Scheme & Syllabus for B.Tech. (1st Year) according to Choice Based Credit System (CBCS)

(Semester-I and Semester-II)

For all branches
For Session 2018-19 onwards
(3rd batch onward)

School of Engineering & Technology

CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH-123031
HARYANA

Central University of Haryana, Mahendergarh

B.Tech. 1ST YEAR (SEMESTER – I) (Common for all branches)

S. No.	Course Code	Course Title	Teaching Schedule L	T	P	Marks of Class work	Examination Marks Theory	Practical	Total Marks	Credits	Duration of Exam.
1	BT HUM 101A	ENGLISH LANGUAGE SKILLS (Gr.-A)	2	0	0	30	70	0	100	2	3
2		MATHEMATICS-I	3	1		30	70	0	100	4	3
3	BT CH 102A	PHYSICS (Gr.-A) OR CHEMISTRY (Gr.-B)	3	1		30	70	0	100	4	3
4	BT EE 103A	BASIC ELECTRICAL ENGINEERING (Gr.-A)	3	1		30	70	0	100	4	3
	BT CSE104A	OR PROGRAMMING FOR PROBLEM SOLVING (Gr.-B)	3	0		30	70	0	100	3	
5	BT ME 105A BT ME106A	ENGINEERING GRAPHICS & DESIGN (Gr.-A) OR WORKSHOP/ MANUFACTURING PRACTICES (Gr.-B)	1	0	4	30	0	70	100	3	3
6	BT HUM107A	ENGLISH LANGUAGE LAB (Gr.-A)	0	0	2	30	0	70	100	1	3
7	BT CH108A	PHYSICS LAB (Gr.-A) OR CHEMISTRY LAB (Gr.-B)	0	0	3	30		70	100	1.5	3
8	BT EE 109A	BASIC ELECTRICAL ENGINEERING LAB(Gr.-A)/ OR	0	0	2	30		70	100	1	3
	BT CSE 110A	PROGRAMMING FOR PROBLEM SOLVING LAB (Gr.-B)	0	0	4	30		70	100	2	
Total		**Gr.-A**	**12**	**3**	**10**	**240**	**280**	**280**	**800**	**20.5**	
		Gr.-B	**10**	**2**	**10**	**180**	**210**	**210**	**600**	**17.5**	

MATHEMATICS AND PHYSICS COURSES FOR DIFFERENT BRANCHES

COURSE CODE	COURSE TITLE
MATHEMATICS –I	
BT MAT 111A	MATHEMATICS –I (For computer Science &Engg)
BT MAT 112A	MATHEMATICS –I (common for all branches except CSE)
PHYSICS and PHYSICS LAB (Any One Combination)	
BT PHY 113A BT PHY 114A	MECHANICS MECHANICS LAB (For CE)
BT PHY115A BT PHY116A	WAVES, OPTICS AND QUANTUM MECHANICS WAVES, OPTICS AND QUANTUM MECHANICS LAB (For EE&PPT)
BT PHY117A BT PHY118A	SEMICONDUCTOR PHYSICS SEMICONDUCTOR PHYSICS LAB (For CSE)

Note:

1   Every student has to participate in the MANDATORY INDUCTION PROGRAM OF THREE WEEKS DURATION at the start of regular teaching of first semester. It comprises of physical activity, creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept/ Branch & Innovations.

2   All the branches are to be divided into groups 'A' and 'B' as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.

For CUH, Mahendergarh: GROUP (Gr.) -A: CSE, CE.   GROUP (Gr.)-B: EE, PPT.

Central University of Haryana, Mahendergarh

B.Tech. 1ST YEAR (SEMESTER – I) (Common for all branches)

S. No.	Course Code	Course Title	Teaching Schedule L	T	P	Marks of Class work	Examination Marks Theory	Practical	Total Marks	Credits	Duration of Exam.
1	BT HUM 101A	ENGLISH LANGUAGE SKILLS (Gr.-B)	2	0	0	30	70	0	100	2	3
2		MATHEMATICS-II	3	1		30	70	0	100	4	3
3	BT CH102A	PHYSICS (Gr.-B) OR CHEMISTRY (Gr.-A)	3	1		30	70	0	100	4	3
4	BT EE 103A	BASIC ELECTRICAL ENGINEERING (Gr.-B)	3	1		30	70	0	100	4	3
	BT CSE104A	OR PROGRAMMING FOR PROBLEM SOLVING (Gr.-A)	3	0		30	70	0	100	3	
5	BT ME 105A BT ME 106A	ENGINEERING GRAPHICS & DESIGN (Gr.-B) OR WORKSHOP/ MANUFACTURING PRACTICES (Gr.-A)	1	0	4	30	0	70	100	3	3
6	BT HUM 107A	ENGLISH LANGUAGE LAB (Gr.-B)	0	0	2	30	0	70	100	1	3
7	BT CH 108A	PHYSICS LAB (Gr.-B) OR CHEMISTRY LAB (Gr.-A)	0	0	3	30		70	100	1.5	3
8	BT EE109A BT CSE 110A	BASIC ELECTRICAL ENGINEERING LAB Gr.-B) OR PROGRAMMING FOR PROBLEM SOLVING LAB (Gr.-A)	0 0	0 0	2 4	30 30		70 70	100 100	1 2	3
	Total Gr.-B Gr.-A		12 10	3 2	10 10	240 180	280 210	280 210	800 600	20.5 17.5	

MATHEMATICS AND PHYSICS COURSES FOR DIFFERENT BRANCHES

COURSE CODE	COURSE TITLE
MATHEMATICS –II	
BT MAT 119A	MATHEMATICS –II (For computer Science &Engg)
BT MAT120A	MATHEMATICS –II (common for all branches except CSE)
PHYSICS and PHYSICS LAB (Any One Combination)	
BT PHY 113A BT PHY 114A	MECHANICS MECHANICS LAB (For CE)
BT PHY 115A BT PHY 116A	WAVES, OPTICS AND QUANTUM MECHANICS WAVES ,OPTICS AND QUANTUM MECHANICS LAB (For EE&PPT)
BT PHY 117A BT PHY 118A	SEMICONDUCTOR PHYSICS SEMICONDUCTOR PHYSICS LAB (For CSE)

Note:
1. All the branches are to be divided into groups 'A' and 'B' as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.
2. For CUH, Mahendergarh: GROUP (Gr.)-A: CSE, CE.   GROUP (Gr.)-B: EE, PPT.

B. Tech. (Semester – I) Physics
(For Group-A at CUH, Mahendergarh)

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam.
			L	T	P		Theory	Practical			
BT PHY 117A	CSE	Semiconductor Physics	3	1	-	30	70	-	100	4	3
BT PHY 113A	CE	Mechanics	3	1	-	30	70	-	100	4	3

B. Tech. (Semester – II) Physics

(For Group-B at CUH, Mahendergarh)

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam.
			L	T	P		Theory	Practical			
BT PHY 115A	EE & PPT	Waves, Optics & Quantum Mechanics	3	1	-	30	70	-	100	4	3

B. Tech. (Semester – I) Physics Lab

(For Group-A at CUH, Mahendergarh)

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
BT PHY 118A	CSE	Semiconductor Physics Lab	0	0	3	30	0	70	100	1.5	3
BT PHY 114A	CE	Mechanics Lab	0	0	3	30	-	70	100	1.5	3

B. Tech. (Semester – II) Physics Lab

(For Group-B at CUH, Mahendergarh)

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
BT PHY 116A	EE & PPT	Wave, Optics & Quantum Mechanics Lab	0	0	3	30	-	70	100	1.5	3

B.Tech. Semester I/II (Common for All Branches)

Course Title: English Language Skills

Course Code: **BT HUM 101A**

Category   :   Humanities

L	T	P	Credits			
2	**0**	**0**	**2**			

Class Work   :   **30 Marks**
Examination   :   **70 Marks**
Total   :   **100 Marks**
Duration of Examination   :   **3 Hours**

Course objectives:
1.   To equip students with English Language skills needed in academic and professional   world
2.   To make students technically proficient in handling language skills required for competitive exams.
3.   To inculcate human/ethical values in the students to ensure their holistic development
4.   To develop ability to critically read the literary texts

Course outcomes:

The students will be able to
1. Acquire basic proficiency in English
2. Develop their verbal ability
3. Enhance their writing, reading and analytical skills
4. Develop proficiency in reading along with sensitivity to the impact literary texts can have on their minds/lives

Course Contents:

Unit I: Basic Writing skills

(a) Subject Verb Agreement
(b) Noun Pronoun Agreement
(c) Governance of Nouns Through Prepositions
(d) Basic Verb Patterns (V, SV, SVO, SVOO,SVC,SVOC,SVOA)

Unit II: Vocabulary Building

(a) One word substitution *(List attached)*
(b) Phrasal Verbs* *(List attached)*
(b) Commonly used Idioms * *(List attached)*
(d) Words/Phrases/Idioms from the texts prescribed in Unit IV-- their meaning and use in sentences

Unit III: Creating Grammatical Cohesion

(a) Referring Time in Language(Tenses)
(b) Use of Conditional Sentences
(c) Use of Active and Passive Voice
(d) Synthesis of Sentences using Coordinating and Subordinating Conjunctions

Unit IV: Reading and Writing Practices

(a) Literary Texts:

i.   "The Secret of Work" by Swami Vivekananda**
ii.   " Public Transport in London and Delhi" by Nirad C. Chaudhuri #
iii. "An Outline of Intellectual Rubbish" by Bertrand Russell #
iv. "Mother Teresa" by Khushwant Singh #

(b) Writing official Letters- Issues Concerning Students' academic and social life
(c) Essay Writing
(d) Paragraph Writing

Recommended Readings:

1. *Bhatnagar, Nitin and Mamta Bhatnagar. *Communicative English for Engineers and Professionals.* Pearson Education, 2013.(The soft copy of the book is available in the university library)
2 . # Bhatnagar, k. Manmohan.Ed. *The Spectrum of Life: An Anthology of Modern Prose.* Delhi: Macmillan India Ltd., 2006.
3. Sinha, R.P.*Current English Grammar and Usage.* OUP, 2017.
4. Rizvi, M. Ashraf. *Effective Technical Communication.* McGraw Hill Education (India) Pvt. Ltd., 2014.
5. Eastwood, John. *Oxford Guide to English Grammar.* OUP, 2010.
6. Kumar, Sanjay and Pushp Lata. *Communication Skills.* OUP, 2011.
7. Raman, Meenakshi and Sangeeta Sharma.*Communication Skills.*New Delhi:OUP,2011.
8. Hill, L. A. *A Guide to Correct English.* London:OUP,1965.
9. *Oxford Dictionary of English Idioms.* New Delhi: OUP, 2009
10.**Vivekananda, Swami. *Karma Yoga.* New Delhi: Sahityashila Prakashan, 2015.
11.**http://yousigma.com/religionandphilosophy/swamivivekananda/thescecretofwork.pdf

Note:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks i.e. 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

Course Code: **BT MAT 111A**
Category: **Basic Science Course**
Course Title: **Mathematics-I**
B.Tech. (Computer Science & Engg.) Semester-I

L	T	P		Marks for External Exam.	: 70
3	1	0	(4 Credits)	Marks for Internal Exam.	: 30
				Total	: 100
				Duration of Exam.	: 3 Hours

Course Objectives:

1. To give adequate exposure of basics of Engineering Mathematics so as to enable them to visualize engineering problems by using Mathematical tools and to support their subsequent engineering studies.
2. To familiarize the students with techniques in basic calculus and linear algebra.
3. To equip the students with standard concepts and tools at an intermediate to advanced level.
4. To know the advanced level of mathematics and applications that they would find useful in their disciplines.
5. Students will demonstrate the ability to apply the techniques of multivariable Calculus to problems in mathematics, the physical sciences, and engineering.

Unit-I (12 Lectures)

Matrices 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.

Unit-II (12 Lectures)

Eigen values, Eigen vectors, Cayley Hamiltan Theorem symmetric, skew-symmetric, and orthogonal Matrices, Eigen space. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Unit-III (12 Lectures)

Taylor's and Maclaurin theorems with remainders; Maxima and minma of function of single independent variable.

Curvature & Asymptotes (Cartesian and polar form), 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.

Unit-IV (12 Lectures)

Vector space, linear dependence and independence 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.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Reference Books:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson Education.
2. D. Poole, Linear Algebra: A Modern Intaiduction, 2nd Edition, Brooks/Cole, 2005.
3. Veerarajan T., Engineering Mathematics for firstyear, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.

Course Outcomes:
1. The students will learn to apply differential and integral calculus to notions of curvature and to improper integrals.
2. They will have a basic understanding of Beta and Gamma functions.
3. They will understand essential tools of matrices and determinant to solve system of algebraic equation.
4. To know the basic concepts of linear algebra i.e., linear transformations, eigen values, diagonalization and orthogonalization to solve engineering problems.
5. Apply Taylor series to approximate functions and estimate the error of approximation

Note:

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B.Tech. Semester-I

(Common for all Branches except CSE)

Course Title: Mathematics-I

Course Code: BT MAT 112A

Category: Basic Science Course

L	T	P	Credits
3	1	--	4

Class Work	:	30 Marks
Examination	:	70 Marks
Total	:	100 Marks
Duration of Examination	:	3 Hours

Course objectives:
1. To familiarize the students with tools and techniques in calculus and analysis.
2. To equip the students with standard concepts towards tackling various applications that are useful in several disciplines.
3. To understand liner algebra concepts and their application in different fields of engineering.
4. To have the idea of vector calculus and its applications
5. To give adequate exposure of basics of Engineering Mathematics so as to enable them to visualize engineering problems by using Mathematical tools and to support their subsequent engineering studies.
6. To introduce to students the concept of convergence of sequences and series.
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Unit-I (12 Lectures)
Determinants; Inverse and rank of a matrix, System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigen vectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Matrix representation, Rank-nullity theorem of a Linear Transformation, Orthogonal transformation.

Unit –II (12 Lectures)
Convergence of sequence and series, tests for convergence of sequence and series ; Power series, Taylor's and Maclaurin series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit-III (12 Lectures)
Taylor's and Maclaurin theorems with remainders; (one variable).Asymptotes, Curvature ,Evolutes and involutes, Curve Tracing; 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.

Unit-IV (12 Lectures)
Function of several variables: Limit, continuity and partial derivatives, Total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers; Differentiation under Integral Sign., Vector Calculus: Gradient, Directional derivative, curl and divergence.

Text Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Reference Books:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson Education.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

Course outcomes:
1. The students will understand the basic properties of Determinants and matrices & apply these concepts in solving linear simultaneous equations.

2. They will learn the basic concepts regarding convergence of series.
3. The students will learn concepts of vector calculus and apply it in most of the branches of engineering.
4. They will be able to solve Eigen value problems and apply Cayley-Hamilton theorem.

Note:
1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks i.e. 14 marks each.

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B. Tech. (Semester – I/ II) Physics

Mechanics

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
BT PHY 113A	CE	Mechanics	3	1	0	30	70	0	100	4	3

Pre-requisites: (i) High-school education
Course Objectives:
1. To have basic understanding vector mechanics,
2. To study various frame of references.
3. To get aware about Harmonic motion,
4. To gain knowledge on rigid body mechanics.
5. To study solid body motion and different frictional forces.

Course outcomes
Students will be familiar with
1. Newton's Law
2. Frame of references
3. Harmonic motion
4. Rigid body and its mechanics
5. solid body motion and different frictional forces

Syllabus:

UNIT I

Vector Mechanics of Particles

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates.

UNIT II

Mechanics of Particles in Motion and Harmonic Motion

Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler problem; Application: Satellite manoeuvres;

Non-inertial frames of reference; Rotating coordinate system: Five-term acceleration formula. Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum;

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance.

UNIT III

Rigid Body Mechanics

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — only need to show that this motion looks two-dimensional but is three-dimensional, and two dimensional formulation fails.

UNIT IV
Statics of Solids

Free body diagrams with examples on modelling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases; Force displacement relationship; Geometric compatibility for small deformations; Illustrations through simple problems on axially loaded members like trusses.

Suggested Reference Books

(i) Engineering Mechanics, 2nd ed. — MK Harbola, Cengage Learning India publisher

(ii) Introduction to Mechanics — MK Verma, CRC Press

(iii) An Introduction to Mechanics — D Kleppner & R Kolenkow, University Printing House, Cambridge

(iv) Principles of Mechanics — JL Synge & BA Griffiths, McGraw-Hill

(v) Mechanics — JP Den Hartog, Dover Publication

(vi) Engineering Mechanics - Dynamics, 7th ed. - JL Meriam, Wiley Publisher

(vii) Mechanical Vibrations — JP Den Hartog, Dover Publication

(viii) Theory of Vibrations with Applications — WT Thomson, Pearson Publisher

Note:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

B. Tech. (Semester – I/ II)

Waves, Optics & Quantum Mechanics

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
BT PHY 115 A	EE &PPT	Waves, Optics & Quantum Mechanics	3	1	0	30	70	0	100	4	3

Course Objectives:
1. To have basic understanding of optics and its applications,
2. To study light propagation.
3. To get aware about wave optics and lasers,
4. To have basic knowledge about Quantum Mechanical phenomena's.
5. To gain knowledge on solids and semiconducting materials.

Course outcomes
Students will be familiar with
1. Wave motion
2. principles, types and applications of lasers
3. basic laws related to quantum mechanics
4. Simple quantum mechanics calculations
5. Various terms related to semiconducting properties of materials

Syllabus:

UNIT – I
Wave and Light Motion
Waves: Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator, forced mechanical and electrical oscillators, impedance, steady state motion of forced damped harmonic oscillator

Non-dispersive transverse and longitudinal waves: Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their Eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves.

Light and Optics: Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave.

UNIT – II
Wave Optics and Lasers

Wave Optics: Huygens' principle, superposition of waves and interference of light by wave-front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity.

UNIT – III

Introduction to Quantum Mechanics

Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle.

Solution of stationary-state Schrodinger equation for one dimensional problems–particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Scattering from a potential barrier and tunneling; related examples like alpha-decay, field-ionization and scanning tunneling microscope, tunneling in semiconductor structures.

UNIT – IV

Introduction to Solids and Semiconductors

Free electron theory of metals, Fermi level, density of states in 1, 2 and 3 dimensions, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.

Types of electronic materials: metals, semiconductors, and insulators. Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p -n junction.

References:

1. I. G. Main, "Vibrations and waves in physics", Cambridge University Press, 1993.

2. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.

3. E. Hecht, "Optics", Pearson Education, 2008.

4. A. Ghatak, "Optics", McGraw Hill Education, 2012.

5. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.

6. D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.

7. R. Robinett, "Quantum Mechanics", OUP Oxford, 2006.

8. D. McQuarrie, "Quantum Chemistry", University Science Books, 2007.

9. D. A. Neamen, "Semiconductor Physics and Devices", Times Mirror High Education Group, Chicago, 1997.

10. E.S. Yang, "Microelectronic Devices", McGraw Hill, Singapore, 1988.

11. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.

Note:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

B. Tech. (Semester – I/ II) Physics

Semiconductor Physics

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
BT PHY 117 A	CSE	Semiconductor Physics	3	1	0	30	70	0	100	4	3

Pre-requisite: "Introduction to Quantum Mechanics" Desirable

Course Objectives:
1. To give the detailed idea how the electronic bands are formed
2. To characterize materials based on band gap.
3. To provide the sound knowledge on semiconductor physics
4. To study light semiconductor interactions.
5. To know how the band gap and defects concentration can be find out.

Course Outcomes:
1. Able to differentiate how the band originated
2. Successfully differentiate the materials types based on their band gap values and use this knowledge as per their requirements.
3. Know about how the junctions are formed in PN diode and its theory.
4. Students have the idea of solar cell and it's working with advantages.
5. Successfully find the band gap, reflection and transmission percentage of a grown film over substrate with contents of defects.

Syllabus

UNIT - I
Electronic Materials
Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT - II
Semiconductors
Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

UNIT - III
Light-Semiconductor Interaction

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT - IV
Measurements & Engineered Semiconductor Materials

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-Vis spectroscopy, absorption/transmission.

Density of states in 2D, 1d and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Heterojunctions and associated band-diagrams

References:

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).

2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).

3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).

4. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).

5. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).

6. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL

7. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL.

Note:
1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

Course Title: Chemistry

Course Code: BT CH 102A

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
3	1	0	4			

Class Work	:	30 Marks
Examination	:	70 Marks
Total	:	100 Marks
Duration of Examination	:	3 Hours

Course Objectives:

1. To give students in-depth knowledge of Atomic and molecular structures.
2. To make students understand and analyse periodic properties and related concepts.
3. To give knowledge of Stereochemistry, Organic reactions and synthesis of a drug molecule.
4. To apprise students of Intermolecular forces and potential energy surfaces and use of free energy in chemical equilibria**.**

UNIT-I

 Atomic and molecular structure: Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations(derivation excluded). Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Molecular orbital energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene . Crystal field theory and the energy level diagrams for transition metal ions . Band structure of solids and the role of doping on band structures.

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.

UNIT-II

Stereochemistry: Representations of 3 dimensional structures, structural isomers and stereoisomers Configurations, symmetry chirality, enantiomers, diastereomers. Optical activity, absolute configurations and conformational analysis.
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 (Asprin/Paracetamol).

UNIT-III

Intermolecular forces and potential energy surfaces: Ionic, dipolar and van der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces (with example).

Use of free energy in chemical equilibria: 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 equilibria, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

UNIT-IV

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 and its applications. Nuclear magnetic resonance and magnetic resonance imaging,surface characterisation techniques. Diffraction and scattering.

Suggested Text Books:

(i) University Chemistry by Bruce M. Mahan, 4th Edition, Pearson Education.

(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

(iii)Fundamentals of Molecular Spectroscopy, by C. N. Banwell

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

Krishnan

(v) Physical Chemistry, by P. W. Atkins

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

(vii) Organic chemistry, by R.T Morrison, R.N Boyd, 7th Edition, Pearson Education.

Course Outcomes

1. The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Students will be able to understand these concepts upto advanced level
2. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, students will be able to understand the description of all chemical processes at molecular levels.
3. The course will enable the student to: Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. Rationalise bulk properties and processes using thermodynamic considerations.

4. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and lectronegativity.

Notes:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

3. A specific note shall be inserted in relevant question paper where ever the use of graph papers, semi-log papers, steam tables,etc.shall be allowed during the examination.

Course Title: BASIC ELECTRICAL ENGINEERING
Course Code: BT EE 103A

B. Tech. Semester – I/II (Common for all Branches except Chemical Engineering)

L	T	P	Credits		Class Work	:	30 Marks
3	1	0	4		Examination	:	70 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

Course Objectives:

1. To analyze dc and ac circuits.

2 To design and analyze RLC networks.

3. To appreciate basic knowledge of electric machines.

4. To assimilate elementary knowledge of electric installations.

UNIT-1

D.C. Circuits & Theorems: Basics of electric circuit elements, Kirchhoff's laws & its applications including those based on dependent sources, Nodal and Loop methods of Analysis, Star-Delta and delta-star transformations. Network Theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum Power transfer theorem. **(11 Hours)**

UNIT-2

Single A.C. Circuits: Sinusoidal signal, instantaneous & peak values, average and RMS values, form factor, peak factor. Concept of Phasors: Rectangular & Polar, Trigonometric & Exponential forms. Behaviour of R, L, C components in ac circuits. Time domain analysis of first-order RL and RC circuits. Series and parallel circuits: Active and reactive power, power factor, Resonance in series and parallel circuits. Q-factor, cut off frequencies and bandwidth. Three Phase Circuits: Phase and line voltages and currents, balanced star and delta circuits. **(11 Hours)**

UNIT-3

Electrical Machines: Construction, working principle, type, & equation of Single phase Transformer, Ideal Transformer, Phasor diagrams of Single-phase Transformer at no load and on load, Equivalent circuit, losses, efficiency. Three phase Transformer connections.single phase Autotransformer. Rotating Machines: Construction, operating principle of d.c. motors and its torque speed characteristics. Construction and working principle & type of single phase Induction motor & Three-phase Induction motor, concept of slip & torque-speed characteristics, construction and working of synchronous generators.**(11Hours)**

UNIT-4

Electrical and electronics components: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB(Miniature Circuit Breaker), ELCB(Earth Leakage Circuit Breaker), MCCB(Moulded Case Circuit Breaker), Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics of Batteries. Elementary calculations for energy

consumption. Introduction to power factor improvement and battery backup. **(11 Hours)**

Course Outcomes:

1. Students will be able to analyze dc and ac circuits.

2. Students will be able to solve, design and synthesize electrical networks

   mathematically.

3. Obtain basic knowledge of electric installations.

4. Imbibe elementary knowledge of electric machines.

TEXT BOOKS:
1. Del Toro, "Principles of Electrical Engineering", 2nd Edition,Pearson Education.
2. D.P.Kothari & I. J. Nagarath, "Basic Electrical Engg", TMH, New Delhi, 3rd edition.
3. B.L. Theraja & A. K. Theraja, "Electrical Technology", (Vol-I, Vol-II), S.Chand.
4. Edward Hughes, "Electrical & Electronics Technology", 10th Edition,Pearson Education.

REFERENCE BOOKS:
1. T.K. Nagsarkar & M.S Sukhija, "Basic Electrical Engineering", OXFORD Uni. Press.2004.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. D.C. Kulshreshtha, "Basic Electrical Engineering", Mc Graw Hill.
4. Hayt & Kemmerly, "Engineering Circuit Analysis", Mc Graw Hill.
5. "Schaum's Outline of Electric Circuits", Mc Graw Hill.
6. A.K.Sawhney. A Course in Electronic Measurements and Instrumentation", Dhanpat Rai & Co.
7. S.K. Sahdev, "Basic Electrical Engineering" Pearson Education.

Note:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

Course Title: Programming for Problem Solving

Course Code: BT CSE 104A

B. Tech. Semester – I/II

L	T	P	Credits			
3	0	0	3			

Class Work : 30 Marks

Examination : 70 Marks

Total : 100 Marks

Duration of Examination : 3 Hours

[The lab component should have one hour of tutorial followed or preceded by laboratory assignments.]

Pre-requisites (if any):   NIL

Course Objectives:

1. To make students understand basics of parts of computers and the programming.
2. To give knowledge of basic constructs of computer programming.
3. To make students understand Recursion.
4. To impart knowledge of Basic Algorithms.

Unit I (10 Lectures)

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.), Introduction to Programming ,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 II (10 Lectures)

 Arithmetic expressions and precedence**,** Conditional Branching and Loops**,** Writing and evaluation of conditionals and consequent branching **,**Iteration and loops Arrays*:* Arrays (1-D, 2-D), Character arrays and Strings, Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Unit III (10 Lectures)

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Structure**:** Defining structures and Array of Structures, Pointers *:*Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit IV (10 Lectures)

Basic Algorithms**:** Searching (Linear and binary search), Basic Sorting Algorithms (Bubble, Insertion, Quick sort), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books :

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Pearson Education.

Course Outcomes:

The student will learn

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).

3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion.

5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

6. To use arrays, pointers and structures to formulate algorithms and programs.

7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

Note:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

Course Title: Engineering Graphics & Design(Theory and Lab)

Course Code: BT ME 105A

B. Tech. Semester – I/II

L	T	P	Credits			
1	0	4	3	Class Work	:	30 Marks
				Practical Examination	:	70 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Objective: - All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore there are many areas (Civil, Mechanical, Electrical, Architectural and Industrial) in which the skills of the CAD technicians play major role in the design and development of new products or construction. Students prepare for actual work situations through practical training in a CAD laboratory using engineering software. This course is designed to address:

1. To prepare the students to communicate effectively through traditional engineering graphics and using computer graphics software.
2. To prepare the students to use the techniques, skills and modern engineering graphics tools necessary for engineering practice.

S. No.	Contents(L-12/P-48)	Contact Hours
1	***Introduction to Engineering Drawing***, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only);Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales	L-2 P-4
2	***Orthographic Projections***, Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes	L-1 P-6
3	***Projections of Regular Solids***, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink,shower, etc.	L-1 P-6
4	***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)	L-1 P-4
5	***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	L-1 P-4
6	***Overview of Computer Graphics*** 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,	L-2 P-4

	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]	
7	***Customisation & CAD Drawing*** consisting of 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.	L-1 P-4
8	***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	L-1 P-8
9	***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).	L-1 P-8

Suggested Text/Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii)Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
(iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
(v) (Corresponding set of) CAD Software Theory and User Manuals

Course Outcomes

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare students to communicate effectively to prepare them to use the techniques, skills, and modern engineering tools necessary for engineering practice

The student will learn-

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modelling
5. Exposure to computer-aided geometric design
6. Exposure to creating working drawings
7. Exposure to engineering communication

Course Title: Workshop/ Manufacturing Practices (Theory and Lab)

Course Code: BT ME 106A

B. Tech. Semester – I/II

L	T	P	Credits			
1	0	4	3			

Class Work	:	30 Marks
Practical Examination	:	70 Marks
Total	:	100 Marks
Duration of Examination	:	3 Hours

Objective

This Course is aimed to provide:

1. Knowledge of different methods employed by manufacturing industries in the production/ fabrication process and measurement of their quality parameters.

2. Knowledge to decide about the appropriate methods and tool for manufacturing a given product/ job.

3. Training to fabricate components with their own hands safely while working with different machine tools and hand tools.

4. Training to produce small devices through assembly of different components.

Detailed contents (L-10/P-48)

S.No.	contents	Contact Hours
1	**Lectures & videos: (10 hours)**	
i	Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods	3
ii	CNC machining, Additive manufacturing	2
iii	Fitting operations & power tools	1
iv	Carpentry	1
v	Welding (arc welding & gas welding), brazing	1
vi	Metal casting	1
vii	Plastic moulding, glass cutting	1
2.	**Workshop Practice:(48 hours)**	
i	Machine shop	12
ii	Fitting shop	6
iii	Carpentry	6
iv	Welding shop	6
v	Casting	6
vi	Smithy	6
vii	Plastic moulding& Glass Cutting	6

Suggested Text/Reference Books:
(i) 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.
(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
(iii)Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
(iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Outcomes
Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials. Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Laboratory Outcomes
- Upon completion of this laboratory course, students will be able to fabricate Components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

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

B.Tech. Semester I/II (Common for All Branches)

Course Title: English Language Lab

Category : Humanities
Course Code: BT HUM 107A

L	T	P	Credits			
0	0	2	1			

Class Work	:	30 Marks
Examination	:	70 Marks
Total	:	100 Marks
Duration of Examination	:	3 Hours

Course Objectives:

1. To develop English language skills especially speaking and listening of the students
2. To make the students excel in their professional lives through proficiency in communication
3. To enhance the students linguistic and communicative competence
4. To enable them to face the challenges of professional and social life

Course Outcomes:

The Students will be able to
1. Acquire basic proficiency in Spoken English
2. Enhance their listening skills with listening comprehension exercises
3. Polish their speaking skills in English both at social and professional platforms
4. Present themselves confidently and meaningfully in professional and social circles.

Course Contents:

(i)   Listening comprehension
(ii)   Recognition of phonemes in International Phonetic Alphabet
(iii)   Self introduction and introduction of another person
(iv)   Conversation and dialogues in common everyday situations
(iv)   Communication at work place (Standard phrases and sentences in various situations)
(vi)   Telephonic communication
(vii)   Speeches for special occasions (Welcome speeches, Introduction speeches, Felicitation speeches and Farewell speeches)
(viii) Tag Questions
(ix)   Formal Presentations on literary texts prescribed in theory paper

Note: Three hour time to each segment is recommended for instruction and practice.

Scheme of End Semester Practical Exam:

1. A small passage may be read out to the examinees and they will have to write the answers to the questions asked at the end of the passage. Questions will be short answer type.
2. Examinees may be asked to identify the sounds of phonemes in given words.
3. Examinees may be asked to introduce themselves or others, participate in role play activities in mock situations, give short responses, engage in hypothetical telephonic conversation or supply the tag questions to statements etc.
4. Examinees may also be asked to deliver speeches on given situations or make presentation on the literary texts prescribed in Unit IV of theory paper.

Recommended Readings:

1. Bhatnagar, Nitin and Mamta Bhatnagar. *Communicative English for Engineers and Professionals*. Pearson Education, 2013.
2. Swan, Michael. *Practical English Usage*. OUP, 1995.
3. Gangal, J.K. *Practical Course in Spoken English*. New Delhi: PHI Learning, 2015.
4. Konar, Nira. *Communication Skills for Professionals*. New Delhi: PHI Learning Pvt. Ltd., 2009.
5. Bansal, R.K. and J.B. Harrison. *Spoken English*. Orient Longman, 1983.
6. Sharma, Sangeeta and Binod Mishra. *Communication Skills for Engineers and Scientists*. Delhi: PHI Learning Pvt. Ltd., 2015.

Note:
1. At least 10 experiments are to be performed by students in the semester.
2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus.

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
BT PHY 114A	CE	Mechanics Lab	0	0	3	30	0	70	100	1.5	3

B. Tech. (Semester – I/ II) Physics Lab

Mechanics Lab

Course Objectives:
1. To make aware the students about very basic apparatuses like vernier calipers, screw gauge, spherometer, spectrometer etc.
2. To understand precision and error calculation in measurements.
3. To perform, take reading, do calculations and analyze the results obtained for the experiments related to mechanics.
4. To seek and co-relate the application of studied practical's in daily life.

Course Outcomes:
1. Students will be able to understand to take readings on very basic apparatuses like vernier calipers, screw gauge, spherometer, spectrometer etc.
2. Students will be aware about precision and error in measurements.
3. Students can take reading, do calculations and analyze the results obtained for the experiments related to mechanics.
4. Students are expected to co-relate the results of performed practical in daily life and can also seek new applications.

Syllabus:

Note:
Basic experiments on least count and error estimation (during orientation)
1. To aware about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
2. Calculation of radius of curvature of a convex surface using spherometer.
3. Angel measurement using spectrometer.

List of Experiments:

1. To perform the moment of inertia measurement of a fly wheel.

2. To find acceleration due to gravity using bar pendulum.

3. To examine resonance phenomena in mechanical oscillators.
4. To examine the behaviour of coupled pendulum.
5. To examine air track experiment and study Collisions between objects, governed by the laws of momentum and energy.
6. To find the modulus of rigidity of a wire using Maxwell's Needle.
7. To determine the moment of inertia of the given disc using Torsion pendulum.
8. To perform experiment on Rotation and Gyroscopic Precession.
9. To measure spring constant using Hook's Law.
10. To measure height of a distant object using sextant.

Note:
1. At least 10 experiments are to be performed by students in the semester.
2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus.

B. Tech. (Semester – I / II) Physics Lab

Course Title: Waves, Optics & Quantum Mechanics Lab

Course Code: BT PHY116A

B. Tech. Semester – II

L	T	P	Credits			
0	0	3	1.5	Class Work Marks	:	30
				Examination Marks	:	70
				Total Marks	:	100

Waves, Optics & Quantum Mechanics Lab

Course Objectives:

1. To make aware the students about very basic apparatuses like vernier calipers, screw gauge, spherometer, spectrometer etc.
2. To understand precision and error calculation in measurements.
3. To perform, take reading, do calculations and analyze the results obtained for the experiments related to optics and quantum mechanics.
4. To seek and co-relate the application of studied practical's in daily life.

Course Outcomes:

1. Students will be able to understand to take readings on very basic apparatuses like vernier calipers, screw gauge, spherometer, spectrometer etc.
2. Students will be aware about precision and error in measurements.
3. Students can take reading, do calculations and analyze the results obtained for the experiments related to optics and quantum mechanics.
4. Students are expected to co-relate the results of performed practical in daily life and can also seek new applications.

Syllabus:

Note:

Basic experiments on least count and error estimation (during orientation)

1. To make aware the students about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
2. Calculation of radius of curvature of a convex surface using spherometer.
3. Angel measurement using spectrometer.

List of Subject related Experiments:

1. To find out wavelength of monochromatic light using Newton's ring experiment.
2. To find out wavelength of monochromatic light using Diffraction grating.
3. To find out wavelength of monochromatic light using Freshnel's bi-prism

4. To examine interference phenomena using Michelson's Interferometer and to find out wavelength of monochromatic light.

5. To find specific rotation of sugar using Polarimeter

6. To find thickness of hair using He-Ne laser.

7. To find Cauchy's constants of a prism by using spectrometer.

8. To find resolving power of a telescope

9. To determine Planks constant using photocell.

10. To plot the characteristics of solar cell and find out the fill factor.

11. To verify the inverse square law with the help of a photovoltaic cell.

12. To examine Zeeman splitting using EPS/ ESR.

Note:
   1. At least 10 experiments are to be performed by students in the semester.
   2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus.

B. Tech. (Semester – I / II) Physics Lab

Semiconductor Physics Lab

Course Code	Branch Name	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total Marks	Credits	Duration of Exam
			L	T	P		Theory	Practical			
BT PHY 118A	CSE	Semiconductor Physics Lab	0	0	3	30	0	70	100	1.5	3

Course Objectives:

1. To make aware the students about very basic apparatuses like vernier calipers, screw gauge, spherometer, spectrometer etc.
2. To understand precision and error calculation in measurements.
3. To perform, take reading, do calculations and analyze the results obtained for the experiments related to semiconductor physics.
4. To seek and co-relate the application of studied practical's in daily life.

Course Outcomes:

1. Students will be able to understand to take readings on very basic apparatuses like vernier calipers, screw gauge, spherometer, spectrometer etc.
2. Students will be aware about precision and error in measurements.
3. Students can take reading, do calculations and analyze the results obtained for the experiments related to semiconductor physics.
4. Students are expected to co-relate the results of performed practical in daily life and can also seek new applications.

Syllabus:

Note:
Basic experiments on least count and error estimation (during orientation)
1. To aware about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
2. Calculation of radius of curvature of a convex surface using spherometer.
3. Angel measurement using spectrometer.
List of Subject related Experiments:

1. To plot the forward and reverse characteristics of P-N junction diode.

2. To plot the characteristics of transistor in common base configuration.

3. To plot the characteristics of transistor in common emitter configuration.

4. To plot the characteristics of Junction field effect (JFET) transistor.

5. To plot the characteristics of Metal oxide semiconductor field effect (MOSFET) transistor.

6. To plot the characteristics of Solar cell and find out the fill factor.

7. To design and study Active and Passive filters.

8. To plot the reverse characteristics of Zener diode and voltage regulation using Zener

   Diode.

9. To determine Planks constant using photocell.

10. To measure e/m of electron using helical method.

11. To find capacitance of condenser using fleshing and quenching experiment.

12. To find temperature co-efficient of platinum using Callender Griffith bridge.

13. To find out low resistance by Carry Foster bridge.

14. To find resistance of galvanometer by post office box.

15. To compare the capacitance of two capacitors using De'Sauty Bridge.

Note:
1. At least 10 experiments are to be performed by students in the semester.
2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus.

Course Title: CHEMISTRY LAB
Course Code: BT CH 108A
   B. Tech. Semester – I/II CHEMISTRY LAB (COMMON FOR ALL BRANCHES)

L	**T**	**P**	**Credits**	**Class Work Marks**	**:**	**30**
0	0	3	1.5	**Examination Marks**	**:**	**70**
				Total Marks	**:**	**100**

LIST OF EXPERIMENTS:

1 .Determination of surface tension of given solvent by stalgmometer.

2. Removal of Ca^{2+} and Mg^{2+} hardness from given water sample using ion exchange coloumn.

3. Calculate the Rf value of given sample using thin layer chromatography.

4.Calculate the strength of strong acid by titrating it with strong base using conductometer.

5. Calculate the emf value of given cell.

6. Prepare the sample of urea formaldehyde and phenol formaldehyde.

7. Determination of chloride content in given water sample.

8. To find the kinetics of ethyl acetate with NaOH.

9. Preparation of asprin.

10. Calculate the sponification value of given oil sample.

11. Chemical analysis of two anions and two cations in given sample of salt.

12. Determination of the partition coefficient of a substance between two immiscible

Liquids.

13. Determine the alkalinity of given water sample.

14. To examine the adsorption phenomena using acetic acid and charcoal.

15. Lattice structures and packing of spheres.

16. Determine the viscosity of given liquid using Ostwald viscometer.

Course Outcomes:

1. The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.
2. The students will learn to: Estimate rate constants of reactions from concentration of reactants/products as a function of time.
3. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
4. Synthesize a small drug molecule and analyse a salt sample

Suggested Books:

1. A Text book on Experiments and Calculation –Engineering Chemistry by S.S.Dara, S.Chand &
   Company Ltd.
2. Essential of Experimental Engineering chemistry, Shashi Chawla, Dhanpat Rai Publishing Co.
3. Theory & Practice Applied Chemistry – O.P.Virmani, A.K. Narula (New Age).

Note:
1. At least 10 experiments are to be performed by students in the semester.
2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus.

Course Title: BASIC ELECTRICAL ENGINEERING LABORATORY

Course Code: BT EE 109A
B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits		Class Work Marks	:	30
0	0	2	1		Examination Marks	:	70
					Total Marks	:	100

LIST OF EXPERIMENTS

1. To plot frequency response of a series R-L-C circuit and determine resonant frequency & Q-factors for various Values of R, L, C.

2. To plot frequency response of a parallel R-L-C circuit and determine resonant frequency & Q-Factors for various values of R, L, C.

3. To perform Open circuit & Short circuit Tests on single phase Transformer.

4. To plot torque- speed characteristic of separately excited DC motor.

5. Demonstration of a DC-DC convertor and DC to AC Convertor and also draw PWM waveform.

6. Speed control of induction motor using DC-AC convertor.

7. Demonstration of Components of LT switch gear like MCB, MCCB, SFU, ELCB and earthing.

8. To obtain torque-slip characteristics of three phase induction motor.

9. To perform voltage control of synchronous generator through field excitation.

10. To plot transient and steady state time response of RLC series circuits.

Laboratory Outcomes
1. Get an exposure to common electrical components and their ratings.
2. Understand the usage of common electrical measuring instruments.
3. Student will be able to understand and design resonant circuits.
4. Understand the basic characteristics of transformers and electrical machines.

Note:
1. At least 10 experiments are to be performed by students in the semester.
2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus.

B. Tech. Semester – I/II

Course Title: **Programming for Problem Solving Lab.**

Course Code: BT CSE110A
Category: Engineering Science Course

L	T	P	Credits			
0	0	4	2			

Class Work Marks	:	30
Examination Marks	:	70
Total Marks	:	100

Course Objectives:

1. To make students understand basics of computer languages and the programming.
2. To give knowledge of basic constructs of computer programming.
3. To make students understand Recursion in programming.
4. To impart knowledge of Basic Algorithms.

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: write a program to input your name and print in output.(to understand use of header files)

Tutorial 2: Variable types and type conversions:

Lab 2: write a program to solve simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Write a Program using if-then-else structure.

Tutorial 4: Loops, while and for loops:

Lab 4: Write a program using different types of Loops.(While, Do-While and For Loop)

Tutorial 5: Arrays: searching, sorting:

Lab 5: Write a program using Array with searching and Sorting of Array.

Tutorial 6: 2D arrays and Strings

Lab 6: Write a program using Strings.

Tutorial 7: Functions, call by value:

Lab 7: Write a program using functions and Call by Value.

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

Lab 8 and 9: Write a program solving Numerical method problems (Ex-Calculator)

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Write a Program explaining Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: write a program using Pointers and structures

Tutorial 12: File handling:

Lab 12: Write a program explaining basic File operations.

Course Outcomes:
1. To formulate the algorithms for simple problems

2. To translate given algorithms to a working and correct program To be able to correct syntax errors as reported by the compilers

3. To be able to identify and correct logical errors encountered at run time
4. To be able to write iterative as well as recursive programs

5. To be able to represent data in arrays, strings and structures and manipulate them through a program

6. To be able to declare pointers of different types and use them in defining self-referential structures.
7. To be able to create, read and write to and from simple text files.
Note:
   1. At least 10 experiments are to be performed by students in the semester.
   2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus.

Course Code: BT MAT 119A
Category: Basic Science Course
Course Title: Mathematics-II
B.Tech. (Computer Science & Engg.) Semester-II

L	T	P		Marks for External Exam	: 70
3	1	0	(4 Credits)	Marks for Internal Exam	: 30
				Total Marks	: 100
				Duration of Exam	: 3 Hours

Course Objectives:
1. To give adequate exposure of basics of Engineering Mathematics so as to enable them to visualize engineering problems by using Mathematical tools and to support their subsequent engineering studies
2. To familiarize with the uses of measure of dispersion and central tendency.
3. To equip with various types of Probability distributions.
4. To familiarize the analysis of statistical data using various distributions.
5. To form a specific relation for the given data using Principle of least square method.

UNIT-I (12 Lectures)
Measures of Central tendency: Moments, skewness and Kurtosis- Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameter for these three distributions, Correlation and regression — Rank correlation.

UNIT-II (12 Lectures)
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.
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.

UNIT-III (12 Lectures)
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.

UNIT-IV (12 Lectures)
Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.
Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Text Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Reference Books:
1. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
2. S. Ross, A First Course in Probability, 9th Ed., Pearson Education.
3 W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
4. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Course Outcomes:

1. The students will be able to apply the concepts of Central tendency in practical work.

2. The students will learn the concept of probability, probability distribution.

3. The students will understand and apply the concept of curve fitting

4. They will be able to understand the concept related to hypothesis tests and bivariate distributions techniques in engineering problems.

Note:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.

B.Tech. Semester-II
(Common for all Branches except CSE)

Course Title: Mathematics-II

Course Code: BT MAT 120A

B. Tech. Semester – III (Common for all Branches except CSE)

L	T	P	Credits		Class Work	:	30 Marks
3	1	0	4		Examination	:	70 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

Course objectives:
1. To familiarize the students with techniques in multivariate integration, ordinary and partial differential equations and complex variables.
2. To equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Unit-I (12 Lectures)
Multiple Integration: Double integrals, change of order of integration, Triple integral and application, Change of variables, Applications to areas and volumes, Centre of mass and Gravity (constant and variable densities) of solids of revolution, orthogonal curvilinear coordinates, vector line integrals, surface integrals, Volume integral Theorems of Green, Gauss and Stokes.

Unit II (12 Lectures)
Ordinary differential Equations of first order and first degree: Exact, linear and Bernoulli's equations, Equations of first order but not of first degree, equation solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.
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.

Unit III (12 Lectures)
Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Unit IV (12 Lectures)
Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, Laurent's series; zeros of analytic functions, singularities, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Course outcomes:
1. The students will learn evaluating multiple integrals and apply it in calculating area and volumes.
2 They will solve first and second order differentiation equations.
3 They are familiar with analytical functions and their applications.
4. The students will know the concepts of singularity and residue and apply these concepts in evaluating definite integrals

Text Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Reference Books:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson Education.
2. W. E. Boyce and R. C. Diprima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed. Mc-Graw Hill, 2004.

Note:

1. The paper setter will set a first compulsory question comprising of 6 to 10 sub parts (short questions), covering the entire syllabus and two questions (with/without parts) from each unit. The examinee will attempt five questions in all, along with the compulsory question (with all it sub parts), selecting one question from each unit. All Questions will carry equal marks, i.e., 14 marks each.

2. The use of programmable devices such as programmable calculators etc. is not allowed during the exam. Sharing of materials will not be permitted during examination.