J.C. Bose University of Science & Technology, YMCA, Faridabad
(A Haryana State Government University)
(Established by Haryana State Legislative Act No. 21 of 2009 & Recognized by UGC Act 1956 u/s 22 to Confer Degrees)
Accredited 'A' Grade by NAAC

Ref. No. Civil/2022/406 Dated: 16/12/2022

CERTIFICATE

This is to certify that the scheme & syllabi of B.Tech. - Civil Engg / Fashion & Apparel Engg (course name & scheme) is duly approved by the competent body/authority and to the best of my knowledge the contents of the same, are correct in all respect.

This Scheme & Syllabus has been approved in — (meeting no.) of BOS held on dated —.

16.12.22

Date: 16/12/2022

Signature & Stamp of Chairperson
Name: Prof Tilak Raj
Deptt. Name: Civil Engg
Chairperson
Civil Engineering Department
J.C. Bose University of Sc. & Technology,
YMCA, Faridabad

B. Tech. Civil Engg & FAE

PROPOSED SCHEME AND SYLLABUS OF I YEAR UNDERGRADUATE DEGREE COURSES IN

CIVIL ENGINEERING / FASHION & APPAREL ENGINEERING

Session 2021-22

J.C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA
FARIDABAD

Curriculum for First Year
Undergraduate Degree Courses in Engineering & Technology

Chapter -1
General, Course structure & Theme
&
Semester-wise credit distribution

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credits
2 Hours Practical(Lab)/week	1 credit

B. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional core courses
PEC	Professional Elective courses
OEC	Open Elective courses
LC	Laboratory course
MC	Mandatory courses
PROJ	Project

C. Category of Courses:

BASIC SCIENCE COURSES

Sl. No.	Course Title	Hours per week			Credits
		L	T	P	
2	Physics	3	1	3	5.5
1	Chemistry-I	3	1	3	5.5
3	Mathematics –I	3	1	0	4
4	Mathematics –2	3	1	0	4

ENGINEERING SCIENCE COURSES

Sl. No.	Course Title	Hours per week			Credits
		L	T	P	
1	Basic Electrical Engineering	3	1	2	5
2	Engineering Graphics & Design	0	0	4	2
3	Programming for Problem Solving	3	0	4	5
4	Workshop I	0	0	4	2
5	Workshop II	0	0	4	2

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT

Sl. No.	Course Title	Hours per week			Credits
		L	T	P	
1	English	2	0	2	3

Chapter -2

Detailed first year curriculum contents

I. Mandatory Induction program

[Induction program for students to be offered right at the start of the first year.]

3 weeks duration
• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD SCHEME OF INSTRUCTION

B.TECH 1st YEAR (SEMESTER -I) (Civil Engg. / FAE) COURSE STRUCTURE

Course Notation	Course Code	Course Title	L	T	P	Credits	Sessional	External	Category Code
B	BSC101B	Physics(Mechanics)	3	1	-	4	25	75	BSC
C	BSC103B (for Civil*) ***BSC 103D for FAE**	Mathematics-I (Civil: Calculus, Multivariable Calculus & Linear Algebra)	3	1	-	4	25	75	BSC
B	ESC-102A-21	Engineering Graphics & Design	-	-	4	2	30	70	ESC
B	ESC103	Programming for Problem solving	3	-	-	3	25	75	ESC
C	ESC-104A-21	Workshop- I	-	-	4	2	30	70	ESC
B	BSC104B	Physics lab	-	-	3	1.5	15	35	BSC
B	ESC105	Programming for Problem solving Lab	-	-	4	2	15	35	ESC

Note: Exams duration will be as under

a. Theory exams will be of 03 hours duration.
b. Practical exams will be of 02 hours duration
c. Workshop exam will be of 03 hours duration

Important Notes:

Significance of the Course Notations used in this scheme: -
C = These courses are common to both the groups Group-A and Group-B.
A = Other compulsory courses for Group-A.
B = Other compulsory courses for Group-B.

Students will study either

Group A (BSC103..,ESC101, BSC102,ESC104,HSMC101,ESC105,BSC105,HSMC102)

OR

Group B (BSC101..,BSC103A/B,ESC102,ESC103,ESC104,BSC104,ESC105)

(* Branch specific scheme and syllabus for Maths-I, Math-II and Physics on next page)

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
PROPOSED SCHEME OF INSTRUCTION
B.TECH 1st YEAR (SEMESTER -II) (Civil Engg. & FAE) COURSE STRUCTURE

Course Notation	Course Code	Course Title	L	T	P	Credits	Sessional	External	Category Code
C	BSC106 B (for Civil*) ***BSC 106D for FAE**	Mathematics-II (Civil: Differential Equations)	3	1	-	4	25	75	BSC
B	ESC101-A	Basic Electrical Technology	3	1	-	4	25	75	AECC
B	BSC 102	Chemistry	3	1	-	4	25	75	BEC
C	ESC-106A-21	Workshop- II	-	-	4	2	30	70	BEC
B	HSMC101	English	2	-	-	2	25	75	BEC
B	ESC107-A	Basic Electrical Technology Lab	-	-	2	1	15	35	BSC
B	BSC 105	Chemistry Lab	-	-	3	1.5	15	35	BEC
B	HSMC102	English Lab	-	-	2	1	15	35	BEC

Note: Exams duration will be as under

a. Theory exams will be of 03 hours duration.
b. Practical exams will be of 02 hours duration
c. Workshop exam will be of 03 hours duration

S.No.	Course code	Course Title	Branch
1.	BSC101 B	**Physics** (Introduction to Electromagnetic Theory)	**Mechanical Engineering, Automation Engineering, Automobile Engineering**
	BSC104A	**Physics** (Introduction to Electromagnetic Theory) Lab	
2	BSC101B	**Physics** (Mechanics)	**Civil Engineering, Fashion Technology**
	BSC104B	**Physics** (Mechanics) Lab	
3	BSC101C	**Physics** (Waves and Optics)	**Electrical Engineering, Electronics & Communication Engineering, Electronics Instrumentation and Control Engineering, Electrical and Electronics Engineering**
	BSC104C	**Physics** (Waves and Optics) Lab	
4	BSC101D	**Physics** (Semiconductor Physics)	**Computer Engineering, Computer Science & Engineering, Information Technology**
	BSC104D	**Physics** (Semiconductor Physics)	
5	BSC103A	**Mathematics-I** (Calculus and Linear Algebra)	**Mechanical Engineering, Automation Engineering, Automobile Engineering**
6	BSC103 B	**Mathematics-I** (Calculus, Multivariable Calculus & Linear Algebra)	**Civil Engineering**
7	BSC103 C	**Mathematics-I** (Calculus and Differential Equations)	**Electrical Engineering,**
8	BSC103 D	**Mathematics-I** (Calculus and Linear Algebra)	**Electronics & Communication Engineering, Electronics Instrumentation and Control Engineering, Electrical and Electronics Engineering, Fashion Technology**
9	BSC103 E	**Mathematics-I** (Calculus and Linear Algebra)	**Computer Engineering, Computer Science & Engineering, Information Technology**
10	BSC106 A	**Mathematics-II** (Calculus, ODE & Complex Variables)	**Mechanical Engineering, Automation Engineering, Automobile Engineering**
11	BSC106 B	**Mathematics-II** (Differential Equations)	**Civil Engineering**
12	BSC106 C	**Mathematics-II** (Linear Algebra, Transform Calculus and Numerical methods)	**Electrical Engineering,**
13	BSC106 D	**Mathematics-II** (Calculus, Ordinary Differential Equations and Complex Variable)	**Electronics & Communication Engineering, Electronics Instrumentation and Control Engineering, Electrical and Electronics Engineering, Fashion Technology**
14	BSC106 E	**Mathematics-II** (Probability & Statistics)	**Computer Engineering, Computer Science & Engineering, Information Technology**

Undergraduate Degree courses

Course code	BSC102(Th)/BSC105(Lab)				
Category	Basic Science Course				
Course title	**Chemistry (Theory & Lab.)** **Contents** (i) Chemistry-I (Concepts in chemistry for engineering) (ii) Chemistry Laboratory				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester –I/II
	3	1	3	5.5	
Pre-requisites (if any)	-				

(i)Chemistry (Concepts in chemistry for engineering) [L : 3; T:1; P : 0 (4 credits)]

Detailed contents

(i) Atomic and molecular structure (12 lectures)

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

(ii) Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

(iii) Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

(iv) Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) ***Periodic properties (4 Lectures)***
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

(vi) ***Stereochemistry (4 lectures)***
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

(vii) ***Organic reactions and synthesis of a drug molecule (4 lectures)***
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Text Books

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

(ii) **Chemistry Laboratory[L : 0; T:0 ; P : 3 (1.5 credits)]**

Choice of 10-12 experiments from the following:

- Determination of surface tension and viscosity
- Thin layer chromatography
- Ion exchange column for removal of hardness of water
- Determination of chloride content of water
- Colligative properties using freezing point depression
- Determination of the rate constant of a reaction
- Determination of cell constant and conductance of solutions
- Potentiometry - determination of redox potentials and emfs
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Lattice structures and packing of spheres
- Models of potential energy surfaces
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal
- Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

Laboratory Outcomes

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

(i) Engineering Mechanics, 2nd ed. — MK Harbola
(ii) Introduction to Mechanics — MK Verma
(iii) An Introduction to Mechanics — D Kleppner& R Kolenkow
(iv) Principles of Mechanics — JL Synge & BA Griffiths
(v) Mechanics — JP Den Hartog
(vi) Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
(vii) Mechanical Vibrations — JP Den Hartog
(viii) Theory of Vibrations with Applications — WT Thomson

Paper: Physics Mechanics Lab
Paper Code: BSC-104B

No. of Credits: 1.5
L: 0, T: 0, P: 3

Internal: 15
External Exam: 35
Total: 50

Select at least 06 experiments from the following

1. To determine the height of a building using a Sextant.
2. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the elastic Constants of a wire by Searle's method.
7. To determine the value of g using Bar Pendulum.
8. To determine the value of g using Kater's Pendulum

Note: Experiments may be added or deleted as per the availability of equipments.

Reference Books

- Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- Engineering Practical Physics, S.Panigrahi & B.Mallick,1515, Cengage Learning India Pvt. Ltd.
- A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 1511,Kitab Mahal

Course code	BSC103B				
Category	Basic Science Course				
Course title	Mathematics –I				
Scheme and Credits	L	T	P	Credit	Semester - I
	3	1	0	4	
Pre-requisites (if an	-				

BSC103B: Mathematics-I (Calculus, Multivariable Calculus & Linear Algebra) (Civil Engineering)

Module 1: Calculus: (6 hours) Calculus (Single Variable)

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

Module 2: Calculus: (6 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima. Module 3: Sequences and series: (10 hours)

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Multivariable Calculus

Module 4: Multivariable Calculus (Differentiation) (10 hours)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Module 5: Multivariable Calculus (Integration) (6 hours)

Multiple Integration: Double integrals, change of order of integration. Double integral in polar coordinates, Applications of double integration to find area enclosed by plane curves and volume of solids of revolution. Triple integral: Change of variables, volume of solids.

Module 6:Matrices (8 hours)

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

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

6. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra,

Affiliated East–West press, Reprint 2005.
7. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

BSC103D: MATHEMATICS 1(Calculus and Linear Algebra).

(Fashion Technology)

OBJECTIVES:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

- To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.
- To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To familiarize the student with functions of several variables that is essential in most branches of engineering.
- To develop the essential tool of matrices and linear algebra in a comprehensive manner.

Module 1: Calculus: (6 hours)

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

Module 2: Calculus: (6 hours)

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

Module 3:Sequences and series: (10 hours)

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

Module 4:Multivariable Calculus (Differentiation): (8 hours)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Module 5:Matrices (10hours)

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

Textbooks/References:

1.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition,Pearson, Reprint, 2002.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

5.D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

6.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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Course code	BSC106B				
Category	Basic Science Course				
Course title	**Mathematics -II (General) (Calculus, Ordinary Differential Equations and Complex Variable)**				
Scheme and Credits	**L**	**T**	**P**	**Credit**	
	3	**1**	**0**	**4**	
Pre-requisites (if any)	-				

BSC106B: MATHEMATICS II (Differential equations)

(Civil Engineering)

Module 1:First order ordinary differential equations(6 hours)

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

Module 2:Ordinary differential equations of higher orders (Prerequisite 2c, 4a) (8 hours) Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Textbooks/References (for Module 1 and 2):

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary
Value Problems, 9th Edition, Wiley India, 2009.

3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.

6. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.

Module 3:Partial Differential Equations – First order (Prerequisite 5a-b) (6 hours) First order partial differential equations, solutions of first order linear and non-linear PDEs.

Module 4: Partial Differential Equations – Higher order (Prerequisite 5b-c) (10 hours) Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

Textbooks/References (for module 3 and 4):

1. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
2. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
3. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
4. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.

BSC106D: MATHEMATICS II (Calculus, Ordinary Differential Equations and Complex Variable)
(Fashion Technology)

OBJECTIVES:

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

a. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
b. To introduce effective mathematical tools for the solutions of differential equations that model physical processes.
c. To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

Module 1:Multivariable Calculus (Integration): (10 hours)

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

Module 2:First order ordinary differential equations:(6 hours)

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

Module 3:Ordinary differential equations of higher orders:(8 hours)

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

Module 4: Complex Variable – Differentiation:(8 hours):

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

Module 5: Complex Variable – Integration:(8 hours):

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

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.

4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

Course code	ESC103(Th)/ESC105(Lab)				
Category	Engineering Science Course				
Course title	**Programming for Problem Solving (Theory & Lab.)**				
Scheme and Credits	L	T	P	Credit	Semester – I/II
	3	0	4	5	
Pre-requisites (if any)	-				

(i) Programming for Problem Solving ([L : 3; T:0; P : 0 (3 credits)] [contact hrs : 40]

Detailed contents

Unit 1Introduction to Programming **(4 lectures)**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture).**

Idea of Algorithm: steps to solve logical and numerical problems.

Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**

Unit 2:Arithmetic expressions and precedence **(2 lectures)**

Conditional Branching and Loops **(6 lectures)**

Writing and evaluation of conditionals and consequent branching **(3 lectures)**

Iteration and loops **(3 lectures)**

Unit 3Arrays **(6 lectures)**

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

Unit 4 Basic Algorithms **(6 lectures)**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 5 Function **(5 lectures)**

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

Unit 6Recursion **(4 -5 lectures)**

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 7Structure **(4 lectures)**
Structures, Defining structures and Array of Structures

Unit 8Pointers **(2 lectures)**
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit 9File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Text Books
(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books
(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Outcomes
The student will learn
- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

(ii) Laboratory - Programming for Problem Solving[L : 0; T:0 ; P : 4 (2credits)]

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations

Laboratory Outcomes

- 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.

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Course code	HSMC 101(Th)/HSMC102(Lab)				
Category	Humanities and Social Sciences including Management				
Course title	**English (Theory & Lab.)**				
Scheme and Credits	**L**	**T**	**P**	**Credit**	Semester – I/II
	2	**0**	**2**	**3**	
Pre-requisites (if any)	-				

English (L: 2, T: 0, P: 0, Credit 2)
Detailed contents

1. **Vocabulary Building**
   The concept of Word Formation
   Root words from foreign languages and their use in English
   Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
   Synonyms, antonyms, and standard abbreviations.

2. **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

3. **Identifying Common Errors in Writing**
   Subject-verb agreement
   Noun-pronoun agreement
   Misplaced modifiers
   Articles
   Prepositions
   Redundancies
   Clichés

4. **Nature and Style of sensible Writing**
   Describing
   Defining
   Classifying
   Providing examples or evidence

5. **Writing introduction and conclusion**

6. **Writing Practices**
   Comprehension
   Précis Writing
   Essay Writing

English Lab (L: 0, T: 0, P: 2, Credit 1)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Suggested Readings:

(i) *Practical English Usage*. Michael Swan. OUP. 1995.
(ii) *Remedial English Grammar*. F.T. Wood. acmillan.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 Outcomes

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

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Course code	ESC-102A-21				
Category	Engineering Science Courses				
Course title	**Engineering Graphics & Design (Theory & Lab.)**				
Scheme and Credits	**L**	**T**	**P**	**Credit**	Semester – I/II
	0	0	4	2	
Pre-requisites (if any)	-				

Engineering Graphics & Design
[[L : 0; T:0; P : 4 (2 credits)]

Course Objectives:

The objective of studying this course is to understand the basic principles of engineering drawing and graphics and to apply the same to daw different types of projections.

Course Outcomes: At the end of the course, the student shall be able to:

CO 1- Understand the basic principles of projections of points and lines.
CO 2- Know the different orientations and projections of planes and solids.
CO 3- Learn about the projections of sectioning of solids in different orientations and development of surfaces.
CO 4- Draw orthographic and isometric view of an object.
CO 5- Learn about the basics of AUTOCAD

Course Contents:

Unit 1:

Introduction: Importance, Significance and scope of Engineering Drawing, Usage of drawing Instruments, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic projections of simple engineering objects, B.I.S Specifications. (12)

Unit 2:

Projection of Points & Lines: Introduction of plane of projection, reference & auxiliary planes, projection of points and line in different quadrants, traces, inclinations & true lengths of the lines, projections on auxiliary plane, shortest distance intersecting and non intersecting lines. (8)

Unit 3:

Projection of Planes and Solids: Parallel to one reference plane, inclined to one plane but perpendicular to the other, inclined to both reference planes. Projection of Polyhedra, solids of revolution-in simple positions with axis perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other. (8)

Unit 4:

Sectioning of Solids and Development of Surfaces: Projections of sections of prisms, pyramids, cylinders and cones. Development of simple object with and without sectioning. (4)

Unit 5:

Isometric Projections: Introduction, isometric scale, Isometric view of plane figures, prisms, pyramids and cylinders. (4)

Unit 6:

Overview of Computer Graphics: Introduction to AUTOCAD and practice of simple exercises related to the above units on CAD Software. (8)

Recommended/ Reference Books:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.
2. A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria & Sons.
3. A Text Book of Engineering Drawing and Machine Drawing by M. L. Aggarwal and Sandhya Dixit: Dhanpat Rai & Co.
4. Textbook on Engineering Drawing , K. L. Narayana and P. Kannaiah, Scitech Publichers

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Course code	ESC 101A (Th)/ESC107A(Lab)				
Category	Engineering Science Course				
Course title	**Basic Electrical Technology (Theory & Lab.)**				
Scheme and Credits	L	T	P	Credit	Semester –I/II
	3	1	2	5	
Pre-requisites (if any)	-				

(i)Basic Electrical Technology (ESC 101A)[L : 3; T:1; P : 0 (4 credits)]

Detailed contents :

Module 1 :

DC Circuits: Basic definitions, Electrical circuit elements (R, L and C), voltage and current sources, Ohm's law and its limitations, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation by mesh analysis and node analysis. Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems. **(10)**

Module 2:

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. **(10)**

Module 3:

Poly Phase Systems: Advantages of 3-phase systems, generation of 3-phase voltages, three phase connections (star and delta), voltage and current relations in star and delta connections, three phase powers, analysis of 3-phase balanced circuits, measurement of 3-phase power- 2 wattmeter method. **(7)**

Module 4:

Transformers: Magnetic Circuits, construction and working of single phase transformer, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, Auto-transformer **(7)**

Module 5

Electrical Machines: Induction motor: Construction, principle and working of a three-phase induction motor, Single-phase induction motor: Construction, principle and working, Applications DC machine: Construction, principle and working of dc motor and generator. Applications Synchronous machine: Construction, principle and working of synchronous motor and generators. Applications. **(9)**

Module 6

Electrical Installations: Components of LT Switchgear: Fuses, MCB, ELCB, MCCB, Types of Wires, Earthing, Power factor improvement. **(7)**

Suggested Text / Reference Books

(i) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(ii) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(iii) L. S. Bobrow, " Fundamentals of Electrical Engineering", Oxford University Press, 2011.
(iv) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
(v) V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Course Outcomes

- CO1- Analyze and solve D. C. networks by different analysis methods and theorems.
- CO2- Formulate and solve complex AC single phase and three circuits.
- CO3- Identify the type of electrical machines and their applications.
- CO4- Introduce the components of low voltage electrical installations.

Basic Electrical Technology Laboratory (ESC107A) [L : 0; T:0 ; P : 2 (1 credit)] List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of network theorem in DC circuits, Thevenin's Theorem, Norton's, Theorem, Superposition Theorem etc.
3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
4. Poly phase systems, three phase connections (star and delta), measurement of three phase power.
5. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
6. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
7. Torque Speed Characteristic of separately excited dc motor.
8. Components of LT switchgear.

Laboratory Outcomes

- CO1- Get an exposure to common electrical components and their ratings.
- CO2- Make electrical connections by wires of appropriate ratings.
- CO3- Understand the usage of common electrical measuring instruments.
- CO4- Understand the basic characteristics of transformers and electrical machines.
- CO5- Get an exposure to the working of power electronic converters.

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Course code	ESC 104A-21/ ESC 106A-21				
Category	Engineering Science Courses				
Course title	**Workshop-I** **Workshop-II**				
Scheme and Credits	**L**	**T**	**P**	**Credit**	Semester-I/II
	0	**0**	**4**	**2**	
Pre-requisites (if any)	-				

Workshop-I (ESC 104A-21) [[L : 0; T:0; P : 4 (2 credits)]

MECHANICAL WORKSHOP

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Acquire skills on basic engineering materials and safety aspects.

CO 2- Understand the fundamental concept of various basic engineering practices namely fitting, sheet metal, carpentry, pattern making and welding etc.

CO 3- Learn and use different marking & measuring instruments used in machine shop, fitting shop, sheet metal shop, carpentry & pattern making shop etc.

CO 4- Practice real time job preparation using various operations related to fitting, sheet metal, carpentry, welding & foundry etc.

List of Exercises:

Machine shop, fitting shop, sheet metal shop, carpentry & pattern making shop, welding shop, foundry shop, forging (smith) shop and injection moulding shop.

Section (A): Machine Shop

1. To understand the layout, safety measures and fundamental concept of different engineering materials used in the workshop.
2. To study and demonstrate the various parts, specifications & operations on lathe, milling and shaping machine.
3. To study different types of measuring tools used in metrology and determine the least count of vernier calipers, vernier height gauges and micrometers.

Section (B): Fitting & Sheet Metal Shop

4. To study different types of tools, equipments, devices and machines used in fitting shop.
5. To prepare a job involving filing, drilling, tapping and hacksaw cutting operations on mild steel plate.
6. To study various types of sheet metal tools and prepare a simple sheet metal joint.

Section (C): Carpentry and Pattern Making Shop

7. To study various types of carpentry and pattern making tools and equipments.
8. To prepare a simple wooden joint (cross lap / Tee-lap/dovetail joint) using kail wood in carpentry shop.
9. To prepare single piece pattern / split pattern using kail wood in pattern making shop.

Section (D): Welding Shop

10. To practice striking an arc and prepare straight short bead on given M.S plate in flat position by arc welding.
11. To prepare straight continuous bead and re start of electrode in flat position by arc welding on given M.S. plate as per size.
12. To practice tack weld &close butt joint in flat position by arc welding on given M.S. plate as per size.

Section (E): Foundry, Forging (Smithy) & Injection Moulding shop

13. To study various types of foundry tools and prepare a mould cavity using single/split pattern in moulding sand.
14. To study various types of forging / black smithy tools and prepare a ring or hook by hand forging operation.
15. To study the working of injection molding machine and prepare a simple component by injection moulding.

NOTE: - Total twelve exercises should be performed from the above list. At least two from each section and remaining two may either be performed from above list or designed by the concerned institution as per the scope of the syllabus and facilities available in institute.

Workshop II (ESC 106A-21)
PART-A
Computer Engineering Workshop

Course Outcomes (COs):

After the completion of the course the student will be able to:

CO1- Acquire skills in basic engineering practice.
CO2- Have working knowledge of various equipments used in workshop.
CO3- Have hands on experience about various machines and their components.
CO4- Obtain practical skills of basic operation and working of tools used in the workshop.

1. To study and demonstrate Block diagram of Digital Computer System and brief explanation of each unit.
2. To demonstrate History/ Generation/ classifications and different types of Personnel Computer.To study and demonstrate internal parts of a Computer System (Card level) and other peripheral devices and explanation of POST & BIOS.
3. To study and demonstrate primary memory and secondary memory.
4. To demonstrate CPU Block diagram and other Peripheral chips, Mother Board/ Main Board and its parts, Connectors, Add On Card Slots etc.
5. To study working of various types of monitors: CRT type, LCD type & LED type.
6. To study Keyboard and Mouse: Wired, Wireless, Scroll & Optical with detail working.
7. To study Printers: Dot Matrix Printers, Daisy wheel Printers, Ink-Jet Printers and Laser Jet Printers with detailed working explanation.
8. Assembly / Installation and Maintenance of Personnel Computer Systems:

Practical exercise on assembly of Personnel Computer System, Installation of Operating System: Windows & Linux etc, Installation of other Application Softwares and Utility Softwares, Fault finding in Personnel Computers: Software or Hardware wise, Virus: Introduction, its Types & Removal techniques, Data Backup and Restore, Data Recovery Concepts, Typical causes of Data loss.

9. To demonstrate networking concepts: Introduction of Connecting devices: Hub, Switch & Router etc, Networking Cable preparation: Normal & Cross Cables, Data Transferring Techniques from one Computer System to another Computer System, Configuration of Switch/ Routers etc.
10. Introduction to system security and Network security.

PART-B
Electrical Workshop

1. Introduction of Electrical Safety precautions, Electrical Symbols, Electrical Materials, abbreviations commonly used in Electrical Engg. and familiarization with tools used in Electrical Works.
2. To make a Straight Joint & Tee joint on 7/22 PVC wire and Britannia Joint on GI wire.
3. To study fluorescent Tube Light, Sodium Lamp and High Pressure Mercury Vapour Lamp.
4. To study different types of earthing and protection devices e.g. MCBs, ELCBs and fuses.
5. To study different types of domestic and industrial wiring and wire up a circuit used for Stair case and Godown wiring.
6. To make the connection of fan regulator with lamp to study the effect of increasing and decreasing resistance in steps on the lamp.
7. To fabricate half wave and full wave rectifiers with filters on PCB.
8. Maintenance and Repair of Electrical equipment i,e Electric Iron , Electric Toaster ,Water heater, Air coolers and Electric Fans etc.
9. To study soldering process with simple soldering exercises.
10. To make the connection of a three core cable to three pin power plug and connect the other cable end by secured eyes connection using 23/0.0076"or 40/0.0076" cable.

PART- C
Electronics Workshop

1. To study and demonstrate basic electronic components, Diode, Transistor, Resistance, Inductor and capacitor.
2. To study and demonstrate resistance color coding, measurement using color code and multimeter and error calculation considering tolerance of resistance.
3. To study and demonstrate Multimeter and CRO- front panel controls, description of block diagram of CRT and block diagram of CRO.
4. To study and demonstrate Vp(peak voltage),Vpp(peak to peak voltage), Time, frequency and phase using CRO.
5. Introduction to function generator. Functions of front panel controls and measurement of different functions on CRO.

6. To study and demonstrate variable DC regulated power supply, function of controls and DC measurement using multimeter and CRO.
7. Soldering practice on wire mesh or a resistance decade board includes fabrication, soldering, lacing, harnessing forming and observation.
8. Testing of components using multimeter and CRO like diode, transistor, resistance capacitor, Zener diode and LED.
9. To study and demonstrate rectification, half wave, Full wave and bridge rectifier. Fabrication, assembly and waveform observation.
10. To design and fabricate a printed circuit board of a Zener regulated/ series regulated power supply and various measurements, testing of power supply.

Note: At least 8 exercises are to be performed from each part by the students.