



Departmental Curriculum Structure

Department of BS & HU mainly deal with the Curriculum on B. Tech. 1st year subjects. The curriculum structure as below:

1st Semester

First Year First Semester							
Mandatory Induction Program- 3 weeks duration							
Sl No.	Category	Subject Code	Subject Name	Total No. of contact hours			Credits
				L	T	P	
Theory							
1	Basic Science course	BS-PH101/ BS-CH101	Physics-I (Gr-A)/ Chemistry-I(Gr-B)	3	1	0	4
2	Basic Science course	BS-M101/ BS-M102	Mathematics –IA*/ Mathematics –IB *	3	1	0	4
3	Engineering Science	ES-EE101	Basic Electrical Engineering	3	1	0	4
<i>Total Theory</i>				9	3	0	12
Practical							
1	Basic Science course	BS-PH191/ BS-CH191	Physics-I Laboratory (Gr-A)/ Chemistry-I Laboratory (Gr-B)	0	0	3	1.5
2	Engineering Science	ES-EE191	Basic Electrical Engineering	0	0	2	1
3	Engineering Science	ES-ME191/ ES-ME192	Engineering Graphics & Design(Gr-B)/ Workshop/Manufacturing Practices(Gr-A)	1	0	4	3
<i>Total Practical</i>				1	0	9	5.5
Total of First Semester				10	3	9	17.5

* Mathematics –IA (BS-M101) - CSE & IT
 Mathematics –IB (BS-M102) - All stream except CSE & IT

**Group division:****Group-A:**

Chemistry based subjects: [Bio-Technology, Food Technology, Leather Technology, Textile Technology, Ceramic Technology, Chemical Engineering and any other Engineering that chooses to be Chemistry based] + Physics based subjects: [Mechanical Engineering, Production Engineering, Civil Engineering, Automobile Engineering, Marine Engineering, Apparel Production Engineering, Computer Science & Engineering, Information Technology.]

Group-B:

All Physics based subjects which are also Electrical & Electronics based [Electrical Engineering, Electronics & Communication Engineering, Applied Electronics & Instrumentation Engineering, Power Engineering, Electrical & Electronics Engineering, Bio- Medical Engineering, Instrumentation & Control Engineering]

2nd Semester

First Year Second Semester							
Sl No.	Category	Subject Code	Subject Name	Total No. of contact hours			Credits
				L	T	P	
Theory							
1	Basic Science course	BS-PH201/ BS-CH201	Physics-I (Gr-B)/ Chemistry-I (Gr-A)	3	1	0	4
2	Basic Science course	BS-M201/ BS-M202	Mathematics –IIA#/ Mathematics –IIB #	3	1	0	4
3	Engineering Science	ES-CS201	Programing for Problem Solving	3	0	0	3
4	Humanities and Social	HM-HU201	English	2	0	0	2
<i>Total Theory</i>				11	2	0	13
Practical							
1	Basic Science course	BS-PH291/ BS-CH291	Physics-I Laboratory (Gr-B)/ Chemistry-I Laboratory (Gr-A)	00	0	3	1.5
2	Engineering Science	ES-CS291	Programing for Problem Solving	00	0	4	2



SurTech

Department of Basic Science and Humanities

JIS GROUP
Educational Initiatives

First Year Second Semester							
Sl No.	Category	Subject Code	Subject Name	Total No. of contact hours			Credits
				L	T	P	
3	Engineering Science	ES-ME291/ ES-ME292	Engineering Graphics & Design(Gr-A)/ Workshop/Manufacturing Practices(Gr-B)	11	0	4	3
4	Humanities and Social	HM-HU291	Language Laboratory	0	0	2	1
<i>Total Practical</i>				1	0	13	7.5
Total of Second Semester				12	2	13	20.5

Mathematics –II (BS-M201) - CSE & IT

Mathematics –II (BS-M202) - All stream except CSE & IT

	Group-A	Group-B
1st Year 1st Semester	Physics-I (BS-PH101); Workshop/Manufacturing Practices (ES-ME192)	Chemistry-I (BS-CH101); Engineering Graphics & Design (ES-ME191)
1 st Year 2nd Semester	Chemistry-I (BS-CH201); Engineering Graphics & Design (ES-ME291)	Physics-I (BS-PH201); Workshop/Manufacturing Practices (ES-ME292)

Syllabus & Course Outcomes

1st Semester

BS-CH101: Chemistry-I

Course Code : BS-CH101**Course Title** : Chemistry-I**L-T-P** : 3-1-0**Category** : Basic Science Courses**Semester** : First**Credit** : 4**Stream** : B. Tech. (For EE and ECE).**Full Marks** : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH101.CO 1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and list major chemical reactions that are used in the synthesis of molecules
BS-CH101.CO 2	Rationalise bulk properties and processes using thermodynamic considerations
BS-CH101.CO 3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
BS-CH101.CO 4	Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.

CO-PO Mapping

Co & PO Mapping BS-CH101 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	3	2	3	2	1	2	1	1	2	2
CO2	3	3	3	2	3	3	-	1	1	-	-	3
CO3	3	3	3	3	2	2	2	1	2	3	3	1
CO4	3	3	3	3	1	3	1	-	1	-	1	1
Average	2.75	3	3	2.5	1.5	2.25	1.33	1.33	1.25	2.0	2.0	1.75

Syllabus

Unit I: Atomic and molecular structure

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.

Unit II: 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 characterisation techniques. Diffraction and scattering

Unit III: Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Unit IV: Use of free energy in chemical equilibria

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.

Unit V: 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

Unit VI: 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

Unit VII: 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.

Books

Learning Resources:

- Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
- Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- Physical Chemistry, by P. W. Atkins
- Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
- Physical Chemistry, P. C. Rakshit, Sarat Book House
- Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

BS-PH101: Physics

Course Code : BS-PH101

Course Title : Physics-I

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : First

Credit : 4

Stream : B. Tech. (All branches except EE and ECE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-PH101.CO1	Learn basic concepts of quantum physics, simple quantum mechanics calculations; Macrostate, Microstate, Density of states, Qualitative treatment of MB, FD and BE statistics.



BS-PH101.CO2	Solve problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Harmonic oscillator. Damped harmonic motion forced oscillations and Resonance. Motion of a rigid body.
BS-PH101.CO3	Learn the application of wave properties of light Interference, Diffraction and Polarization; Lasers: Principles and working of laser
BS-PH101.CO4	Learn Maxwell's equations. Polarization, Dielectrics; Magnetization, magnetic-hysteresis.

CO-PO Mapping

CO-PO Mapping BS-PH101 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	2	-	-	2	1	2
CO2	3	3	3	2	2	1	2	-	-	2	1	2
CO3	3	3	3	3	2	1	2	-	-	2	1	2
CO4	3	3	3	2	2	1	2	-	-	2	1	2

Syllabus

UNIT 1. Mechanics

Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function $F = -\text{grad } V$, 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.

UNIT 2. 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 formulae only), characteristics of diffraction grating and its applications.

Polarization: Introduction, polarization by reflection, polarization by double reflection, scattering of light, circular and elliptical polarization, optical activity.

Lasers: Principles and working of laser – population inversion, pumping, various modes, threshold population inversion with examples

UNIT 3. Electromagnetism and Dielectric Magnetic Properties of Materials

Maxwell's equations, Polarization, permeability and dielectric constant, polar and non-polar Dielectrics, internal fields in a solid, Clausius-Mossotti equation (expression only), applications of dielectrics.

Magnetization: permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

UNIT 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.

UNIT 5. Statistical Mechanics

Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

BOOKS

Learning Resources:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley
3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola, Cengage India
8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill
10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley



SurTech

Department of Basic Science and Humanities



13. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
14. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
15. Optics , Hecht, Pearson Education
16. Optics, Ghatak, McGraw Hill Education India Private Limited
17. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
18. Statistical Mechanics , Pathria , Elsevier
19. Statistical Physics, L.D.Landau , E.M. Lifshitz, Butterworth-Heinemann

BS-M101: Mathematics - IA

- Course Code** : BS-M101
Course Title : Mathematics - IA
L-T-P : 3-1-0
Category : Basic Science Courses
Semester : First
Credit : 4
Stream : B. Tech. (For CSE).
Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 101.CO 1	Apply the concept and techniques to differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
BS-M 101.CO 2	Understand the domain of applications of mean value theorems to engineering problems.
BS-M 101.CO 3	Learn different types of matrices, concept of rank, methods of matrix inversion and their applications.
BS-M 101.CO 4	Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science.
BS-M 101.CO 5	Learn and apply the concept of Eigen values, Eigen vectors, Diagonalization of matrices and Orthogonalization in inner product spaces for understanding physical and engineering problems.

CO-PO Mapping



	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	1	1	1	-	2	-	2	2
CO2	3	3	2	1	2	2	2	-	1	-	-	1
CO3	3	3	2	2	2	2	2	-	2	-	2	2
CO4	3	3	2	2	3	2	2	-	-	-	1	2
CO5	3	3	3	2	1	1	-	-	-	-	2	1
Average	3	3	2.4	1.8	1.8	1.6	1.75		1.67		1.75	1.6

Syllabus

Syllabus

Module 1: Calculus (Integration) [8L]

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus (Differentiation) [6L]

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3: Matrices [7L]

Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Module 4: Vector Spaces [9L]

Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.

Module 5: Vector Spaces (Continued) [10L]

Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Books

Learning Resources:

1. Reena Garg, Engineering Mathematics-I, 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.



SurTech

Department of Basic Science and Humanities



6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.
7. S.K. Mapa, Higher Algebra: Abstract and Linear, Sarat Book House Pvt.Ltd.
8. Hoffman and Kunze: Linear algebra, PHI.

BS-M102: Mathematics - IB

Course Code : BS-M102
Course Title : Mathematics - IB
L-T-P : 3-1-0
Category : Basic Science Courses
Semester : First
Credit : 4
Stream : B. Tech. (For Except CSE).
Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 102.CO 1	Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
BS-M 102.CO 2	Understand the domain of applications of mean value theorems to engineering problems.
BS-M 102.CO 3	Learn the tools of power series and Fourier series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
BS-M 102.CO 4	Apply the knowledge for addressing the real life problems which comprise of several variables or attributes and identify extremum points of different surfaces of higher dimensions.
BS-M 102.CO 5	Learn and apply the concept of rank-nullity, eigen values, eigen vectors, diagonalization and orthogonalization of matrices for understanding physical and engineering problems.

CO PO Mapping



CO & PO Mapping BS-M102 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	2	2	2	-	-	1	2	2
CO2	3	3	2	2	2	2	-	-	2	-	1	2
CO3	3	3	3	2	2	-	2	-	2	1	-	1
CO4	3	3	2	2	3	2	-	-	-	-	2	2
CO5	3	3	2	2	2	2	1	-	1	1	2	1
Average	3	3	2.4	2	2.2	2	1.67	-	1.67	1	1.75	1.6

Syllabus (BS-M102)

Syllabus

Module 1: Calculus (Integration) [8L]

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus (Differentiation) [6L]

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3: Sequence and Series [11L]

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's theorem.

Module 4: Multivariate Calculus [9L]

Limit, continuity and partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.

Module 5: Matrices [8L]

Inverse and rank of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and Eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Books



SurTech

Department of Basic Science and Humanities



Learning Resources:

1. Reena Garg, Engineering Mathematics-I, 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, New Delhi.

ES-EE101: Basic Electrical Engineering

Course Code : ES-EE101

Course Title : Basic electrical engineering

L-T-P : 3-1-0

Category : Engineering Science Courses

Semester : First

Credit : 4

Stream : B. Tech.

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

Course outcome codes	Statement
ES-EE-101.1	To describe fundamentals of DC and AC circuits
ES-EE-101.2	To explain the operating principle of transformer
ES-EE-101.3	To illustrate construction, working of Electrical Machines
ES-EE-101.4	To classify different power converters and installation process

CO-PO Mapping



Co & PO Mapping ES-EE101 to PO attainment

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ESEE-101.1	3	2	2	2	2	2	1	-	2	2	2	3	2	2
ESEE-101.2	3	2	2	2	2	2	1	-	2	2	2	3	2	2
ESEE-101.3	3	2	2	2	2	2	1	-	2	2	2	3	2	2
ESEE-101.4	3	2	2	2	2	2	1	-	2	2	2	3	2	2
Average	3	2	2	2	2	2	1	-	2	2	2	3	2	2

Syllabus (ES-EE101)

Module 1: DC Circuits

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.

Module 2: AC Circuits

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.

Module 3: Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4: Electrical Machines

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.

Module 5: Power Converters

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Module 6: Electrical Installations



SurTech

Department of Basic Science and Humanities



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.

Books

1. Ritu Sahdev, 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.
5. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
6. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

BS-CH191: Chemistry-I Lab

Course Code : BS-CH191

Course Title : Chemistry-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : First/ Second

Credit : 1.5

Stream : B. Tech. (For EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH191.CO 1	Analyse sample by apply instruments like viscometer, pH-meter, Conductometer, Potentiometer <i>etc</i> to achieve high accuracy.
BS-CH191.CO 2	Analyse inorganic salts by semi-micro techniques
BS-CH191.CO 3	Analyse quantitative chemicals present in different samples

CO-PO Mapping

Co & PO Mapping BS-CH191 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	3	3	2	2	-	3	2	1	1
CO2	1	3	3	3	-	1	2	-	3	2	2	2
CO3	3	3	3	3	3	2	1	1	2	2	2	2
Average	2.3	3	2.6	3	3	1.6	1.6	1	2.6	2	1.6	1.6

Syllabus

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 viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

N.B.: Choose 10 experiments from the above 15

Books



- Advance Practical Chemistry by Subhas C Das, Sarat Book House
- A test book of Macro and Semimicro qualitative Inorganic Analysis by I. Vogel

BS-PH191: Physics Laboratory

Course Code : BS-PH191

Course Title : Physics-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : First

Credit : 1.5

Stream : B. Tech. (All branches except EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-PH191.CO1	Ability to increase power of observation and reasoning and to think and work with precision and accuracy in daily life. Use Slide callipers and screw gauge, familiar with concept of Band gap of semiconductor and dielectric constant
BS-PH191.CO2	Get the opportunity to verify the validity of various laws taught in curriculum, Familiar with dispersive power of the material of a prism, Newton's ring, Planck constant
BS-PH191.CO3	Familiar with Hall coefficient of a semiconductor Electron spin resonance spectrometer, Young's modulus, Poiseulle's capillary flow method for viscosity measurement.

CO-PO Mapping

CO–PO Mapping BS-PH191 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	1	2	-	-	2	1	2
CO2	3	3	3	3	3	1	2	-	-	2	1	2
CO3	3	3	3	3	3	1	2	-	-	2	1	2

Syllabus

Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton's ring
3. Determination of wavelength of a monochromatic light by Fresnel's bi-prism
4. Determination of wavelength of the given laser source by diffraction method

Electricity & Magnetism experiments

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
3. Determination of dielectric constant of a given dielectric material.
4. Determination of Hall coefficient of a semiconductor by four probe method.
5. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge
8. Study of Transient Response in LR, RC and LCR circuits using expeyes
9. Generating sound from electrical energy using expeyes

Experiments in Quantum Physics

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.



6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Miscellaneous experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method
5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseuille's capillary flow method

ES-EE191: Basic Electrical Engineering

Course Code : ES-EE191

Course Title : Basic Electrical Engineering Laboratory

L-T-P : 0-0-2

Category : Engineering Science Courses

Semester : First

Credit : 1

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

ESEE191.1	Demonstrate the characteristics of carbon, tungsten & florescent lamps.
ESEE191.2	Verify the different electrical parameters obtained using network theorems.
ESEE191.3	Experiment on R-L-C series & parallel circuits

CO-PO Mapping

Co & PO Mapping ES-EE191 to PO attainment



SUBJECT CODE	COs	PROGRAM OUTCOMES(POs)											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ESEE 191	ESEE 191.1	3	2	2	2	2	2	1	-	2	2	2	3
	ESEE 191.2	3	2	2	2	2	2	1	-	2	2	2	3
	ESEE 191.3	3	2	2	2	2	2	1	-	2	2	2	3
	AVE RAG E	3	2	2	2	2	2	1	-	2	2	2	3

Syllabus (ES-EE191)

Name of the Experiment Performed:

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

ES-ME191: Engineering Graphics & Design

Course Code : ES-ME191

Course Title : Engineering Graphics & Design

L-T-P : 1-0-4

Category : Engineering Science Courses

Semester : First

Credit : 3

Stream : B. Tech.

Full Marks : 100 (60 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
-----	--



CO2	Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine
CO4	Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

CO-PO-Mapping

Co & PO Mapping ES-ME191 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	1	2	1	1	1	-	1	-	-	1
CO2	3	-	2	2	-	1	-	-	1	1	1	1
CO3	2	2	2	1	-	1	1	1	1	-	-	1
CO4	1	-	2	2	2	1	-	-	1	1	1	1

Syllabus (BS-M101)

INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.

LETTERING, DIMENSIONING, SCALES

Plain scale, Diagonal scale and Vernier Scales.

GEOMETRICAL CONSTRUCTION AND CURVES

Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedean Spiral.

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.

PROJECTION OF REGULAR SOLIDS

Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).

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.



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;

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)

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;

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, Computer aided 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. 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)



1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of CAD Software Theory and User Manuals

ES-ME191: Workshop/ Manufacturing

Course Code : ES-ME192

Course Title : Workshop/ Manufacturing Practices

L-T-P : 1-0-4

Category : Engineering Science Courses

Semester : First

Credit : 3

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
CO2	Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.
CO3	Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
CO4	Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

CO-PO Mapping

Co & PO Mapping ES-ME191 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	2	-	1	3	-	1	1
CO2	2	2	1	1	1	1	1	2	1	1	-	-
CO3	2	-	2	-	-	1	-	1	1	1	1	2
CO4	1	1	1	2	1	3	1	3	2	-	-	1

Syllabus (BS-M101)

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

(ii) Workshop Practice:

Machine shop

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

Typical jobs that may be made in this practice module: To make a Gauge from MS plate.



Carpentry

Typical jobs that may be made in this practice module:

To make wooden joints and/or a pattern or like.

Welding shop

Typical jobs that may be made in this practice module:

ARC WELDING To join two thick (approx 6mm) MS plates by manual metal arc welding.

GAS WELDING: To join two thin mild steel plates or sheets by gas welding

Casting

Typical jobs that may be made in this practice module:

One/ two green sand moulds to prepare, and a casting be demonstrated.

Smithy

Typical jobs that may be made in this practice module:

A simple job of making a square rod from a round bar or like.

Plastic moulding & Glass cutting

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

Familiarization with LT switch gear 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.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.



SurTech

Department of Basic Science and Humanities



Books

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology – I” Pearson Education, 2008.

2st Semester

BS-CH201: Chemistry-I

Course Name: Chemistry-I

Course Code : BS-CH201

Course Title : Chemistry-I

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : 2nd

Credit : 4

Stream : B. Tech. (Other than EE and ECE).

Full Marks = 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH201.CO 1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and list major chemical reactions that are used in the synthesis of molecules
BS-CH201.CO 2	Rationalise bulk properties and processes using thermodynamic considerations
BS-CH201.CO 3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
BS-CH201.CO 4	Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.

CO-PO Mapping

Co & PO Mapping BS-CH201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	3	2	3	2	1	2	1	1	2	2
CO2	3	3	3	2	3	3	-	1	1	-	-	3



CO3	3	3	3	3	2	2	2	1	2	3	3	1
CO4	3	3	3	3	1	3	1	-	1	-	1	1
Average	2.75	3	3	2.5	1.5	2.25	1.33	1.33	1.25	2.0	2.0	1.75

Syllabus

Unit I: Atomic and molecular structure

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. 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.

Unit II: 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 characterisation techniques. Diffraction and scattering

Unit III: Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Unit IV: Use of free energy in chemical equilibria

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.

Unit V: 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

Unit VI: Stereochemistry



SurTech

Department of Basic Science and Humanities



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

Unit VII: 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.

Books

Learning Resources:

- ❖ Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
- ❖ Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- ❖ Physical Chemistry, by P. W. Atkins
- ❖ Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
- ❖ Physical Chemistry, P. C. Rakshit, Sarat Book House

Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

BS-PH101: Physics

Course Code : BS-PH201

Course Title : Physics-I

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : 2nd

Credit : 4

Stream : B. Tech. (All branches except EE and ECE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-PH201.CO1	Learn basic concepts of quantum physics, simple quantum mechanics calculations; Macrostate, Microstate, Density of states, Qualitative treatment of MB, FD and BE statistics.



BS-PH201.CO2	Solve problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Harmonic oscillator. Damped harmonic motion forced oscillations and Resonance. Motion of a rigid body.
BS-PH201.CO3	Learn the application of wave properties of light Interference, Diffraction and Polarization; Lasers: Principles and working of laser
BS-PH201.CO4	Learn Maxwell's equations. Polarization, Dielectrics; Magnetization, magnetic-hysteresis.

CO-PO Mapping

CO-PO Mapping BS-PH201 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	2	-	-	2	1	2
CO2	3	3	3	2	2	1	2	-	-	2	1	2
CO3	3	3	3	3	2	1	2	-	-	2	1	2
CO4	3	3	3	2	2	1	2	-	-	2	1	2

Syllabus

UNIT 1. Mechanics

Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function $F = -\text{grad } V$, 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.

UNIT 2. 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 formulae only), characteristics of diffraction grating and its applications.

Polarization: Introduction, polarization by reflection, polarization by double reflection, scattering of light, circular and elliptical polarization, optical activity.

Lasers: Principles and working of laser – population inversion, pumping, various modes, threshold population inversion with examples

UNIT 3. Electromagnetism and Dielectric Magnetic Properties of Materials

Maxwell's equations, Polarization, permeability and dielectric constant, polar and non-polar Dielectrics, internal fields in a solid, Clausius-Mossotti equation (expression only), applications of dielectrics.

Magnetization: permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

UNIT 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.

UNIT 5. Statistical Mechanics

Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

Books

Learning Resources:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley
3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola, Cengage India
8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill
10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley



SurTech

Department of Basic Science and Humanities



13. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
14. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
15. Optics , Hecht, Pearson Education
16. Optics, Ghatak, McGraw Hill Education India Private Limited
17. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
18. Statistical Mechanics , Pathria , Elsevier
19. Statistical Physics, L.D.Landau , E.M. Lifshitz, Butterworth-Heinemann

BS-M201: Mathematics - IIA

Course Code : BS-M201

Course Title : Mathematics - IIA

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : First

Credit : 4

Stream : B. Tech. (For CSE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 201.CO 1	Learn the ideas of probability and random variables, calculate probabilities using conditional probability, rule of total probability and Bayes' theorem.
BS-M 201.CO 2	Illustrate the Various discrete and continuous probability distribution with their properties and their applications in physical and engineering environment.
BS-M 201.CO 3	Understand the basic ideas of statistics with different characterization of a univariate and bivariate data set.
BS-M 201.CO 4	Apply statistical tools for analyzing data samples and drawing inference on a given data set.

CO-PO Mapping

CO & PO Mapping BS-M201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	1	1	-	-	-	-	-	2
CO2	3	3	2	1	2	2	2	-	2	-	1	2
CO3	3	3	1	2	2	-	1	-	2	-	2	1
CO4	3	3	2	2	3	2	-	-	-	-	1	2
Average	3	3	2.67	2.33	2.67	1.67	1.5	-	2	-	1.33	1.75

Syllabus (BS-M201)

Syllabus

Module 1: Basic Probability [11L]

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the Multinomial distribution, Poisson approximation to the Binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Module 2: Continuous Probability Distributions [4L]

Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities.

Module 3: Bivariate Distributions [5L]

Bivariate distributions and their properties, distribution of sums and quotients, Conditional densities, Bayes' rule.

Module 4: Basic Statistics [8L]

Measures of Central tendency, Moments, Skewness and Kurtosis, Probability distributions: Binomial, Poisson and Normal and evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Module 5: Applied Statistics [8L]

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Module 6: Small samples [4L]

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Books

Learning Resources:

1. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. S. Ross, A First Course in Probability, Pearson Education India
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
5. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill.

BS-M202: Mathematics - IIB

Course Code : BS-M202
Course Title : Mathematics - IIB
L-T-P : 3-1-0
Category : Basic Science Courses
Semester : 2nd
Credit : 4
Stream : B. Tech. (For Except CSE).
Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 202.CO 1	Learn the methods for evaluating multiple integrals and their applications to different physical problems.
BS-M 202.CO 2	Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences.
BS-M 202.CO 3	Learn different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.



BS-M 202.CO 4	Apply different types of transformations between two 2-dimensional planes for analysis of physical or engineering problems.
---------------	---

CO-PO Mapping

CO & PO Mapping BS-M202 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	2	2	2	-	-	1	2	2
CO2	3	3	2	2	2	2	-	-	2	-	1	2
CO3	3	3	1	1	2	-	2	-	2	1	-	1
CO4	3	3	2	2	3	2	-	-	-	-	2	2
Average	3	3	2	1.75	2.25	2	2	-	2	1	1.67	1.75

Syllabus (BS-M202)

Syllabus

Module 1: Multivariate Calculus (Integration) [11L]

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, change of variables (Cartesian to Polar), Applications: Areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Module 2: First order ordinary differential equations [5L]

Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 3: Ordinary differential equations of higher orders [9L]

Second order linear differential equations with constant coefficients, Use of D - operators, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 4: Complex Variable – Differentiation [6L]

Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties.

Module 5: Complex Variable – Integration [9L]

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, Zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Evaluation



SurTech

Department of Basic Science and Humanities



of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Books

Learning Resources:

1. Reena Garg, 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

BS-M202: Mathematics - IIB

Course Code : BS-M202

Course Title : Mathematics - IIB

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : 2nd

Credit : 4

Stream : B. Tech. (For Except CSE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 202.CO 1	Learn the methods for evaluating multiple integrals and their applications to different physical problems.
BS-M 202.CO 2	Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences.



BS-M 202.CO 3	Learn different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.
BS-M 202.CO 4	Apply different types of transformations between two 2-dimensional planes for analysis of physical or engineering problems.

CO-PO Mapping

CO & PO Mapping BS-M202 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	2	2	2	-	-	1	2	2
CO2	3	3	2	2	2	2	-	-	2	-	1	2
CO3	3	3	1	1	2	-	2	-	2	1	-	1
CO4	3	3	2	2	3	2	-	-	-	-	2	2
Average	3	3	2	1.75	2.25	2	2	-	2	1	1.67	1.75

Syllabus (BS-M202)

Syllabus

Module 1: Multivariate Calculus (Integration) [11L]

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, change of variables (Cartesian to Polar), Applications: Areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Module 2: First order ordinary differential equations [5L]

Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 3: Ordinary differential equations of higher orders [9L]

Second order linear differential equations with constant coefficients, Use of D - operators, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 4: Complex Variable – Differentiation [6L]

Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties.

Module 5: Complex Variable – Integration [9L]

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, Zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Evaluation



SurTech

Department of Basic Science and Humanities



of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Books

Learning Resources:

1. Reena Garg, 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

HMHU 201: ENGLISH

- Course Code** : HMHU201
Course Title : English
L-T-P : 2-0-0
Category : Humanities and Social Sciences including Management courses
Semester : Second
Credit : 2
Stream : B. Tech. (ALL).
Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

Student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
HMHU201.CO 1	Revise the basic grammar of English language.
HMHU 201.CO 2	Learn appropriate use of English language to enhance knowledge on building vocabulary and framing sentences.
HMHU 201.CO 3	Learn and incorporate sensible style in Technical writing.
HMHU201.CO 4	Acquire proficiency in English language for comprehensive excellence in reading, listening, writing and speaking.

CO-PO Mapping

Co & PO Mapping HMHU201 to PO attainment



SurTech

Department of Basic Science and Humanities



JIS GROUP
Educational Initiatives

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	2	-	-	-	-	-	-	1	3	-	2
CO2	-	2	-	1	-	1	-	-	2	3	-	2
CO3	-	2	-	1	-	1	1	2	1	3	-	2
CO4	-	2	-	1	-	1	1	1	2	3	1	2
Average	-	2	-	1	-	1	1	1.5	1.5	3	1	2

Syllabus (HMHU201)

Syllabus

MODULE I

Vocabulary Building 1.1

The concept of Word Formation: Compounding, Backformation, Clipping, Blending. 1.2 Root words from foreign languages and their use in English 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. 1.4 Synonyms, antonyms, and standard abbreviations: Acronyms

MODULE II

2. Basic Writing Skills 2.1 Sentence Structures & Types: Simple, Compound, Complex 2.2 Use of phrases and clauses in sentences: Transformation of sentences, active, passive, narration 2.3 Importance of proper punctuation 2.4 Creating coherence: Arranging paragraphs & Sentences in logical order 2.5 Creating Cohesion: Organizing principles of paragraphs in documents 2.6 Techniques for writing precisely

MODULE III

3. Identifying Common Errors in Writing 3.1 Subject-verb agreement 3.2 Noun-pronoun agreement 3.3 Misplaced modifiers 3.4 Articles 3.5 Prepositions 3.6 Redundancies 3.7 Clichés

MODULE IV

4. Nature and Style of sensible Writing 4.1 Describing 4.2 Defining 4.3 Classifying 4.4 Providing examples or evidence 4.5 Writing introduction and conclusion

MODULE V

5. Writing Practices 5.1 Comprehension 5.2 Précis Writing 5.3 Essay Writing 5.4 Business Letter, Cover Letter & CV; E-mail

Books

Learning Resources:

(i) Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.



- (ii) Practical English Usage. Michael Swan. OUP. 1995.
- (iii) Remedial English Grammar. F.T. Wood. Macmillan.2007
- (iv) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (v) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (vi) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- (vii) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- (viii) Universal English Prof. Prasad Kataria Publications, 2019.
- (ix) "Communication Skills for Professionals"-NiraKonar, Prentice Hall of India 2nd edition, NewDelhi,2011.
- (x) Gajendra Singh Chauhan, SmitaKashiramka and L. Thimmesha. Functional English. Cengage, 2019.

ES-CS201: Programming for Problem Solving

Course Code : ES-CS201

Course Title : Programming for Problem Solving

L-T-P : 3-0-0

Category : Engineering Science Courses

Semester : 2nd

Credit : 3

Stream : B. Tech.

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

Course Name	COs	CO Statement
Basic Computation & Principles of Computer Programmin g (CS 201)	CS 201.1	Students will be able to <i>describe</i> the meaning of system of numbers, logic gates and the basic anatomy of a Computer.
	CS 201.2	Students will be able to <i>understand</i> the inherent meaning of the basic elements of C Programming Language like; constants, variables, operators, operator precedence etc., and <i>identify</i> the use of data types and C statements and <i>classify</i> the statements.
	CS 201.3	Students will be able to <i>organize</i> the statements in appropriate order to <i>prepare</i> a complete program that <i>solves</i> a specific problem and <i>analyze</i> a program to <i>point out</i> the bugs that might be present in it and change it to achieve the goal.
	CS 201.4	Students will be able to <i>construct</i> the final program and <i>create</i> the executable module for execution purpose.

CO-PO Mapping

Co & PO Mapping ES- CS 201 to PO attainment



Basic Computation & Principles of Computer Programming(CS201)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS 201.1	—	—	3	2	1	—	2	3	1	—	2	2
CS 201.2	1	3	2	2	—	2	—	3	2	3	2	2
CS 201.3	3	2	1	2	—	2	3	2	2	2	2	3
CS 201.4	3	2	3	3	2	2	2	1	2	2	3	—
Average	2.33	2.33	2.25	2.25	1.5	2.00	2.33	2.25	2.33	2.33	2.25	2.33

Syllabus (BS-M101)

Unit 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 Errors in compilation, object and executable code-

Unit 2: Arithmetic expressions and precedence

Unit 3: Conditional Branching and Loops

Writing and evaluation of conditionals and consequent branching

Unit 4: Arrays

Arrays (1-D, 2-D), Character arrays and Strings

Unit 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)

Unit 6: Function

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Books

Learning 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
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India



SurTech

Department of Basic Science and Humanities



BS-PH291:Physics-I Lab

Course Code : BS-PH291

Course Title : Physics-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : Second

Credit : 1.5

Stream : B. Tech. (EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-PH291.CO1	Ability to increase power of observation and reasoning and to think and work with precision and accuracy in daily life. Use Slide callipers and screw gauge, familiar with concept of Band gap of semiconductor and dielectric constant
BS-PH291.CO2	Get the opportunity to verify the validity of various laws taught in curriculum, Familiar with dispersive power of the material of a prism, Newton's ring, Planck constant
BS-PH291.CO3	Familiar with Hall coefficient of a semiconductor Electron spin resonance spectrometer, Young's modulus, Poiseuille's capillary flow method for viscosity measurement.

CO-PO Mapping

CO-PO Mapping BS-PH291 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	1	2	-	-	2	1	2
CO2	3	3	3	3	3	1	2	-	-	2	1	2
CO3	3	3	3	3	3	1	2	-	-	2	1	2



Syllabus

Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton's ring
3. Determination of wavelength of a monochromatic light by Fresnel's bi-prism
4. Determination of wavelength of the given laser source by diffraction method

Electricity & Magnetism experiments

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
3. Determination of dielectric constant of a given dielectric material.
4. Determination of Hall coefficient of a semiconductor by four probe method.
5. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge
8. Study of Transient Response in LR, RC and LCR circuits using expeyes
9. Generating sound from electrical energy using expeyes

Experiments in Quantum Physics

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.
6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Miscellaneous experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method



SurTech

Department of Basic Science and Humanities



5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseuille's capillary flow method

BS-CH291: Chemistry-I Lab

Course Code : BS-CH291

Course Title : Chemistry-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : Second

Credit : 1.5

Stream : B. Tech. (Other than EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH291.CO 1	Analyse sample by apply instruments like viscometer, pH-meter, Conductometer, Potentiometer <i>etc</i> to achieve high accuracy.
BS-CH291.CO 2	Analyse inorganic salts by semi-micro techniques
BS-CH291.CO 3	Analyse quantitative chemicals present in different samples

CO-PO Mapping

Co & PO Mapping BS-CH291 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	3	3	2	2	-	3	2	1	1
CO2	1	3	3	3	-	1	2	-	3	2	2	2
CO3	3	3	3	3	3	2	1	1	2	2	2	2
Average	2.3	3	2.6	3	3	1.6	1.6	1	2.6	2	1.6	1.6



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 viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

N.B.: Choose 10 experiments from the above 15

Books

- Advance Practical Chemistry by Subhas C Das, Sarat Book House
- A test book of Macro and Semimicro qualitative Inorganic Analysis by I. Vogel



SurTech

Department of Basic Science and Humanities



HMHU 291: ENGLISH

Course Code : HMHU291
Course Title : English
L-T-P : 0-0-2
Category : Humanities and Social Sciences including Management courses
Semester : Second
Credit : 1
Stream : B. Tech. (ALL).
Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

Student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
HMHU291.CO 1	Get introduced to professional application of English Language with emphasis on listening and speaking skills through language lab aids.
HMHU 291.CO 2	Practice sessions on pronunciation, intonation, voice modulation, stress, pitch and accent and developing communicative skills with special focus on Group Discussion.
HMHU 291.CO 3	Master effective reading and writing style through Language Lab aids.
HMHU291.CO 4	Ensure proficiency in reading, listening comprehension, technical writing and in speaking.

CO-PO Mapping

Co & PO Mapping HMHU291 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	1	-	-	-	2	3	-	2
CO2	-	2	-	1	-	1	-	1	3	3	-	2
CO3	-	2	-	1	1	1	1	1	2	3	-	2
CO4	-	2	-	1	1	1	1	1	3	3	-	2
Average	-	2	-	1	1	1	1	1	2.5	3	-	2



Syllabus (HMHU291)

Syllabus

- 1) Honing 'Listening Skill' and its sub skills through Language Lab Audio device; 3P
- 2) Honing 'Speaking Skill' and its sub skills 2P
- 3) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/ Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech 2P
- 4) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone &Role Play Mode) 2P
- 5) Introducing 'Group Discussion' through audio –Visual input and acquainting themwith key strategies for success 2P
- 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 4P
- 7) Honing 'Reading Skills' and its sub skills using Visual / Graphics/ Diagrams /Chart Display/Technical/Non Technical Passages Learning Global / Contextual / Inferential Comprehension; 2P8)
Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions

ES-ME291: Engineering Graphics & Design

Course Code : ES-ME291

Course Title : Engineering Graphics & Design

L-T-P : 1-0-4

Category : Engineering Science Courses

Semester : First

Credit : 3

Stream : B. Tech.

Full Marks : 100 (60 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
CO2	Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine
CO4	Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

Co & PO Mapping ES-ME291 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	1	2	1	1	1	-	1	-	-	1
CO2	3	-	2	2	-	1	-	-	1	1	1	1
CO3	2	2	2	1	-	1	1	1	1	-	-	1
CO4	1	-	2	2	2	1	-	-	1	1	1	1

Syllabus (ES-ME291)

INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.

LETTERING, DIMENSIONING, SCALES

Plain scale, Diagonal scale and Vernier Scales.

GEOMETRICAL CONSTRUCTION AND CURVES

Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedian Spiral.

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.

PROJECTION OF REGULAR SOLIDS

Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).

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.

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;

SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids -



SurTech

Department of Basic Science and Humanities



Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

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;

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, Computer aided 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. 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)

Books

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of CAD Software Theory and User Manuals



ES-ME291: Workshop/ Manufacturing

Course Code : ES-ME292

Course Title : Workshop/ Manufacturing Practices

L-T-P : 1-0-4

Category : Engineering Science Courses

Semester : 2nd

Credit : 3

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
CO2	Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.
CO3	Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
CO4	Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

CO-PO Mapping

Co & PO Mapping ES-ME291 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	2	-	1	3	-	1	1
CO2	2	2	1	1	1	1	1	2	1	1	-	-
CO3	2	-	2	-	-	1	-	1	1	1	1	2
CO4	1	1	1	2	1	3	1	3	2	-	-	1



Syllabus (ES-ME291)

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

(ii) Workshop Practice:

Machine shop

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

Typical jobs that may be made in this practice module: To make a Gauge from MS plate.

Carpentry

Typical jobs that may be made in this practice module: To make wooden joints and/or a pattern or like.

Welding shop

Typical jobs that may be made in this practice module: ARC WELDING

To join two thick (approx 6mm) MS plates by manual metal arc welding. GAS WELDING: To join two thin mild steel plates or sheets by gas welding

Casting

Typical jobs that may be made in this practice module: One/ two green sand moulds to prepare, and a casting be demonstrated.

Smithy

Typical jobs that may be made in this practice module: A simple job of making a square rod from a round bar or like.

Plastic moulding & Glass cutting

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



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.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

ES-CS291: Programming for Problem Solving

Course Code : ES-CS291

Course Title : Programming for Problem Solving

L-T-P : 0-0-4

Category : Engineering Science Courses

Semester : 2nd

Credit : 2

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

Course Name	COs	CO Statement
Basic Computation & Principles of Computer Programming(Lab) (CS291P)	CS 291.1	Students will be able to <i>define</i> the specifications like input and output relating to a particular problem and <i>describe</i> the algorithm that <i>solves</i> the problem.
	CS 291.2	Students will be able to <i>construct</i> each of the modules of a program by <i>restating</i> the steps of the algorithm using functions in the framework of C language.
	CS 291.3	Students will be able to <i>create</i> the program by using the functions and execute the program.
	CS 291.4	Students will be able to <i>point out</i> the bugs if any, and modify the program to <i>solve</i> the problem.

CO-PO Mapping

Co & PO Mapping ES- CS 291 to PO attainment

Basic Computation & Principles of Computer Programming (CS291)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS 291.1	3	3	2	2	2	3	-	-	-	-	2	2
CS 291.2	2	2	-	2		2	2	2		1	2	2
CS 291.3	2	2	2	3	1	3	2	3	1	1	3	2
CS 291.4	1	1	-	1	1	2	-	1	1	1	1	2
Average	2	2	2	2	1.33	2.5	2	2	1	1	2	2

Syllabus (ES-CS291)

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations