Panjab University, Chandigarh
Scheme of Examination and Syllabi for
B.E. (Biotechnology Engineering)
1st and 2nd Semesters for Academic Year 2019-2020

Year: First **Semester: First**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
		Choice Based Physics Course	Theory	4	0	0	4	50	50	100
		Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
	BSC 101	Mathematics-I (Calculus)	Theory	4	1	0	5	50	50	100
		Choice Based Subject	Theory	3	1	0	4	50	50	100
		Choice Based Subject (P)	Practical	0	0	2	1	50	0	50
	ESC 101	Basics of Electrical and Electronics Engineering	Theory	3	0	0	3	50	50	100
	ESC 151	Basics of Electrical and Electronics Engineering (P)	Practical	0	0	2	1	50	0	50
Total				**14**	**2**	**7**	**19.5**	**350**	**200**	**550**

Year: First **Semester: Second**

S. No.	Course Code	Course Name	Option	Hours per week			Credits			
				L	T	P		Internal Assessment	University Exam	Total
	BSC 103	Applied Chemistry	Theory	4	0	0	4	50	50	100
	BSC 153	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
	BSC 102	Mathematics-II (Differential Equations and Transforms)	Theory	4	1	0	5	50	50	100
	ESC 102	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
	ESC 152	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
	ESC 153	Workshop (P)	Practical	0	0	4	2	50	0	50
	HSMC 101	Professional Communication	Theory	2	0	0	2	50	50	100
	HSMC 151	Professional Communication (P)	Practical	0	0	2	1	50	0	50
Total				**13**	**1**	**13**	**20.5**	**400**	**200**	**600**

Summer training (four weeks):

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		
						Theory		Practical*
						Internal Assessment	University Exam	
1.		**Summer Training**	0-0-20	20	0+2	Nil	Nil	50

Note: Students will undergo four week in-house training during summer vacations in their respective branches. They will be trained to handle laboratory and practical aspects in their field of engineering.
The marks and credits of Summer Training will be added in the third semester mark-sheet.

Panjab University, Chandigarh
Scheme of Examination and Syllabi for
B.E. (Computer Science and Engineering)
1st and 2nd Semesters for Academic Year 2019-2020

Year: First **Semester: First**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
		Choice Based Physics Course	Theory	4	0	0	4	50	50	100
		Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
	BSC 101	Mathematics-I (Calculus)	Theory	4	1	0	5	50	50	100
	ESC 101	Basics of Electrical and Electronics Engineering	Theory	3	0	0	3	50	50	100
	ESC 151	Basics of Electrical and Electronics Engineering (P)	Practical	0	0	2	1	50	0	50
		Choice Based Subject	Theory	3	1	0	4	50	50	100
		Choice Based Subject (P)	Practical	0	0	2	1	50	0	50
Total				**14**	**2**	**7**	**19.5**	**350**	**200**	**550**

Year: First **Semester: Second**

S. No.	Course Code	Course Name	Option	Hours per week			Credits			
				L	T	P		Internal Assessment	University Exam	Total
	BSC 103	Applied Chemistry	Theory	4	0	0	4	50	50	100
	BSC 153	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
	BSC 102	Mathematics-II (Differential Equations and Transforms)	Theory	4	1	0	5	50	50	100
	ESC 102	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
	ESC 152	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
	ESC 153	Workshop (P)	Practical	0	0	4	2	50	0	50
	HSMC 101	Professional Communication	Theory	2	0	0	2	50	50	100
	HSMC 151	Professional Communication (P)	Practical	0	0	2	1	50	0	50
Total				**13**	**1**	**13**	**20.5**	**400**	**200**	**600**

Summer training (four weeks):

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		
						Theory		Practical*
						Internal Assessment	University Exam	
1.		**Summer Training**	0-0-20	20	0+2	Nil	Nil	50

Note: Students will undergo four week in-house training during summer vacations in their respective branches. They will be trained to handle laboratory and practical aspects in their field of engineering.
The marks and credits of Summer Training will be added in the third semester mark-sheet.

Panjab University, Chandigarh
Scheme of Examination and Syllabi for
B.E. (Information Technology)
1st and 2nd Semesters for Academic Year 2019-2020

Year: First **Semester: First**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
		Choice Based Physics Course	Theory	4	0	0	4	50	50	100
		Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
	BSC 101	Mathematics-I (Calculus)	Theory	4	1	0	5	50	50	100
	ESC 101	Basics of Electrical and Electronics Engineering	Theory	3	0	0	3	50	50	100
	ESC 151	Basics of Electrical and Electronics Engineering (P)	Practical	0	0	2	1	50	0	50
	ESC 102	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
	ESC 152	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
Total				**14**	**1**	**9**	**19.5**	**350**	**200**	**550**

Year: First **Semester: Second**

S. No.	Course Code	Course Name	Option	Hours per week			Credits			
				L	T	P		Internal Assessment	University Exam	Total
	BSC 103	Applied Chemistry	Theory	4	0	0	4	50	50	100
	BSC 153	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
	BSC 102	Mathematics-II (Differential Equations and Transforms)	Theory	4	1	0	5	50	50	100
		Choice Based Subject	Theory	3	1	0	4	50	50	100
		Choice Based Subject (P)	Practical	0	0	2	1	50	0	50
	ESC 153	Workshop (P)	Practical	0	0	4	2	50	0	50
	HSMC 101	Professional Communication	Theory	2	0	0	2	50	50	100
	HSMC 151	Professional Communication (P)	Practical	0	0	2	1	50	0	50
Total				**13**	**2**	**11**	**20.5**	**400**	**200**	**600**

Summer training (four weeks):

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		
						Theory		Practical*
						Internal Assessment	University Exam	
1.		**Summer Training**	0-0-20	20	0+2	Nil	Nil	50

Note: Students will undergo four week in-house training during summer vacations in their respective branches. They will be trained to handle laboratory and practical aspects in their field of engineering.
The marks and credits of Summer Training will be added in the third semester mark-sheet.

Panjab University, Chandigarh
Scheme of Examination and Syllabi for
B.E. (Electrical and Electronics Engineering)
1st and 2nd Semesters for Academic Year 2019-2020

Year: First **Semester: First**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Internal Assessment	University Exam	Total
				L	T	P				
	BSC 103	Applied Chemistry	Theory	4	0	0	4	50	50	100
	BSC 153	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
	BSC 101	Mathematics-I (Calculus)	Theory	4	1	0	5	50	50	100
	ESC 102	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
	ESC 152	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
	ESC 153	Workshop (P)	Practical	0	0	4	2	50	0	50
	HSMC 101	Professional Communication	Theory	2	0	0	2	50	50	100
	HSMC 151	Professional Communication (P)	Practical	0	0	2	1	50	0	50
Total				**13**	**1**	**13**	**20.5**	**400**	**200**	**600**

Year: First **Semester: Second**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
		Choice Based Physics Course	Theory	4	0	0	4	50	50	100
		Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
	BSC 102	Mathematics-II (Differential Equations and Transforms)	Theory	4	1	0	5	50	50	100
	ESC 101	Basics of Electrical and Electronics Engineering	Theory	3	0	0	3	50	50	100
	ESC 151	Basics of Electrical and Electronics Engineering (P)	Practical	0	0	2	1	50	0	50
		Choice Based Subject	Theory	3	1	0	4	50	50	100
		Choice Based Subject (P)	Practical	0	0	2	1	50	0	50
Total				**14**	**2**	**7**	**19.5**	**350**	**200**	**550**

Summer training (four weeks):

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		
						Theory		Practical*
						Internal Assessment	University Exam	
1.		**Summer Training**	0-0-20	20	0+2	Nil	Nil	50

Note: Students will undergo four week in-house training during summer vacations in their respective branches. They will be trained to handle laboratory and practical aspects in their field of engineering.
The marks and credits of Summer Training will be added in the third semester mark-sheet.

Panjab University, Chandigarh
Scheme of Examination and Syllabi for
B.E. (Mechanical Engineering)
1st and 2nd Semesters for Academic Year 2019-2020

Year: First **Semester: First**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Internal Assessment	University Exam	Total
				L	T	P				
	BSC 103	Applied Chemistry	Theory	4	0	0	4	50	50	100
	BSC 153	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
	BSC 101	Mathematics-I (Calculus)	Theory	4	1	0	5	50	50	100
		Choice Based Subject	Theory	3	1	0	4	50	50	100
		Choice Based Subject (P)	Practical	0	0	2	1	50	0	50
	ESC 153	Workshop (P)	Practical	0	0	4	2	50	0	50
	HSMC 101	Professional Communication	Theory	2	0	0	2	50	50	100
	HSMC 151	Professional Communication (P)	Practical	0	0	2	1	50	0	50
Total				**13**	**2**	**11**	**20.5**	**400**	**200**	**600**

Year: First **Semester: Second**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
		Choice Based Physics Course	Theory	4	0	0	4	50	50	100
		Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
	BSC 102	Mathematics-II (Differential Equations and Transforms)	Theory	4	1	0	5	50	50	100
	ESC 101	Basics of Electrical and Electronics Engineering	Theory	3	0	0	3	50	50	100
	ESC 151	Basics of Electrical and Electronics Engineering (P)	Practical	0	0	2	1	50	0	50
	ESC 102	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
	ESC 152	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
Total				**14**	**1**	**9**	**19.5**	**350**	**200**	**550**

Summer training (four weeks):

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		
						Theory		Practical*
						Internal Assessment	University Exam	
1.		**Summer Training**	0-0-20	20	0+2	Nil	Nil	50

Note: Students will undergo four week in-house training during summer vacations in their respective branches. They will be trained to handle laboratory and practical aspects in their field of engineering.
The marks and credits of Summer Training will be added in the third semester mark-sheet.

Panjab University, Chandigarh
Scheme of Examination and Syllabi for
B.E. (Electronics and Communications Engineering)
1st and 2nd Semesters for Academic Year 2019-2020

Year: First **Semester: First**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
	BSC 103	Applied Chemistry	Theory	4	0	0	4	50	50	100
	BSC 153	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
	BSC 101	Mathematics-I (Calculus)	Theory	4	1	0	5	50	50	100
	ESC 102	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
	ESC 152	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
	ESC 153	Workshop (P)	Practical	0	0	4	2	50	0	50
	HSMC 101	Professional Communication	Theory	2	0	0	2	50	50	100
	HSMC 151	Professional Communication (P)	Practical	0	0	2	1	50	0	50
Total				**13**	**1**	**13**	**20.5**	**400**	**200**	**600**

Year: First **Semester: Second**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
		Choice Based Physics Course	Theory	4	0	0	4	50	50	100
		Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
	BSC 102	Mathematics-II (Differential Equations and Transforms)	Theory	4	1	0	5	50	50	100
	ESC 101	Basics of Electrical and Electronics Engineering	Theory	3	0	0	3	50	50	100
	ESC 151	Basics of Electrical and Electronics Engineering (P)	Practical	0	0	2	1	50	0	50
		Choice Based Subject	Theory	3	1	0	4	50	50	100
		Choice Based Subject (P)	Practical	0	0	2	1	50	0	50
Total				**14**	**2**	**7**	**19.5**	**350**	**200**	**550**

Summer training (four weeks):

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		
						Theory		Practical*
						Internal Assessment	University Exam	
1.		**Summer Training**	0-0-20	20	0+2	Nil	Nil	50

Note: Students will undergo four week in-house training during summer vacations in their respective branches. They will be trained to handle laboratory and practical aspects in their field of engineering.
The marks and credits of Summer Training will be added in the third semester mark-sheet.

Panjab University, Chandigarh
Scheme of Examination and Syllabi for
B.E. (Civil Engineering)
1st and 2nd Semesters for Academic Year 2019-2020

Year: First **Semester: First**

S. No.	Course Code	Course Name	Option	Hours per week			Credits	Marks		
				L	T	P		Internal Assessment	University Exam	Total
		Choice Based Physics Course	Theory	4	0	0	4	50	50	100
		Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
	BSC 101	Mathematics-I (Calculus)	Theory	4	1	0	5	50	50	100
	ESC 101	Basics of Electrical and Electronics Engineering	Theory	3	0	0	3	50	50	100
	ESC 151	Basics of Electrical and Electronics Engineering (P)	Practical	0	0	2	1	50	0	50
		Choice Based Subject	Theory	3	1	0	4	50	50	100
		Choice Based Subject (P)	Practical	0	0	2	1	50	0	50
Total				**14**	**2**	**7**	**19.5**	**350**	**200**	**550**

Year: First **Semester: Second**

S. No.	Course Code	Course Name	Option	Hours per week			Credits			
				L	T	P		Internal Assessment	University Exam	Total
	BSC 103	Applied Chemistry	Theory	4	0	0	4	50	50	100
	BSC 153	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
	BSC 102	Mathematics-II (Differential Equations and Transforms)	Theory	4	1	0	5	50	50	100
	ESC 102	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
	ESC 152	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
	ESC 153	Workshop (P)	Practical	0	0	4	2	50	0	50
	HSMC 101	Professional Communication	Theory	2	0	0	2	50	50	100
	HSMC 151	Professional Communication (P)	Practical	0	0	2	1	50	0	50
Total				**13**	**1**	**13**	**20.5**	**400**	**200**	**600**

Summer training (four weeks):

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		
						Theory		Practical*
						Internal Assessment	University Exam	
1.		**Summer Training**	0-0-20	20	0+2	Nil	Nil	50

Note: Students will undergo four week in-house workshop training during summer vacations in the workshop. They will be trained to handle skill and practical aspects in their field of engineering.
The marks and credits of Summer Training will be added in the third semester mark-sheet.

Course Code	**BSC 101**
Course Title	**Mathematics-I (Calculus)**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	1. To understand the behaviour of infinite series and its use. 2. To learn the concepts of functions of two and more than two variables and their applications. 3. To learn the methods to evaluate multiple integrals and their applications to various problems. 4. To understand the concepts of Vector calculus and their use in engineering problems.
Course Outcome	1. The students are able to test the behaviour of infinite series. 2. Ability to analyze functions of more than two variables and their applications. 3. Ability to evaluate multiple integrals and apply them to practical problems. 4. Ability to apply vector calculus to engineering problems

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION-A

FUNCTIONS OF ONE VARIABLE

Sequences and Series: Sequences, Limits of sequences, Infinite series, series of positive terms, Integral test, Comparison test, Ratio test, Root test. Alternating series, Absolute and Conditional Convergence, Leibnitz test. Power series: radius of convergence of power series, Taylor's and Maclaurin's Series. (Scope as in Chapter 10, Sections 10.1 – 10.9 of Reference 1).

Integral Calculus: Length of curves, Volume (disk and washer method) and surface areas of revolution (Scope as in Chapter 6, 6.1, 6.3, 6.4 of Reference 1).

DIFFERENTIAL CALCULUS OF FUNCTIONS OF TWO AND THREE VARIABLES

Concept of limit and continuity of a function of two and three variables, Partial derivatives, total derivative, composite function, differentiation of an implicit function, chain rule, change of variables, Jacobian, Taylor's theorem (statement only), Maxima and minima of a function of two and three variables, Lagrange's method of multipliers (Scope as in Chapter 14, Sections 14.1-14.4, 14.6-14.10 of Reference 1).

SECTION-B

INTEGRAL CALCULUS OF FUNCTIONS OF TWO AND THREE VARIABLES

Double and triple integrals, Change of order of integration, Change of Variables, Applications to area, volume and surface area. (Scope as in Chapter 15 of Reference 1).

VECTOR DIFFERENTIAL CALCULUS

Vector-valued functions and space curves and their tangents, integration, arc lengths, unit tangent vector, Curvature and torsion of a curve, Gradient of a Scalar field, Directional Derivative (Scope as in Chapter 13, Sections 13.1-13.5 Chapter 14, Section 14.5 of Reference 1).

VECTOR INTEGRAL CALCULUS

Line integrals, Vector fields, Work, Circulation and Flux, Path Independence, Potential functions and Conservative fields, Green's theorem in the plane, Surface Areas and Surface Integrals, Stoke's Theorem, Gauss Divergence Theorem (Statements only) (Scope as in Chapter 16 of Reference 1).

RECOMMENDED BOOKS			
S. No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Calculus	Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas	12th edition, Pearson Education.
2.	Advanced Engineering Mathematics	E. Kreyszig.	8th edition , John Wiley.
3.	Advanced Engineering Mathematics	Michael D. Greenberg	2nd edition, Pearson Education.
4.	Advanced Engineering Mathematics	Wylie and Barrett	Tata McGraw Hill
5.	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw Hill.
6.	Advanced Engineering Mathematics	R. K. Jain, S. R. K. Iyenger	Narosa Publications

Course Code	**BSC 102**
Course Title	Mathematics-II (Differential Equations and Transforms)
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To learn the methods to formulate and solve linear differential equations and their applications to engineering problems 2. To learn the concepts of Laplace transforms and to evaluate Laplace transforms and inverse Laplace transform 3. To apply Laplace transforms to solve ordinary differential equations 4. To learn the concept of Fourier series, integrals and transforms. 5. To learn how to solve heat, wave and Laplace equations.
Course Outcome	1. The student will learn to solve Ordinary Differential equations. 2. The students will be able to apply the tools of Laplace Transforms to model engineering problems and solve the resulting differential equations. 3. Students will understand the nature and behaviour of trigonometric (Fourier) series and apply it to solve boundary value problems.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION – A

ORDINARY DIFFERENTIAL EQUATIONS

Review of geometrical meaning of the differential equation, directional fields, exact differential equations(scope as in chapter 8, sections 8.1 – 8.10 of reference 5), solution of differential equations with constant coefficients; methods of differential operators (scope as in chapter 9, sections 9.1 – 9.5 of reference 5). Non-homogeneous equations of second order with constant coefficients: Solution by method of variation of parameters, reduction by order (scope as in chapter 9, section 9.7, 9.10 of reference 5). Power series method of solution (scope as in chapter 10, section 10.2 of reference 5)

Laplace Transforms

Laplace transform, Inverse transforms, shifting, transform of derivatives and integrals. Unit step function, second shifting theorem, Dirac's Delta function. Differentiation and integration of transforms. Convolution Theorem on Laplace Transforms. Application of Laplace transforms to solve ordinary differential equations with initial conditions (Scope as in Chapter 6, Sections 6.1 – 6.6 of Reference 2).

SECTION – B

Fourier Series and Transforms: Periodic functions, Fourier series, Even and odd series, half range expansions, Complex Fourier Series, Approximation by trigonometric polynomials. Fourier integrals, Fourier Cosine and Sine transforms, Fourier Transforms (Scope as in Chapter 11, Sections 11.1 – 11.2, 11.4-11.5, 11.7 – 11.9 of Reference 2).

Partial Differential Equations: Partial differential equations of first order, origin, solution of linear partial differential equations of first order, Integral surfaces passing through a given curve (Scope as in Chapter 2, Sections 1, 2, 4, 5 of Reference 1).

Boundary Value Problems: D'Alembert's solution of wave equation, separation of variables: one dimension and two dimension heat and wave equation (Scope as in Chapter 12, Sections 12.1, 12.3 – 12.4, 12.6, 12.9 of Reference 2).

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Elements of Partial Differential Equations	Ian N. Sneedon	McGraw Hill,Singapore 1957.
2.	Advanced Engineering Mathematics	E. Kreyszig.	10th edition , John Wiley.
3.	Advanced Engineering Mathematics	Michael D. Greenberg	2nd edition, Pearson Education.
4.	Advanced Engineering Mathematics	Wylie and Barrett	Tata McGraw Hill
5.	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw Hill.
6.	Advanced Engineering Mathematics	R. K. Jain, S. R. K. Iyenger	Narosa Publications
7.	Theory and problems of Differential Equations	Frank Ayers	Shuam outline series, McGraw-Hill, Singapore, 1957

Course Code	**BSC 103**
Course Title	**Applied Chemistry**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	To teach the fundamentals of basic chemical sciences essential for the development of new technologies to all branches of engineering.
Course Outcome	1. The geometry and bonding in homonuclear, heteronuclear molecules and coordination compounds. Splitting of d-orbital in octahedral, tetrahedral and square planar field along with different properties of the coordination compounds. 2. How the molecules are arranged in three dimensional structure and how it leads to the phenomena of various types of isomerism. 3. The basic principles of spectroscopy and its use to determine the chemical structure. 4. The different thermodynamic laws, heat changes and energy calculations. 5. The role and mechanism of various heterogeneous and homogeneous catalysts in increasing reactions rate of many synthetically important chemical reactions. 6. The sustainable technology in design and synthesis of polymers for its variety of applications.

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SYLLABUS

SECTION - A

Chemical Bonding (6 hrs)

Molecular orbital theory and its applications to the formation of homonuclear (H_2, N_2) and heteronuclear diatomic molecules (NO, CO, CN), Valence bond theory as applicable to coordination compounds and its limitations. Crystal Field Theory, Splitting of octahedral, tetrahedral and square planner complexes, crystal field stabilization energies of octahedral and tetrahedral complexes and its application.

***S*tereochemistry of Organic Compounds (8 hrs)**

Concept of isomerism. Types of isomerism. Optical isomerism–enantiomers, optical activity, properties of enantiomers, diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization, R & S systems of nomenclature. Geometric isomerism– determination of configuration of geometric isomers, E & Z

system of nomenclature Conformational isomerism – conformational analysis of ethane and n-butane; conformations of cyclohexane, Newman projection.

Spectroscopy (9 hrs)

Spectroscopy: UV- Introduction, Lambert-Beer's Law, selection rules, electronic transitions, Application to simple organic molecules (auxochrome, chromophore), effect of conjugation and solvent on transition of organic molecules, Woodward-Fieser Rules for calculating λmax for dienes. Infrared Spectroscop- Introduction, Principle of IR spectroscopy-Fundamental vibrations, Application to simple organic molecules (effect of masses of atoms, bond strength, nature of substituent, hydrogen bonding on IR frequency), sample preparation for IR.

SECTION - B

Thermodynamics (10 hrs)

Review of objectives and limitations of chemical thermodynamics, State functions, Thermodynamic equilibrium, work, heat, internal energy, enthalpy, heat capacity. Zeroth law of thermodynamics, First law of thermodynamics Reversible, isothermal and adiabatic expansion & compression of an ideal gas. Irreversible isothermal and adiabatic expansion of an ideal gas. Carnot cycle and efficiency of reversible engines, Enthalpy change and its measurement. Flame temperature, Second and third law of thermodynamics. Concept of entropy. Gibb's and Helmholtz equations. Simple numericals for calculating w, q, ΔE, ΔH and entropy.

Catalysis (6 hrs)

Catalysis and general characteristics of a catalytic reactions, Homogeneous catalysis, Heterogenous catalysis, Acid base catalysis and Enzyme catalysis – Michealis Menten equations, Application of catalysis for industrially important processes – Hydrogenation (Wilkinson's catalyst), Hydroformylation, Acetic acid process, Wacker process.

Polymers (6 hrs)

General introduction, classification of polymers, Mechanism of addition and condensation polymerization, Idea of number average and weight average molecular masses of polymers, Properties and uses of polystyrene, polyester, polyamide, epoxy, phenol-formaldehyde and silicon resins.

Books suggested:

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Atkin's Physical Chemistry	Peter Atkins, Julio de Paula	7th Ed., Oxford University Press
2	Concise Inorganic Chemistry	J D Lee	5th Edition, Chapman & Hall, 2003
3	Organic Chemistry	Joseph M. Hornback	Brooke Cole Publishing Company U.S.A.
4	A Textbook of Engineering Chemistry	Shashi Chawla	Dhanpat Rai & Co. Pvt. Ltd., Delhi (2008)
5	Principles of Physical Chemistry	Puri, Sharma and Pathania	W.H. Freeman & Co. 2008.
6	Introductory Polymer Chemistry	G.S.Mishra	John Wiley & Sons, New York, 1993
7	Introduction to spectroscopy	D. S. Pavia, G.M. Lasmpman and G.S. Kriz	4th Edition, Thomson learning, Indian Edition 2012.

8	Basic Inorganic Chemistry.	F.A. Cotton, G. Wilkinson and P.L. Gaus	3rd Ed., John Wiley & Sons
9	Inorganic Chemistry- Principles of structure and reactivity	James E. Huheey, Ellen A. Keiter and Richard L. Keiter	4^{th} Ed. Pearson Edu. Asia
10	Organic Chemistry	S. M. Mukherji, S. P. Singh & R. P. Kapoor	1st Edition, Vol. 2, 1985, New Age International Pvt. Ltd

Course Code	**BSC 153**
Course Title	**Applied Chemistry (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

Instruction for Students: The candidate will be attending a laboratory session of three hours weekly and has to perform any eight experiments.

1. Verify Lambert Beer's law using spectrophotometer and $CoCl_2$ or $K_2Cr_2O_7$ solution.
2. To determine the strength of an acid solution by using conductivity meter.
3. Determination of saponification number of oil.
4. Preparation of a phenol formaldehyde resin.
5. Experiments on TLC (determination of Rf values and identification of various compounds).
6. To determine the heat of a neutralization reaction.
7. To determine the heat of solution of given compound.
8. Determination of total hardness of a water sample.
9. Determination of copper.
10. Determination of chloride ion and dissolved O_2 in water.
11. Preparation of an inorganic complex/organic compound

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	A textbook of Quantitative Inorganic Analysis	A. I. Vogel	Longman Gp. Ltd, 4th editon
2	Essentials of Experimental Engineering Chemistry	Shashi Chawla	Dhanpat Rai and Co. Delhi (2001)
3	Vogel's text book of quantitative chemical analysis	J. Mendham, R. C. Denny, J. D. Barnes and M. J. K. Thomas	Pearson Education

Course Code	**ESC 101**
Course Title	**Basics of Electrical and Electronics Engineering**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To provide students about basic knowledge of A.C and D.C circuits and theorems. 2. To introduce the concepts of single phase and three phase supply system. 3. To understand the operation of transformers and other electrical machines. 4. To introduce the basics electronics and different types of diodes.
Course Outcome	1. Applying network theorems for solving circuit output parameters. 2. The student will be able to operate system with single and three phase connected system. 3. To apply test procedures for performance analysis of transformers and various machines. 4. The students will be able to use semiconductors and diodes for circuit applications.

Syllabus

Note for the paper setter: Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART-A

DC circuits: (9 hours)

Voltage and current sources, network analysis by mesh and node analysis, superposition theorem, Thevenin's theorem, Norton's theorem, maximum-power transfer theorem, reciprocity theorem and Tellegen's theorem (numerical based on these theorem).

Single Phase AC Fundamentals: (6 hours)

Alternating current systems, average and RMS values of alternating, quantities, phasor notation, solution and phasor diagram of single phase ac circuits (RLC) with sinusoidal source excitation.

Three Phase AC Fundamentals: (7 hours)

Three phase voltages and currents generation, voltages and currents in star and delta connected systems, power in a three phase system, solution of three phase balanced circuits, power and power factor measurement by two watt-meters method.

PART-B

Transformers: (4 hours)

Introduction, Basic Principle, EMF equation, losses, efficiency and condition for maximum efficiency, voltage regulation, open circuit and short circuit tests.

Electric Machines: (4 hours)

Operating principle and application of DC machine and three phase induction motors Construction, operating Principle, slip and speed torque characteristics.

Basic Semiconductor Physics: (5 hours)

Energy band diagram of metal, insulator, and semiconductor, direct and indirect band gap materials, types of semiconductors, their properties and applications, intrinsic and extrinsic semiconductors, charge carriers in semiconductor, carrier concentration, conductivity of semiconductors and its temperature dependence.

Semiconductor Devices: (10 hours)

p-n junction in equilibrium, p-n junction under open circuit condition, p-n junction under forward bias and reverse bias conditions, p-n junction in breakdown, diode small signal model, applications of p-n junction (types of Rectifier, Clipper and Clamper). Types of diodes, their I-V characteristics and applications: zener diode, avalanche diode, schottky diode, LED, tunnel Diode, varactor Diode.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Electrical & Electronic Technology	Edward Hughes	Pearson Education Publication Asia, 2003.
2.	Basic Electrical Engineering	T.K. Nagsarkar and M.S. Sukhija	OXFORD University Press, 2004.
3.	Basic Electrical Engineering	Fitzgerald, Higginbotham, & Gabriel	McGraw Hill, 4th edition.
4.	Principles of Electrical Engineering	Del Toro	PHI, 2nd edition
5.	Basic Electrical Engineering	I. J. Nagrath and D. P. Kothari	TMH, 3rd edition.
6.	Experiments in Basic Electrical Engineering	S. K. Bhattacharya and K. M. Rastogi	New Age International Publishers Ltd.
7.	Engineering Circuit Analysis	Milliam H. Hayt., Jack E. Kemmerly	
8.	Circuits and Networks (Analysis and Synthesis)	A. Sudhakar & S.P. Shyammohan	Tata McGraw Hill 1994, Edition 2ND
9.	Solid State Electronic Devices	G. Streetman, and S. K. Banerjee	Pearson, 7th edition
10.	Semiconductor Physics and Devices	Neamen , D. Biswas	McGraw-Hill Education

Course Code	**ESC 151**
Course Title	**Basics of Electrical and Electronics Engineering (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

Note: Perform at least ten experiments.

1. Measure resistance and inductive reactance of a choke coil make a series RLC circuit using the choke coil and obtain its phasor diagram.
2. To prove Superposition and Maximum Power Transfer theorem.
3. To prove Thevenin's and Norton's theorem.
4. Study the resonance in an RLC series and parallel circuits.
5. To find out the relationship between line current & phase current, between line voltage & phase voltage for star and delta connected loads supplied from balanced three phase supply.
6. To measure power and power factor using wattmeter in single phase circuit.
7. Perform Open circuit and short circuit tests on a single phase transformer to draw equivalent circuit.
8. To connect, start and reverse the direction of a 3 Phase Induction Motor and measure speed / torque.
9. Study and demonstration of earthing system for protection against shocks.
10. To measure power and power factor using two wattmeter of three phase load.
11. To study the V-I characteristics of a p-n junction diode and determine its static and dynamic resistance.
12. To study and plot the characteristics of half wave rectifier and full wave rectifier and calculate the value of RMS, peak and average output voltage.
13. To study the response of Clipping & Clamping circuits.
14. To study Zener diode V-I characteristics and study the circuit of Zener diode as a voltage regulator.

Course Code	**ESC 102**
Course Title	Programming for Problem Solving
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Outcome	1. To develop simple algorithms for solving arithmetic and logical problems. 2. To translate the algorithms to programs using C language and their execution. 3. To implement conditional branching, iteration and recursion. 4. To decompose a problem into functions and synthesize a complete program. 5. To use arrays, pointers and structures to develop algorithms and programs.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

PART- A

Unit–1: Introduction to Programming [06]

Introduction to components of a computer system: Memory, processor, I/O devices, storage, operating system, concept of assembler, compiler, interpreter, loader and linker.

Concept of algorithm: Representation of an algorithm, flowchart, Pseudocode with examples, converting algorithms to programs.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language, standard I/O in C, data types, variables and constants, memory storage, storage classes.

Unit –2: Expressions and Statements [10]

Expressions and their evaluation: Operands and Operators, formation of expressions using arithmetic, relational, logical and bitwise operators, precedence and associativity rules , mixed operands, type conversion and evaluation of expressions.

Statements: Simple and compound statements, Conditional Branching: if and switch statements, nested if-else, dangling else problem, use of break and default with switch. Iteration and loops: use of while, do while and for loops, nested loops, use of break and continue statements.

Unit– 3: Arrays & Basic Algorithms [07]

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays, character arrays and strings.

Basic Algorithms: Searching and Sorting Algorithms (Bubble, Insertion and Selection), finding roots of equations, notion of order of complexity through example programs.

PART – B

Unit–4: Functions [09]

Introduction, advantages of modularizing a program into functions, types of functions, passing parameters to functions: call by value, call by reference, passing arrays to functions, recursion with example programs.

Unit – 5: Structures , Union, Enums and Bit-fields [06]

Defining, declaring and usage of structures, unions and their arrays, passing structures and unions to functions, introduction to enums and bit-fields.

Unit – 6: Pointers and File handling [07]

Pointers: Introduction, declaration, applications, dynamic memory allocation (malloc, calloc, realloc, free), use of pointers in self-referential structures.

File handling: File I/O functions, standard C pre-processors, defining and calling macros, command-line arguments.

Text books:

1. Schaum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. Programming in C: A practical approach by Ajay Mittal, Pearson Education, 2010
3. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
4. Computer Basics and C Programming by V.Rajaraman , PHI Learning, 2015.
5. Computer Concepts and Programming in C, E Balaguruswamy, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A.Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.

Course Code	**ESC 152**
Course Title	Programming for Problem Solving (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Outcome	• To formulate the algorithms for simple problems • To translate given algorithms to a working and correct program • To be able to correct syntax errors as reported by the compilers • To be able to identify and correct logical errors encountered at run time • To be able to write iterative as well as recursive programs • To be able to represent data in arrays, strings and structures and manipulate them through a program • To be able to declare pointers of different types and use them in defining self-referential structures. • To be able to create, read and write to and from simple text files.

Lab1: Familiarization with programming environment
Lab 2: Simple computational problems using arithmetic expressions
Lab 3: Problems involving if-then-else structures
Lab 4: Iterative problems e.g., sum of series
Lab 5: 1D Array manipulation, Arrays: searching, sorting
Lab 6: Matrix problems, String operations
Lab 7: Simple functions and parameter passing
Lab 8: Numerical methods (Root finding, numerical differentiation, numerical integration)
Lab 9: Recursive functions
Lab 10: Pointers and structures
Lab 11: File operations

Course Code	**ESC 153**
Course Title	**Workshop (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Objectives (CO)	1. Know different machines, tools and equipment, Identify different Engineering materials, metals and non-metals. 2. Understand different Mechanisms, Use of Machines, Tools and Equipment. 3. Knowledge of basic Manufacturing Processes in Electronics, Electrical, Machine, Welding, Fitting, Sheet Metal.Smithy, Foundry and Carpentry Workshops.
Course Outcome	1. Familiarity with common machines, Tools and Equipment in basic Workshop Practices. 2. On hand basic workshop practices in Electronics, Electrical, Machine, Welding, Fitting, Sheet Metal. Smithy, Foundry and Carpentry Workshops in Engineering professions. 3. Applications of Basic Workshop Practices..

SYLLABUS

Instruction for Students: Practice of basic exercises related with different shops. On hand basic workshop practices in Electronics, Electrical, Machine, Welding, Fitting, Sheet Metal. Smithy, Foundry and Carpentry Workshops in Engineering professions.

Welding Workshop :

(Theory)Joining Processes, Welding and its Classification, Welding Processes, Fusion Welding, Pressure Welding, Electric Arc Welding, Gas Welding, Resistance Welding, Metal Inert gas Welding, Welding Joints, Welding Positions, Welding defects, Welding Applications, Basic welding design and Procedures, identification of materials.

Jobs: Butt Joint in Flat Position using SMAW, Lap Joint using Spot Welding, Edge Joint in Horizontal Position using SMAW, Tee Joint in Flat position using SMAW, Corner Joint in vertical position using SMAW.
Defect Identification and marking, Edge preparation and Fillet making, Tacking, Distortion identification.

Electronics Workshop

To know about Soldering mechanism and techniques, Familiarity with Electronic Components / symbols, Testing of electronic components, Application of Soldering : Circuit Assembly

List of Jobs :

Practice of Soldering and de-soldering, Identification and testing of a) passive electronic components b) Active electronic components, Assembly of Regulated Power supply circuit.

Electrical Workshop

Introduction of Various Electric wirings, Wiring Systems, Electrical wiring material and fitting, different type of cables, Conduit pipe and its fitting, inspection points, switches of all types, Distribution boards, M.C.B's etc., Electric Shock and its management.

Electric Tools: Conversance with various tools and to carry out the following:

1. Measurement of wire sizes using SWG and micrometer
2. Identification of Phase and neutral in single phase supply

Jobs:

To control a lamp with a single way switch

To control a lamp from two different places
To assemble a fluorescent lamp with its accessories
To control a lamp, fan and a three pin socket in parallel connection with single way switches

Fitting Shop

Introduction of Fitting, different type of operations, Tools, materials, precision instruments like Vernier caliper and Micrometer etc, Safety precautions and Practical demonstration of tools and equipments

Jobs:

To make a square from MS Flat, Punching, Cutting, Filling techniques and practice, Tapping, Counter Drilling.

Smithy Workshop

Introduction of Smithy and Forging process, Tools and Equipment's, Operations, Heat Treatment processes, Advantages, Dis-advantages, Defects and Safety precautions.

Jobs:

Drawing and Upsetting Practice using Open Hearth Furnace, Cold working process practice, Heat Treatment \: Annealing and hardening process

Machine Shop

Application, Function and different parts, Operations of Lathe, Type of Cutting Tools and their materials, Drill machine Types, applications and Functions. Hacksaw machines and functions, Work Holding devices and tools, chucks, Vices, machine Vices, V Block, Measuring Instruments uses, Shaper and Milling machine Applications.

Jobs:

To perform Marking, Facing, Turning,taper Turing, Grooving, Knurling, parting, Drilling, Reaming operations on lathe machine,Hacksawing practice on Power hacksaw,Shaping operation practice on Shaper.

Carpentry Shop

Classification of Tree, Timber. Advantages and uses of Timber, Seasoning of Wood, Tools Used, Defects and Prevention of Wood,

Jobs:

Tee Joint, Cross Joint,Tenon Joint, L Shape Joint, Practice of Wood Working Lathe, Practice on multi-purpose Planer.

Foundry Shop

Introduction to Foundry, Advantages and Disadvantages of castings process, Introduction to pattern and various hand tools, Ingredients of Green sands, Various Hand Molding processes, Introduction to Casting Defects.

Jobs:

Identification and uses of hand tools, Preparation of Green sand in Muller, Preparation of Sand Mould of Single piece solid pattern, Split pattern, Preparation of Green sand Core, casting of a Mould and study its defects.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Introduction to Basic Manufacturing Processes and Workshop Technology	Rajender Singh	New Age International Publication
2	Manufacturing Processes	Chapman	Viva Books Private Limited

Course Code	**HSMC 101**
Course Title	Professional Communication
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Outcome	The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

PART-A

English Grammar

Subject-verb agreement , Noun-pronoun agreement , Misplaced modifiers , Articles , Prepositions , Tenses, One word substitutes , Idioms and Phrases , Active-Passive , Synonyms -Antonyms (6)

Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences , Importance of proper punctuation , Creating coherence , Organizing principles of paragraphs in documents, Techniques for writing precisely , Paragraph , Essay and Letter writing (5)

Communication details

Four Fundamental communication methods namely Writing, Speaking, Listening and Reading ,7 Cs of Communication , Barriers to Communication (3)

PART-B

Communication in Organizations

Formal- Informal Communication, Communication Networks, Intra and Inter Firm Communication (3)

Modes of Communication

Emerging channels of communication , Telephone and Email Etiquettes, Non-Verbal Communication, Cross-culture communication, Formal Presentations (3)

Communication methods

Reports and their types , Layout of a report , writing a report ,Office notice , Memo ,Business proposals, Minutes of meeting (5)

Suggested Readings:

(i) Practical English Usage. Michael Swan. OUP. 1995.

(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007

(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001

(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

(v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Code	**HSMC 151**
Course Title	Professional Communication (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Outcome	The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Practical

Oral Communication

(This unit involves interactive practice sessions in Language Lab)

1. Telling something about oneself
2. Story Telling and Event
3. Listening Comprehension
4. Pronunciation, Intonation, Stress and Rhythm
5. Common Everyday Situations: Conversations and Dialogues
6. Communication at Workplace
7. Facing an Interview
8. Formal Presentations

Syllabi of Choice Based Subjects

Course Code	**ESC 105**
Course Title	**Digital Design**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To apply minimization techniques for reducing the functions up to six variables. 2. To design various combinational circuits 3. To write the truth table, excitation table, characteristic equations of various flip flops and to design the sequential circuits using Flip flops. 4. To familiarize the various A/D, D/A Converters, Logic families and their characteristics.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION – A

Introduction (5 hours)

Digital logic, Number Systems and Conversions for Binary, Octal, Decimal, Hexadecimal, Binary Arithmetic, Basic and Universal gates, Boolean Alegbra, Binary addition and subtraction.

Minimization Techniques (6 hours)

Sum of Products and Products of Sum forms, Minterms & Maxterms, Karnaugh Map for two, three, four five and six variables, Quine-McCluskey method.

Combinational Circuit Design (6 hours)

Half adder, full adder, subtractor, BCD adder, comparator, code converter, encoder decoder, multiplexer, demultiplexer, parity detector and generator, PLA, PAL and ROM

Flip Flops (5 hours)

1-bit memory cell, clocked and unclocked flip flops, S-R Flip flop, D flip flop, JK Flip flop, T flip flop, edge triggered flip flop, race around condition , Master slave flip flop, conversion of flip flops using excitation table.

SECTION - B

Counters (5 hours)

Ripple counter, design of Mod-N ripple counter, design of synchronous counter with and without lockout condition, decade counter, ring counter, Johnson counter

Shift Registers (5 hours)

Serial in serial out shift register, serial in parallel out shift register, parallel in serial out shift register and parallel in parallel out shift register, bidirectional shift register, universal shift register.

A/D and D/A Converters (6 hours)

Weighted resistor D/A converter, Binary ladder D/A converter. A/D Converters- flash type, successive approximation, counter ramp type, dual slope type, characteristics of ADC and DAC.

Logic Families (7 hours)

Characteristics of logic families: fan-out, noise margin, propagation delay, power dissipation. Circuit diagrams and working of DTL, DCTL, I^2L, HTL, TTL, Totem pole TTL, ECL, CMOS logic families.

RECOMMENDED BOOKS			
S. No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Digital Design	Morris Mano	PHI, 4th edition
2.	Digital principles and Applications	Malvino Leach	Tata-McGraw Hill
3.	Digital System Principles and Applications	R J Tocci	PHI
4.	Modern Digital Electronics	R P Jain	Tata-McGraw Hill
5.	Digital Integrated Electronics	Taub Schilling	Tata-McGraw Hill

Course Code	**ESC 155**
Course Title	**Digital Design (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Prerequisites	10+2

List of Experiments

1. To Study the data sheets of TTL and ECL gates
2. Implementation of Adder and Subtractor using Logic Gates.
3. Implementation of Binary Adder/Subtractor.
4. Implementation of BCD Adder.
5. Design & implementation of Combinational circuits using Multiplexers
6. Design and implement a Universal shift register having shift-right, shift-left, SISO, PIPO capabilities.
7. Implementation of Flip-flops using Logic Gates.
8. Implementations of Ripple counter.
9. Implementation of Modulo-N Synchronous Counter.
10. Implementation of Synchronous counters with unused states and/or avoiding Lock Out condition.
11. To convert 8 bit Digital data to Analog value using DAC
12. To convert Analog value into 8 bit Digital data using ADC.

Course Code	**ESC 106**
Course Title	**Digital Electronics and Logic Design**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	The objective of this course is to provide knowledge about digital electronics circuitry

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

Section A

Module 1

IC Digital Logic Families Characteristics of digital IC.s, Transistor – Transistor Logic family, Standard TTL characteristics, Other TTL series, Open collector TTL, Wired OR/AND connection, Tristate TTL, Emitter Coupled Logic family, ECL NOR/OR gate and its characteristics, Metal-oxide semiconductor (MOS) family, NMOS and CMOS gates and their characteristics, CMOS transmission gate circuits .

(7 hours)

Module 2

Simplification of Boolean Functions Using Karnaugh map and Quine-Mccluskey methods, SOP, POS simplification, NAND and NOR implementations, other two-level implementation (AND OR INVERT).

(6 hours)

Module 3

Combinational Logic Design-Design procedure, Adder: Half adder, Full adder, Serial adder, Parallel adder & Carry look-ahead adder, Subtractors: Half subtractor & Full subtractor, BCD to Excess-3 code convertor, BCD to 7segment decoder, Parity generator and checker.

(7 hours)

Section B

Module 4

Combinational Logic Design using MSI Circuits Application of typical IC.s like 4bit parallel adder (ex : 7483), Encoders (ex :74148), Multiplexers (ex: 74151, 74153, 74157) and their use in realising boolean functions, Multiplexer trees, Demultiplexer / Decoders (e.g.: 74138, 74154) and their use in realising a boolean function and demultiplexer trees, 4it magnitude comparator (ex:7485).

(7 hours)

Module 5

Synchronous Sequential Logic-Analysis of clocked sequential logic, State reduction and assignment, Flipflop excitation tables, Design procedure, Design of sequential ciruits ex : 3bit up/down counter (mod < 8), 3bit up/down gray code counter, Serial adder.

(5 hours)

Module 6

Counters-Dependancy notation, Symbols for Decoder, Multiplexer, Flipflops, Registers, Counters, RAM. Flipflops, Asynchronous counters (mod 8 and less than 8), IC asynchronous counters (7493, 7490) and cascading, synchronous counters, binary and binary updown counters, IC synchronous counters (74192, 74190) and cascading.

(6 hours)

Module 7

Registers-Registers and their different modes of operation SISO, SIPO, PISO, PIPO, Shift registers (7495 / 74195), bidirectional universal shift register (74194), Applications of shift registers, Time delay, Ring counter, Johnson counter, Sequence generator; Programmable Logic Devices-PLD, PLA, PAL, FPGA structures & applications.

(7 hours)

TEXT BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Digital Design	M Morris Mano	3rd edition, 2006, PHI
2	Modern Digital Electronics	R. P. Jain	2nd edition, TMH
3	Digital Electronics	Bignell & Donovan Digital Electronics	4th edition, 2007, Thomson Learning
Reference Books			
1.	Digital Systems	Tocci	PHI, 6e, 2001
2.	Digital Systems Design	Uyemeru	2003, Thomson Learning
3.	Digital Integrated Electronics	Anand Kumar	2ed 2009

Course Code	**ESC 156**
Course Title	**Digital Electronics and Logic Design (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Prerequisites	10+2

List of Experiments

1. To study truth tables of AND, OR, NOR, NAND, NOT and XOR Gates.
2. To verify the truth tables of RS, of JK and T Flip Flops.
3. To fabricate and test the truth table of half and full adder.
4. To design and implement a ModuloN Counter.
5. To design and implement a Universal shift register.
6. Design and fabrication of synchronous counter
7. Design and fabrication of combinational circuits using Multiplexers
8. To convert 8 bit Digital data to Analog value using DAC.
9. To convert Analog value into 8 bit Digital data using ADC

Course Code	**ESC 109**
Course Title	**Electrical Measurements & Instrumentation**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50

SYLLABUS

Note for Examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION – A

Units, Dimensions and Standards: Introduction to MKS & Rationalized MKSA System, SI Units, Standards of EMF, Resistance, Capacitance and Inductance, Systematic errors. (4 hours)

General Theory of Analog Measuring Instruments: Operating torque, damping & controlling torque, T/W ratio, Pointers & Scales. Principles of operation of various types of electro mechanical indicating / registering instruments viz. PMMC, dynamometer for DC & AC measurement of V, I, W, frequency, phase & power factor etc., energy meter, their sources of error & compensation, shunts & multipliers, multi- meter.
(8 hours)

Potentiometers: Basic Potentiometer circuit, multiple range potentiometers, constructional details of potentiometers, applications of d-c potentiometers; self balancing potentiometers. A-C potentiometers, polar and co-ordinate types. (6 hours)

SECTION - B

Bridges: Sources and Detectors, General equation for bridge balance, Measurement of R,L,C,M, F etc by Wheatstone, Kelvin, Maxwell, Hay's, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges. Bridge sensitivity. Errors, Wagner Earthing Device. (9 hours)

Magnetic Measurements: Flux meter, B-H Curve, Hysteresis loop, Permeameters, AC Testing of Magnetic materials, Separation of iron losses, iron loss measurement by Wattmeter and Bridge methods.
(5 hours)

Instrument Transformers: Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of CTs. & PTs., Testing of CTS & PTS.
(3 hours)

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	A Course in Electrical & Electronics Measurement & Inst	A. K. Sawhney	Dhanpat Rai & sons.
2.	Electronic Inst. & Measurement techniques	W.D. Cooper	

Course Code	**ESC 159**
Course Title	**Electrical Measurements & Instrumentation (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

Instruction for Students: Perform at least eight experiments.

1. Study of principle of operation of various types of moving iron, PPMC and dynamo type measuring instruments.
2. Measurement of resistance using Wheatstone Bridge.
3. Measurement of resistance using Kelvin's Bridge.
4. Measurement of self inductance using Anderson's Bridge.
5. Measurement of capacitance using Schering Bridge.
6. Plotting of Hysteresis loop for a magnetic material using flux meter.
7. Measurement of frequency using Wein's Bridge.
8. To study the connections and use of Current and potential transformers and to find out ratio error.
9. Determination of frequency and phase angle using CRO.
10. Measurement of unknown voltage using potentiometer.
11. To find 'Q' of an inductance coil and verify its value using Q- meter.
12. To measure power factor using three voltmeters/ ammeters method.

Course Code	**ESC 104**
Course Title	**Object Oriented Programming using C++**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To provide students in-depth theoretical base and fundamentals of Object Oriented Programming paradigm. 2. To prepare students to design and code various projects using C++.
Course Outcome	After completion of this course, the students are able to: I. Understand the fundamentals of Object Oriented Programming paradigm. II. Learn and apply core objected oriented concepts like classes, objects and overloading, code reusability. III. Learn how the data flows between the programs and files in OO framework and implement various file handling operations. Analyze information systems in real-world settings and prepare an OO design for the same.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

Section A

Principles of Objected Oriented Programming **(03 hours)**

Advantages of OOP, comparison of OOP with Procedural Paradigm

C++ Constructs **(03 hours)**

Tokens, Expressions and control structures, various data types, and data structures, Variable declarations, Dynamic Initializations, Operators and Scope of Operators, Typecasting, Unformatted and formatted console I/O Operations

Functions **(05 hours)**

Classes and Objects: Prototyping, Referencing the variables in functions, Inline, static and friend functions. Memory allocation for classes and objects. Arrays of objects, pointers to member functions.

Constructors and Destructors **(05 hours)**

Characteristics and its various types, Dynamic Constructors, Applications, Order of Invocation, C++ garbage collection, dynamic memory allocation.

Polymorphism **(05 hours)**

Using function and Operator overloading, overloading using friend Functions, type conversions from basic data types to user defined and vice versa.

Section B

Inheritance **(06 hours)**

Derived classes, types of inheritance, various types of classes, Invocation of Constructors and Destructors in Inheritance, aggregation, composition, classification hierarchies,

metaclass/abstract classes.

Pointers **(05 hours)**

Constant pointers, Use of this Pointer, Pointer to derived and base classes, virtual functions, Bindings, Pure virtual Functions and polymorphism

I/O Operations and Files **(04 hours)**

Classes for files, Operations on a file, file pointers

Generic Programming With Templates **(06 hours)**

Definition of class template, Function Templates, Overloading Template Functions, Class templates and member functions templates with parameters, Standard C++ classes, persistent objects, streams and files, namespaces, exception handling, generic classes, standard template library: Library organization and containers, standard containers, algorithm and Function objects, iterators and allocators, strings, streams, manipulators, user defined manipulators and vectors

Introduction: **(03 hours)**

Object Oriented System, Analysis and Design.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1	Programming with C++, 2nd Edition	BalaGuruswamy	Tata McGraw Hill
2	C++ Primer Plus	Prata	Pearson Education
3	The C++ Programming Language	BjarneStroutstrup	Prentice Hall of India
4	The Complete Reference to C++	Schildt	Tata McGraw Hill
5	OOPs Using C++	SanjeevSofat	Khanna Publishers

Course Code	**ESC 154**
Course Title	**Object Oriented Programming using C++ (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

Objectives: Understanding of object oriented programming concepts and fundamentals of programming in C++ by designing and implementing moderately complex problems. Students should master modern tools for computer aided software engineering along with good program documentation.

1. Functions, Classes and Objects
2. Constructors and Destructors
3. Operator Overloading and Type Conversion
4. Inheritance and Virtual Functions
5. File Handling
6. Exception Handling and Generic Programming

Course Code	**ESC 107**
Course Title	**Introduction to Biotechnology and Bioengineering**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To build on the foundation of biological aspects with emphasis on origin and propagation of various life forms and their constituent molecules. 2. To introduce the students about tools and technique used in biotechnology and various biological processes.
Course Outcome	1. The students will be able to explain the structure, function and application of biological macromolecules. 2. The students will be able to identify the development, importance and scope of Biotechnology as a discipline. 3. Students will be aware of various analytical techniques and their applications.

SYLLABUS

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SECTION-A

Introduction to Biotechnology: Definition, scope and future prospects. (1 hour)

Engineering Calculations: System of units, conversion of units, dimensional consistency, scientific notations, mole concept, mixtures and solutions (2 hours)

Basic Tools in Biotechnology: pH meter, autoclave, incubator, lyophilizer, microscope (5 hours)

Separation Techniques in Biotechnology: Centrifugation, electrophoresis, chromatography (5 hours)

Introduction to Bioinformatics: Basic of Bioinformatics and its application. (2 hours)

Introduction to Fermentation Technology: Basic of fermentation processes and overview of bioreactors. (4 hours)

Nano-Bioengineering: Introduction of nano-biotechnology and biological systems at nanoscale, applications of nano biotechnology in medicine and healthcare (2 hours)

SECTION-B

Introduction to Bio-molecules : Role of water in biological systems, types of bonds and interactive forces in bio-molecules, carbohydrates, proteins, lipids and nucleic acids.

(8 hours)

Cell Structure and Function: Prokaryotic and eukaryotic cell (plant and animal cell), various cell organelles, their structure and functions (4 hours)

Tissues and Organ System: Basic structure and function of epithelial tissue, connective tissue, muscular tissue and nervous tissue. Outlines of the major biological systems – digestive, circulatory, nervous, endocrine and reproductive system. (10 hours)

Micro-organisms in Biotechnology: Introduction to microorganisms, historical concept, beneficial and harmful micro-organisms and their applications. (2 hours)

RECOMMENDED BOOKS

S. No.	NAME	AUTHOR(S)	PUBLISHER
1.	Biology	NA Campbell, J.B. Reece, L. A. Urry, M. L. Cain, S. A. Wasseman, P. V. Minorsky, R. B. Jackson	Pearson/Benjamin Cummings, 8th edition, 2008
2.	Biotechnology: Expanding Horizons	B. D. Singh.	Kalyani Publishers, 4th edition, 2012
3.	Lehninger Principles of Biochemistry	Nelson DL and Cox MM	W.H. Freeman and Company, USA. 6th edition, 2013
4.	Principles of Anatomy and Physiology	G. J. Tortora and B.H. Derrickson	John Wiley & Sons, 13th edition, 2011
5.	Biology of Microorganisms	Madigan, M.T., Bender, K.S., Buckley, D.H., Stahl, D.A. and Sattley, W.M.	Pearson (2017) 15th ed.

Course Code	**ESC 157**
Course Title	**Introduction to Biotechnology and Bioengineering (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Objectives (CO)	To impart to students skills to work with biotechn and familiarize them with different techniques us a biotechnology lab
Course Outcome	Students become proficient to use biological techniques in different scenarios pertaining to biotechnology

SYLLABUS

List of Experiments:

- To prepare the standard curve of Bovine Serum Albumin (BSA)
- To observe epithelial tissue under a microscope.
- To test the presence of carbohydrates in a given sample by Molisch's test/Anthrone test.
- To test the presence of proteins in a given sample by Ninhydrin test/Biuret test.
- Preparation and study of wet mounts of different microorganisms.
- Acquaintance to NCBI database.
- To verify the validity of Beer Lambert law using a spectrophotometer.
- To study the working and components of a CO_2 incubator.
- To study the working and components of an autoclave.

Course Code	**ESC 108**
Course Title	**Engineering Mechanics**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Prerequisites	Prior knowledge of integral and differential calculus and vector algebra
Course Objectives (CO)	The main objective of this course is to develop in the student the ability to analyze any engineering problem in a simple and logical manner with the help of free body diagrams and then to apply the basic principles of mechanics to solve the problem. The students should develop skills to apply equilibrium equations of statics to various problems to determine reactions and also could determine centre of gravity and moment of inertia of various bodies.
Course Outcome	The student can apply the principles of Engineering Mechanics to wide range of applications from Mechanical Engineering, Civil Engineering, Automotive Engineering to Medicine and Biology and can make use of the concept of free body diagrams and equilibrium equations in statics to solve practical engineering problems that are applicable to engineering design. At the end of the course students can determine centre of gravity and moment of inertia of any lamina which is required to solve practical engineering problems.

SYLLABUS

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SECTION-A

General Principles: Mechanics. Fundamental Concepts, Units of Measurement, The International System of Units, Numerical Calculations, General Procedure for Analysis.

Force Vectors: Scalars and Vectors, Vector Operations, Vector Addition of Forces, Addition of a System of Coplanar Forces, Cartesian Vectors, Addition and Subtraction of Cartesian Vectors, Position Vectors, Force Vector Directed Along a Line, Dot Product.

Equilibrium of a Particle: Condition for the Equilibrium of a Particle, the Free-Body Diagram, Coplanar Force Systems, Three-Dimensional Force Systems.

Force System Resultants: Cross Product, Moment of a Force - Scalar Formulation, Moment of a Force - Vector

Formulation, Principle of Moments, Moment of a Force about a specific Axis, Moment of a Couple, Movement of a Force on a Rigid Body, Resultants of a Force and Couple System, Further reduction of a Force and Couple System, Reduction of a Simple Distributed Loading.

Equilibrium of a Rigid Body: Conditions for Rigid-Body Equilibrium, Equilibrium in Two Dimensions and Free-Body Diagrams, Equations of Equilibrium, Two-Force and Three-Force Members, Equilibrium in Three Dimensions, Free-Body Diagrams, Equations of Equilibrium, Constraints for a Rigid-Body.

Structural Analysis: Simple Trusses, The Method of Joints, Zero-Force Members, The Method of Sections, Space Trusses, Frames and Machines.

SECTION-B

Internal Forces: Internal Forces developed in Structural Members, Shear and Moment Equations and Diagrams, Relationships between Distributed Load and Shear and Moment, Cables.

Friction – Characteristics of Dry Friction, Problems Involving Dry Friction, Wedges, Rolling Resistance.

Center of Gravity and Centroid – Center of Gravity and Center of Mass for a System of Particles, Center of Gravity and Center of Mass and Centroid for a Body, Composite Bodies, Theorems of Pappus and Goldinus, Resultant of a General Distribued Force System,

Moments of Inertia – Definition of Moments of Inertia for Areas, Parallel-Axis Theorem for an Area, Radius of Gyration of an Area, Moments of Inertia for an Area by Integration, Moments of Inertia for Composite Areas, Product of Inertia for an Area, Moments of Inertia for and Area about Inclined Axes, Mohr's Circle for Moments of Inertia, Mass Moment of Inertia.

Virtual Work – Definition of Work and Virtual Work, Principle of Virtual Work for a Particle and a Rigid Body, Principle of Virtual Work for a System of Connected Rigid Bodies, Conservative Forces, Potential Energy.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Engineering Dynamics	R.C. Hibbeler	Pearson
2.	Engineering Dynamics	F.P. Beer et al.	McGrawHill
3.	Engineering Dynamics	Merriam and Kraige	Wiley and Sons Publishers

Course Code	**ESC 158**
Course Title	**Engineering Mechanics (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Prerequisites	Prior knowledge of integral and differential calculus and vector algebra
Course Objectives (CO)	To become science engineers, having thorough knowledge of mathematics and physical science, a broad grasp of the principles and methods of mechanics, and an ability to apply those fundamentals in practical situations.
Course Outcome	1)An ability to design and conduct experiments as well as to analyze and interpret data. 2)An ability to design a system ,component or a process to meet desired needs with realistic constraints such as economic, environmental, social ,political, ethical, health and safety, manufacturability and sustainability.

List of Experiments:

1. Fundamentals of Statics - Accumulation and resolution of forces with force Parallelogram.
2. Equilibrium of forces. Law of levers, determination of moments and equilibrium of moments
3. Inclined Plane and Friction - Dynamic friction as a function of the normal force, contact area and surface properties of the friction body. Determination of the friction coefficient. Rolling friction.
4. To verify the law of Moments using Parallel Force apparatus. (simply supported type)
5. To verify the law of moments using Bell crank lever.
6. Experimental and analytical study of a 3 bar pin jointed Truss
7. Forces in a Simple Bar Structure – Measurement and Calculation of bar forces by the method of joints. Comparison od measurement result and calculation also use graphical method
8. Equilibrium of Moments on a Two Arm Lever - Fundamentals of the equilibrium of moments: applied forces, generated moments and equilibrium. Action of forces dependent on the lever arm
9. Crank and Connecting Rod - conversion of smooth rotary motion into reciprocating motion
10. To find CG and moment of Inertia of an irregular body using Computation method.
11. Inertia in Rotational Motion - Determination of the moment of inertia of various bodies.

Course Code	**ESC 110**
Course Title	**Engineering Graphics**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50

SYLLABUS

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Part A

1. Introduction: Technical lettering as per BIS codes, Tabs and Panels, The Command Line Box , Command Tools, Starting a New Drawing , Naming a Drawing , Drawing Units , Drawing Limits , Grid and Snap, Save and Save As, Open, Close, Terminology and Conventions, Linear Dimension, Dimension Styles, Units, Aligned Dimensions, Radius and Diameter Dimensions, Angular Dimensions, Ordinate Dimensions, Baseline Dimensions, Continue Dimension, Quick Dimension, Center Mark, MLEADER and QLEADER, Text Angle, Tolerances, Dimensioning Holes, Placing Dimensions, Fillets and Rounds, Rounded Shapes (Internal), Rounded Shapes (External), Irregular Surfaces, Polar Dimensions, Chamfers, Symbols and Abbreviations, Symmetry and Centerline, Dimensioning to Points

2. Fundamentals of 2D Construction: Line-Random Points, Erase, Line-Snap Point, Line-Dynamic Inputs, Construction Line, Circle, Circle Centerlines, Polyline, Spline, Ellipse, Rectangle, Polygon, Point, Text, Move, Copy, Offset, Mirror, Array, Rotate, Trim, Extend, Break, Chamfer, Fillet, Table, Osnap, Osnap-Endpoint, Osnap-Snap From, Osnap-Midpoint, Osnap-Intersection, Osnap-Apparent Intersection, Osnap-Center, Osnap-Quadrant, Osnap-Perpendicular, Osnap-Tangent, Osnap-Nearest, Grips, Grips-Extend, Grips-Move, Grips-Rotate, Grips-Scale, Grips-Mirror, Edit Polyline, Edit Spline, Edit Text, Constructing the Bisector of an Angle

3. Sketching: Establishing Your Own Style, Graph Paper, Pencils, Lines, Proportions, Curves, Isometric Sketches, Oblique Sketches, Perspective Sketches, Working in Different Orientations

4. Orthographic Views: Points, Lines Parallel to both H P and V P, Parallel to one and inclined to other, and inclined to both, contained in profile plane. True length and angle orientation of straight line: rotation method and auxiliary plane method, Difference between plane and lamina. Projection of lamina Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, Definition of solids, types of solids, and elements of solids. Projection of solids in first quadrant, with axis parallel to one and perpendicular to other, axis parallel to one inclined to other, axis inclined to both the principle plane, axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible details in the projection. Three Views of an Object, Visualization, Hidden Lines, Hidden Line Conventions, Drawing Hidden Lines, Precedence of Lines.

Part B

5. Sectional Views: Cutting Plane Lines, Section Lines, Hatch, Styles of Section Lines, Sectional View Location, Holes in Sections, Gradients, Offset Sections, Multiple Sections, Aligned Sections, Drawing Conventions in Sections, Half, Partial, and Broken-Out Sectional Views, Removed Sectional Views, Sectional View of Castings.

6. Isometric Views: Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric projection of solids such as cube, prism, pyramid and cylinder.

7. Development and Intersection: Purpose of development, Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, and development of surface of sphere. Intersection of solids.

8. Auxiliary Views: Projection Between Normal and Auxiliary Views ,Transferring Lines Between Views , Projecting Rounded Surfaces , Projecting Irregular Surfaces , Partial Auxiliary Views , Sectional Auxiliary Views.

Books

Title	Author	Publisher
Engineering Graphics with AutoCAD	Bethune	Pearson
Fundamentals of Engineering Drawing	Luzadder	Literary Licensing, LLC
Engineering Drawing and Design	Jensen	Mc-Graw Hill
Manual of Engineering Drawing	French	WENTWORTH Press

Course Code	**ESC 160**
Course Title	**Engineering Graphics (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

Practical based on theory course

List of Physics Courses

Course Code	BSC 105
Course Title	Introduction to Quantum Mechanics
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	50 50

SYLLABUS

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Section A

Special Theory of Relativity

Inertial and non-inertial frames of reference, Galilean transformation, Michelson Morley Experiment, Postulates of special theory of relativity, Lorentz transformation, Simultaneity, Length contraction, Time dilation, Doppler effect, Addition of velocities, variation of mass with velocity, mass-energy relation, Relativistic momentum (8)
(Section 1.1 to 1.5, 1.7 to 1.9 of Book 1)

Origin and Postulates of Quantum Mechanics

Quantum theory of light, Blackbody Radiation, Photoelectric effect, Compton effect, X-rays production, spectrum & diffraction (Bragg's law), pair production, photons & gravity, Gravitational Red Shift, Black holes, de-Broglie hypothesis, particle diffraction, uncertainty principle and its applications (9)

Postulates of quantum mechanics, wave function, Born interpretation and normalization, Schrodinger theory, Time-dependent and Time-independent Schrodinger equation, Operators, expectation values, Ehrenfest theorem (7)
(Sections 2.1-2.10, 3.1-3.5, 3.7-3.10, 5.1-5.7 of Book 1)

Section B

Applications of Quantum Mechanics

Particle in a box (infinite potential well), Potential step, Finite Potential Well and Barrier, Tunneling, Linear harmonic oscillator (one-dimensional), 3-D rigid box and degeneracy (9)
(Sections 5.8 – 5.11 of Book 1)

Application of Quantum Mechanics to Solids

Free Electron theory of Metals (Classical and Sommerfield), Bloch's theorem for particles in a periodic potential, Kronig-Penney Model and origin of energy bands, conductors, insulators and semiconductors, Fermi level, density of states, Effective mass, Specific heat of solids (12)
(Sections 6.35-6.38, 6.40, 6.41, 7.1-7.5 of book 4 and Section 1 of Chapter 10 of Book 2)

References:

1. Concepts of Modern Physics, by Arthur Beiser (McGraw-Hill)
2. Introduction to Solids by Leonid V. Azaroff
3. Elementary Solid state Physics by M.Ali Omar (Pearson Education)
4. Solid State Physics, by C. Kittel (Wiley Eastern)
5. Solid State Physics, by S.O. Pillai (New Age International

Course Code	BSC 155
Course Title	Introduction to Quantum Mechanics (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

1) To study the quantized energy level of the first excited state in the Argon using the Frank-Hertz setup.
2) To find the value of Planck's constant and evaluate the work function of cathode material by used of photoelectric cell.
3) To study various characteristics of photo-voltaic cell: (a) Voltage-current characteristics, (b) loading characteristics, (c) power-resistance characteristics and (d) inverse square law behavior of the photo-current with distance of source of light from photo-voltaic cell
4) To study the response of a photo-resistor to varying intensity of light falling on it and deduce spectral sensitivity of its semiconductor material.
5) To study the Balmer Series of Mercury and Hydrogen spectrum using diffraction grating and calculate Rydberg constant.
6) To evaluate charge on an oil drop using Millikan's oil drop method.
7) To verify Rutherford's alpha scattering formula using a mechanical model.

Course Code	BSC 108
Course Title	Condensed Matter Physics
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	50 50

SYLLABUS

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Part A

Crystal structure: Space lattices and their symmetries, crystal structures (cubic and hexagonal cells), assignment of coordinates, directions and planes in crystals, linear, planer and space densities in crystals, close packed morphology (Hexagonal and cubic close packing), single and polycrystalline structures, interstitial spaces (trigonal, tetrahedral and octahedral voids, crystal Structure analysis, X-ray diffraction and Bragg's law, crystal defects, Point, line, surface and volume imperfections (10)

Theory of Metals: Free electron theory, electrical properties, thermal properties, motion in magnetic field (cyclotron resonance), Zone theory. Band theory of solids, Kronig-Penney Model (qualitative), conductors, insulators and semiconductors (5)

Dielectric Materials: Review of basic formulas, dielectric constant and polarizability, sources of polarizability, classical treatment of dipolar, ionic and electronic polarizability, piezoelectricity, ferroelectrcity. (4)

Part B

Magnetic Materials: Review of basic formulas, magnetic susceptibility, classification of materials, Langevin diamagnetism, paramagnetism (only classical treatment), magnetism in metals, ferromagnetism in insulators, anti-ferromagnetism and ferrimagnetism, ferromagnetism in metals, ferromagnetic domains, hysteresis (8)

Superconductivity: Zero resistance, occurrence of superconductivity, Meissner effect, critical field, thermodynamics of superconducting transitions, electrodynamics of superconductors, qualitative idea of BCS theory. (3)

Semiconductors: p-type and n-type semiconductors, statistics of electrons and holes, Hall effect (for single as well as both type of charge carriers) (3)

Nanotechnology: Introduction, Synthesis of Nanoparticles: Mechanical Method, Sputtering, Chemical Vapour Deposition, Sol-gel Technique, Applications of Nanotechnology (4)

References:

1. Material science and Engineering – An Introduction by William D Callister, Jr, Sixth Edition, John Wiley and Sons.
2. Material science and Engineering – A First Course by V.Raghvan Fourth Edition, Eastern Economy Edition
3. Solid State Physics (New Age Publishers) – S.O. Pillai
4. Introduction to Solids (Tata McGraw Hill, Third Edition) - Leonid V Azaroff

Course Code	BSC 158
Course Title	Condensed Matter Physics (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

PRACTICALS

1. To find the energy band gap of the given semiconductor by four probe method.
2. To study the Hall Effect of a given semiconductor.
3. To determine the dielectric constant of the given materials.
4. To study the B-H curve of the ferromagnetic materials.
5. To determine the value of e/m for electron by long solenoid (helical) method.
6. To study the variation of magnetic field with distance along the axis of a circular coil carrying current by plotting a graph.

Course Code	BSC 104
Course Title	Oscillations and Optics
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	50 50

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION - A

Ultrasonics: Production and detection of ultrasonics, reverberation, sabine's formula (no derivation) (3)

SHM: Review of basic kinematics (displacement, velocity, acceleration, time period and phase of vibration) and dynamics (restoring force and energetics) of simple harmonic motion, differential equation of SHM, superposition of two SHM in one dimension, charge oscillations in LC circuits (4)

Damped Oscillations: Concept and cause of damping, differential equation of a damped oscillator and different kinds of damping, Methods of describing damping of an oscillator - logarithmic decrement, relaxation time, quality factor, band width. Series LCR circuit as a damped oscillator. (5)

Forced Oscillations: States of forced oscillations, differential equation of forced oscillator – its displacement, velocity and impedance, behaviour of displacement and velocity with driver's frequency, Power, bandwidth, Quality factor and amplification of forced oscillator, resonance in forced oscillators, forced oscillations in series LCR circuit (6)

Wave Motion: Wave equation and its solution, characteristic impedance of a string, reflection and transmission of waves on a string at a boundary, reflection and transmission of energy, the matching of impedances (3)

SECTION – B

Interference: Division of wave front and amplitude; Fresnel's biprism, Newton's rings, Michelson interferometer and its applications for determination of λ and dλ. (4)

Diffraction: Fresnel and Fraunhofer diffraction, qualitative changes in diffraction pattern on moving from single slit to double slit, plane transmission grating, dispersive power & resolving power of a grating. (5)

Polarization: Methods of polarization, analysis of polarized light, quarter and half wave plates, double refraction. (4)

Lasers: Elementary idea of LASER production, spontaneous emission, stimulated emission, Einstein's coefficients, Helium-Neon, Ruby and semiconductor lasers, applications of lasers. (4)

Fibre Optics: Basics of optical fibre - its numerical aperture, coherent bundle, step index and graded index fibre, material dispersion, fibre Optics sensors, applications of optical fibre in communication systems. (3)

Holography: Basic principle, theory and requirements. (2)

References:

1. Physics for Engineers (Prentice Hall India) - N.K. Verma
2. Physics of Vibrations and Waves (5th Edition, John Wiley & Sons) – H.J.Pain
3. Optics – Ajoy Ghatak

Course Code	BSC 154
Course Title	Oscillations and Optics (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

PRACTICALS

1. To find the wavelength of sodium light using Fresnel's biprism.(3)
2. (i) To determine the wavelength of He-Ne laser using transmission grating.
   (ii) To determine the slit width using the diffraction pattern.
3. To determine the wave length of sodium light by Newton's rings method.
4. To determine the wave length of sodium light using a diffraction grating.
5. To find the specific rotation of sugar solution using a Bi-quartz Polarimeter.
6. To design a hollow prism and used it find the refractive index of a given liquid

Course Code	BSC 109
Course Title	Mechanics
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	50 50

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

Part A

SHM: Review of basic kinematics (displacement, velocity, acceleration, time period and phase of vibration) and dynamics (restoring force and energetics) of simple harmonic motion, differential equation of SHM, superposition of two SHM in one dimension, charge oscillations in LC circuits (4)

Damped Oscillations: Concept and cause of damping, differential equation of a damped oscillator and different kinds of damping, Methods of describing damping of an oscillator - logarithmic decrement, relaxation time, quality factor, band width. Series LCR circuit as a damped oscillator. (5)

Forced Oscillations: States of forced oscillations, differential equation of forced oscillator – its displacement, velocity and impedance, behaviour of displacement and velocity with driver's frequency, Power, bandwidth, Quality factor and amplification of forced oscillator, resonance in forced oscillators, forced oscillations in series LCR circuit (5)

Coupled Oscillations: Basic idea of coupled oscillators, Stiffness coupled oscillators and inertia coupled oscillators, normal coordinates, degrees of freedom and normal modes of vibrations. (5)

Part B

Motion under inverse square force

Force between a Point Mass and Spherical shell. Force between a Point Mass and Solid Sphere, Gravitational and Electrostatic self-energy. Gravitational energy of the Galaxy and of uniform sphere; Orbits and their eccentricity, Two-body problem - reduced mass. (7)

Special Theory of Relativity

Inertial and non-inertial frames of reference, Galilean transformation, Michelson Morley Experiment, postulates of special theory of relativity, Lorentz transformation, Simultaneity, Length contraction, Time dilation, Doppler effect, Addition of velocities, variation of mass with velocity, mass-energy relation, four vectors, space-time continuum. (9)

References:

1. Physics of Vibrations and Waves (5th Edition, John Wiley & Sons) – H.J.Pain
2. Mechanics by Hans and Puri

Course Code	BSC 159
Course Title	Mechanics (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

PRACTICALS

1. To find the moment of inertia of a flywheel.
2. To determine the value of acceleration due to gravity at a place with kater's pendulum.
3. To determine the velocity of ultrasonics waves in a given liquid.
4. To determine the frequency of A.C. mains using a sonometer and an electro-magnet.
5. To find the capacitance of a capacitor using flashing and quenching of a neon lamp.
6. To plot graph between current and frequency in a series LCR circuit and to find the resonant frequency.

Course Code	**BSC 107**
Course Title	**Physics of Materials**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION - A

Crystal structure: Bonding forces and energies, Primary and Secondary bonds, Space Lattices, Symmetries in a cubic lattice, Crystal Structures (cubic and hexagonal cells), Assignment of coordinates, directions and planes in crystals, Linear, Planar and Space densities in crystals, close packed morphology (Hexagonal and cubic close packing), single and polycrystalline structures, interstitial spaces (trigonal, tetrahedral and octahedral voids)

Structure of ceramics (NaCl, Zinc blende, silica and silicates, diamond crystal, Graphite, Fullerenes and carbon nanotubes)

Structure of polymers, crystallinity of long chain polymers

Crystal Structure analysis, X-ray diffraction and Bragg's law, Experimental methods for study of X-ray diffraction pattern, Crystal Defects (Point, line, surface and volume imperfections) (14 hours)

Diffusion: Diffusion mechanisms, steady state diffusion, non-steady state diffusion, factors affecting diffusion, applications based on diffusion (corrosion resistance of Duralumin, carburization of steel, decarburization of steel, doping of semiconductors) (3 hours)

Elastic, Anelastic and Viscoelastic Behaviour Elastic behaviour and its atomic model, rubber like elasticity, anelastic behaviour, relaxation processes, viscoelastic behaviour (3 hours)

SECTION - B

Plastic Deformations and strengthening mechanisms : Tensile properties (Yield strength, Tensile Strength, Ductility, Resilience, Toughness), Dislocations and plastic deformation, characteristics of dislocations, slip systems, slip in single crystals, plastic deformation of polycrystalline materials, mechanisms of strengthening in metals (grain size reduction, solid-solution strengthening, strain hardening), recovery, recrystallization and grain growth (5hours)

Fracture, Fatigue and Creep : Fracture (Ductile and brittle fractures), principles of fracture mechanics, fracture toughness, ductile to brittle transitions Cyclic stresses, S-N curve, crack initiation and propagation, factors that affect fatigue life, environmental effects, generalized creep behavior, stress and temperature effect (5 hours)

Phase Diagrams : One-Component (or Unary) Phase Diagrams, Binary Isomorphous Systems, Interpretation of Phase Diagrams, Development of Microstructure in Isomorphous Alloys, Mechanical Properties of Isomorphous Alloys ,Binary Eutectic Systems, Development of Microstructure in Eutectic Alloy, Equilibrium Diagrams Having Intermediate Phases or Compounds, Eutectic and Peritectic Reactions, the Iron-Carbon system. (6 hours)

Phase Transformations: Kinetics of phase transformation, kinetics of solid state reactions, Isothermal transformation diagrams, continuous cooling transformation, temper embrittlement (4 hours)

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Material science and engineering – An Introduction	William D Callister	6^{Th} edition, John Willey and Sons.
2.	Material Science and Engineering – A First Course	V. Raghvan	4^{th} edition, Eastern economy edition
3.	Solid State Physics	S. O. Pillai	New Age International
4.	Introduction to Solids	Leonid V Azaroff	Tata McGraw Hill, 3^{rd} edition.

Course Code	**BSC 157**
Course Title	**Physics of Materials (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

1. To find the energy band gap of the given semiconductor by four probe method.
2. To study Hall Effect in the given semiconductor.
3. To study the B-H curve of the given ferromagnetic materials.
4. To find the Curie temperature of a Ferroelectric material by measuring Capacitance as a function of temperature.
5. To determine the thermal conductivity of an insulator material using guarded plate method (Lee's disc method).
6. To study the quantized energy level of the first excited state in the Argon using the Frank-Hertz setup.
7. To find the value of Planck's constant and evaluate the work function of cathode material by used of photoelectric cell.
8. To study various characteristics of photo-voltaic cell: (a) Voltage-current characteristics, (b) loading characteristics, (c) power-resistance characteristics and (d) inverse square law behavior of the photo-current with distance of source of light from photo-voltaic cell
9. To study the response of a photo-resistor to varying intensity of light falling on it and deduce spectral sensitivity of its semiconductor material.

Course Code	**BSC 110**
Course Title	**Electromagnetism**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

Part A

Vector Calculus:
Overview of vector algebra, cartesian coordinates, spherical and polar coordinates, ∇ del operator, gradient, divergence, curl, scalar and vector potential. Dirac Delta Function. 4 **lectures**

Electromagnetic Waves:
Maxwell's equations, in both differential and integral form, uniform plane wave propagation in free space and good conductors. boundary conditions: reflection and transmission, energy and momentum of electromagnetic waves, poynting's theorem and skin effect. Reflection and transmission coefficients for oblique and normal incidence.
8 lectures

Dielectrics: Electric fields in matter, macroscopic electric field, dielectric constant, induced dipoles, alignment of polar molecules, polarization, classical treatment of dipolar, ionic and electronic polarizabilty, Claussius Mossotti equation, depolarization field. **8 lectures**

Part B

Magnetism and magnetic materials: A brief introduction to origin of magnetism, magnetic units, different types of magnetic materials such as dia-, para-, ferro-, antiferro-magnetism. Types of magnetism, susceptibility, permeability and their relation. Langevin diamagnetism and paramagnetism (classical treatment only). Ferromagnetic domains, hysteresis. **10 Lectures**

Superconductivity: Introduction to super conductors, Type I and II superconductors, Meissner Effect, London equation, London penetration depth. Isotope effect, energy gap, BCS theory of perconductivity, Coherence length. flux quantization in a superconducting ring, persistent currents. DC Josephson effect, AC Josephson effect. Applications of Superconductors. A brief overwiew of High temperature super conductors,
10 Lectures

1.Solid State Physics by Ashcroft & Mermin, (1976).
2. Introduction to Solid State Physics, 7th Eddition, by C. Kittle, (1996).
3.Elementary Solid State Physics by M. A. Omar, (1975).
4. Quantum Theory of the Solid State by J. Callaway, (1991).
5. Principles of the Theory of Solids by J. M. Ziman, (1969).

Course Code	**BSC 150**
Course Title	**Electromagnetism (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

1. To find the energy band gap of the given semiconductor by four probe method.
2. To study the Hall Effect of a given semiconductor.
3. To determine the dielectric constant of the given materials.
4. To study the B-H curve of the ferromagnetic materials.
5. To determine the value of e/m for electron by long solenoid (helical) method.
6. To study the variation of magnetic field with distance along the axis of a circular coil carrying current by plotting a graph.
7. To find the Curie temperature of a Ferroelectric material by measuring Capacitance as a function of temperature.
8. To find the capacitance of a capacitor using flashing and quenching of a neon lamp.
9. To plot graph between current and frequency in a series LCR circuit and to find the resonant frequency.