS 291**
Type of Course: Practical	**Course Designation: Compulsory**
Semester: 2nd	**Contact Hours: 4P/week**
Continuous Assessment: 40 Marks	**Final Exam: 60 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Course Outcomes of ES CS291:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
ES CS 291:CO1	To Analyze the problem and formulate algorithms for them.	Analyze (K4)
ES CS 291:CO2	To translate the algorithms to programs (in C language).	Translate (K2)
ES CS 291:CO3	To understand the correct syntax of logical expression, branch instruction, iteration,	Understand (K2)
ES CS 291:CO4	Apply array and pointer to solve problem.	Apply (K3)
ES CS 291:CO5	To understand the use of function, recursion.	Understand (K2)
ES CS 291:CO6	Build analytical skill.	Build (K6)

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO11	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	-	-	-	2	2	1	2
CO2	2	2	2	2	-	-	-	-	-	-	-	2	2	1	2
CO3	2	2	2	2	-	-	-	-	-	-	-	2	2	1	3
CO4	2	2	2	2	-	-	-	-	-	-	-	2	2	1	2
CO5	2	2	2	2	-	-	-	-	-	-	-	2	2	1	2
CO6	2	2	2	2	-	-	-	-	-	-	-	2	2	1	3
AVG	2	2	2	2	0	0	0	0	0	0	0	2	2	1	2.3333

University Syllabus:

Unit	Content
1	Tutorial 1: Problem solving using computers: Lab1: Familiarization with programming environment
2	Tutorial 2: Variable types and type conversions:

	Lab 2: Simple computational problems using arithmetic expressions
3	Tutorial 3: Branching and logical expressions: Lab 3: Problems involving if-then-else structures
4	Tutorial 4: Loops, while and for loops: Lab 4: Iterative problems e.g., sum of series
5	Tutorial 5: 1D Arrays: searching, sorting: Lab 5: 1D Array manipulation
6	Tutorial 6: 2D arrays and Strings Lab 6: Matrix problems, String operations
7	Tutorial 7: Functions, call by value: Lab 7: Simple functions
8	Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration): Lab 8 and 9: Programming for solving Numerical methods problems
9	Tutorial 10: Recursion, structure of recursive calls Lab 10: Recursive functions
10	Tutorial 11: Pointers, structures and dynamic memory allocation Lab 11: Pointers and structures
11	Tutorial 12: File handling: Lab 12: File operations

Course Title: Workshop/Manufacturing Practices	**Code: ES ME 292**
Type Of Course: Practical	**Course Designation: Compulsory**
Semester: 2nd	**Contact Hours: 1L - 4P/week**
Continuous Assessment: 35 Marks **Attendance : 5 Marks**	**Final Exam: 60 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: Basic knowledge on Mathematics, physics

COURSE OBJECTIVE:

- Students will be able to manufacture components with their own hands.
- Accustomed with different manufacturing processes
- Able to make hardware (mechanical) part of their research work.

COURSE OUTCOMES (COs) of ES ME 292

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
CO1	Demonstrate the hand tools and machine tools used in workshops	Understanding (Level II)
CO2	Discuss the safety measures required to be taken while using the tools.	Understanding (Level II)
CO3	Select the appropriate machine tools required to manufacture an object of predetermined shape and size considering least wastage and cost.	Understanding (Level II)
CO4	Students will be able to fabricate components with their own hands.	Application (Level III)
CO5	Confident on practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes	Analysing (Level VI)
CO6	Assembling of different components, able to produce small devices for project or research purpose	Application (Level III)

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	1	-	1	-	-	1	-	-	-	-
CO3	1	-	-	-	-	1	-	1	1	-	2	-	-	-	-
CO4	1	-	-	-	-	-	2	-	2	1	1	-	-	1	-

CO5	1	-	-	-	-	-	2	-	2	1	1	1	-	-	-
CO6	1	-	-	-	-	-	2	-	2	1	2	1	-	1	-
AVG.	1	0	0	0	0	1	2	1	1.75	1	1.333	1	0	1	0

University Syllabus:

Unit	Content	Hrs/Unit
1	**Lectures & videos: Detailed contents:** 1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods 2. CNC machining, Additive manufacturing 3. Fitting operations & power tools 4. Electrical &Electronics 5. Carpentry 6. Plastic moulding, glass cutting 7. Metal casting 8. Welding (arc welding & gas welding), brazing	10

2	**Workshop Practice:** **Machine shop (8 hours)** Typical jobs that may be made in this practice module: To make a pin from a mild steel rod in a lathe. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine. Fitting shop (8 hours) Typical jobs that may be made in this practice module: To make a Gauge from MS plate. **Carpentry (8 hours)** Typical jobs that may be made in this practice module: To make wooden joints and/or a pattern or like. **Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs))** Typical jobs that may be made in this practice module: ARC WELDING (4 hours): To join two thick (approx 6mm) MS plates by manual metal arc welding. GAS WELDING (4 hours): To join two thin mild steel plates or sheets by gas welding. **Casting (8 hours)** Typical jobs that may be made in this practice module: One/ two green sand moulds to prepare, and a casting be demonstrated. Smithy (4 hours) Typical jobs that may be made in this practice module: A simple job of making a square rod from a round bar orlike. **Plastic moulding & Glass cutting (4 hours)** Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made. For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made. Electrical &**Electronics (8 hours) Familiarization with LT switchgear elements, making its sketches and noting down its specification.** Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable. Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point. Simple wiring exercise to be executed to understand the basic electrical circuit. Simple soldering exercises to be executed to understand the basic process of soldering. Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.	40

GATE syllabus (If applicable for GATE): **Not applicable**

RESOURCES:

- M.L.BegemanandB.H.Amstead,"ManufacturingProcess"JohnWiley,1968
- W.A.J.ChapmanandE.Arnold,"WorkshopTechnology"Vol.1,2&3
- B.S.Rghuwanshi, "WorkshopTechnology"Vol.1&2–DhanptRaiandSons.
- S.K.HajraChoudhury, "ElementsofWorkshopTechnology"MediaPromotersofPublishers
- Khanna,O.P."WorkshopTechnology"DhanpatRaiPublications
- S.Crawford"BasicEngineeringProcesses"Hodder&Stoughton

Course Title: Language Laboratory	**Code: HM-HU291**
Type of Course: Practical	**Course Designation: Compulsory**
Semester: 2nd	**Contact Hours: 2P/week**
Practical Continuous Assessment: 25 Marks **Attendance : 5 Marks**	**Final Exam: 100 Marks**
Writer: Course Coordinator	**Approved by HoD (Convenor of DAB)**

Pre-requisites: NA

Course Objective:

Students will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Course Outcomesof HM-HU291:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
HMHU291:CO1	**Develop** personality and self-confidence	**K6:**Creating
HMHU291:CO2	**Hone** active listening skill	**K3:**Applying
HMHU291:CO3	**Apply** English Language Skill for Responding Verbally & Nonverbally	**K3:**Applying
HMHU291:CO4	**Apply** Rules of English Grammar Skill for Writing correctly	**K3:**Applying
HMHU291:CO5	**Demonstrate** LSRW skills while communicating	**K2:**Understanding
HMHU291:CO6	**Develop** industry-ready attitude towards professional communication	**K6:**Creating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	-	2	2	2	3	3	-	2	1	1	1
CO2	-	1	-	-	2	1	1	1	2	3	1	2	1	3	2
CO3	1	1	1	1		1	1	1	2	3	1	2	1	1	1
CO4	2	1	2	1	1	2	1	2	2	3	1	2	2	2	3
CO5	2	2	2	2	1	3	2	3	3	3	1	2		3	3
CO6	2	3	2	2	2	2	2	2	2	3	2	2	1	3	1
AVG	1.8	1.6666667	1.8	1.4	1.5	1.833	1.5	1.833	2.333	3	1.2	2	1.20	2.17	1.83

University Syllabus:

Module	Content	Hrs/Unit
Module 1	Honing 'Listening Skill' and its sub skills through Language Lab Audio device	03

Module 2	Honing 'Speaking Skill' and its sub skills	02
Module 3	Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/ Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech	02
Module 4	Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone &Role Play Mode)	02
Module 5	Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success	02
Module 6	G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies &other soft skills) of GD	04
Module 7	Honing 'Reading Skills' and its sub skills using Visual / Graphics/ Diagrams /Chart Display/Technical/Non Technical Passages Learning Global / Contextual / Inferential Comprehension	02
Module 8	Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions	02

RESOURCES:

1. Kulbushan Kumar, R S Salaria. *Effective Communication Skills*, Khanna Publishing House, Delhi.
2. Michael Swan. *Practical English Usage*. OUP. 1995.
3. F.T. Wood. *Remedial English Grammar*. Macmillan.2007
4. William Zinsser. *On Writing Well.* Harper Resource Book. 2001
5. Liz Hamp-Lyons and Ben Heasly. *Study Writing.* Cambridge University Press. 2006.
6. Sanjay Kumar and PushpLata. *Communication Skills.* Oxford University Press. 2011.
7. *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press
8. Prof. Prasad. *Universal English*.Kataria Publications, 2019.
9. NiraKonar. *Communication Skills for Professionals.* Prentice Hall of India 2nd edition, New Delhi, 2011
10. Gajendra Singh Chauhan, SmitaKashiramka and L. Thimmesha. *Functional English.* Cengage, 2019.
11. Laurie Bauer. *English Word-Formation.* Cambridge University Press.
12. Timothy J. Fitikides. *Common Mistakes in English.* Pearson Education Ltd.
13. Meenakshi Raman, Sangeeta Sharma. *Technical Communication: Principles and Practice.* Oxford University Press.