GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)
An Autonomous Institute

'A' GRADE ACCREDITED BY NAAC

Evaluation Scheme & Syllabus For Bachelor of Technology First Year (Effective from the Session: 2025-26)

APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK

1. DEFINITION OF CREDIT

1	1 Lecture (L) per week	1 Credit
2	1 Tutorial (T) per week	1 Credit
3	1 Practical (P) per week	0.5 Credit
4	2 Practical (Lab) per week	1 Credit

2. RANGE OF CREDIT

A range of credits from 160 to 180 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 18-20 credits. These could be acquired through MOOCs.

3. STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM (B.TECH)

Sr. No.	Category	Breakup of Credits
1	Basic Science Courses	21*
2	Engineering Science Courses	22*
3	Professional Core Courses	71*
4	Professional Elective Courses (Relevant to chosen specialization/branch)	18*
6	Multidisciplinary Open Electives Courses	9*
7	Humanities and Social Sciences including Management courses	15*
8	Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad	14*
9	Mandatory Non Credit Courses – Audit Course (Including Environment Science, Indian Knowledge System, Constitution of India, Essence of Indian Traditional Knowledge, Yoga/NCC/NSS etc.	(Non-Credit)
	Total Credits	**170***

Minor variation is allowed as per need of the respective disciplines.

4. COURSE CODE AND DEFINITIONS

Sr. No.	Category	Course Code
1	Basic Science Courses	BSC
2	Engineering Science Courses	ESC
3	Professional Core Courses	PCC
4	Professional Elective Courses (Relevant to chosen specialization/branch)	PEC
5	Indian Knowledge System	IKS
6	Multidisciplinary Open Electives Courses	MOEC
7	Humanities and Social Sciences including Management courses	HSMC
8	Laboratory Courses	LC
9	Mandatory Non-Credit Courses – Audit Course	MC
10	Project	PR
11	Internship	INT

Course Level Coding Scheme:

Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the level of the course. Digit at hundred's place signifies the year in which course is offered.

e.g. 101, 102 … etc. for first year.

201, 202 …. Etc. for second year.

301, 302 … for third year.

Course Level/Duration/System:

Undergraduate / Three or Four years/6 or 8 Semesters with multiple entry and exit.

For Example:

The following option will be made available to the students joining Electrical Engineering Program:

A. One year: Under Graduate Certificate in Electrical Engineering

B. Two years: Under Graduate Diploma in Electrical Engineering

C. Three years: Bachelor of Vocational in Electrical Engineering (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Electrical Engineering

The following option will be made available to the students joining Mechanical Engineering Program:

A. One year: Under Graduate Certificate in Mechanical Engineering

B. Two years: Under Graduate Diploma in Mechanical Engineering

C. Three years: Bachelor of Vocational in Mechanical Engineering (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Mechanical Engineering

The following option will be made available to the students joining Fire Technology and Safety Engineering Program:

A. One year: Under Graduate Certificate in Fire Technology and Safety Engineering

B. Two years: Under Graduate Diploma in Fire Technology and Safety Engineering

C. Three years: Bachelor of Vocational in Fire Technology and Safety Engineering (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Fire Technology and Safety Engineering

The following option will be made available to the students joining Civil Engineering Program:

A. One year: Under Graduate Certificate in Civil Engineering

B. Two years: Under Graduate Diploma in Civil Engineering

C. Three years: Bachelor of Vocational in Civil Engineering (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Civil Engineering

The following option will be made available to the students joining Electronics and Communication Engineering Program:

A. One year: Under Graduate Certificate in Electronics and Communication Engineering

B. Two years: Under Graduate Diploma in Electronics and Communication Engineering

C. Three years: Bachelor of Vocational in Electronics and Communication Engineering (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Electronics and Communication Engineering

The following option will be made available to the students joining Computer Science and Engineering Program:

A. One year: Under Graduate Certificate in Computer Science and Engineering

B. Two years: Under Graduate Diploma in Computer Science and Engineering

C. Three years: Bachelor of Vocational in Computer Science and Engineering (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Computer Science and Engineering

The following option will be made available to the students joining Computer Science and Engineering (Data Science) Program:

A. One year: Under Graduate Certificate in Computer Science and Engineering (Data Science)

B. Two years: Under Graduate Diploma in Computer Science and Engineering (Data Science)

C. Three years: Bachelor of Vocational in Computer Science and Engineering (Data Science) (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Computer Science and Engineering (Data Science)

The following option will be made available to the students joining Computer Science and Engineering (Artificial Intelligence and Machine Learning) Program:

A. One year: Under Graduate Certificate in Computer Science and Engineering (Artificial Intelligence and Machine Learning)

B. Two years: Under Graduate Diploma in Computer Science and Engineering (Artificial Intelligence and Machine Learning)

C. Three years: Bachelor of Vocational in Computer Science and Engineering (Artificial Intelligence and Machine Learning) (B.Voc.)

D. Four years: Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Computer Science and Engineering (Artificial Intelligence and Machine Learning)

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)
Scheme of Studies and Examination
B.Tech – 1st Semester
w.e.f. 2025-26

Sr. No.	Category	Notations	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Total Load Per Week	Credits	Assessment	End Semester Examination Theory	End Semester Examination Practical	Total	Exam Duration in H
1	Basic Science Courses	C	BSC-MAT-101B	Engineering Mathematics-I	3	1	0	4	4	40	60		100	3
2	Basic Science Courses	A	Refer Table-I	Engineering Physics	3	1	0	4	4	40	60		100	3
		B	Refer Table-II	Engineering Chemistry	3	1	0	4	4	40	60		100	3
3	Engineering Science Courses	A	ESC-CSE-102B	Programming for Problem Solving	3	0	0	3	3	30	45		75	3
		B	ESC-EE-101B	Basics of Electrical and Electronics Engineering	3	0	0	3	3	30	45		75	3
4	Engineering Science Courses	A	LC-ME-102B	Engineering Graphics and Design	0	0	4	4	2	20		30	50	3
		B	ESC-ME-102B	Manufacturing Process	2	0	0	2	2	20	30		50	3
5	Humanities and Social Sciences including Management courses	A	HSMC-ENG-101B	Communication Skills for Professionals	2	0	0	2	2	20	30		50	3
		B	HSMC-ASH-103B	Universal Human Value-II: Understanding Harmony and Ethical Conduct	3	0	0	3	3	30	45		75	3
6	Engineering Science Courses	A	Refer Table-III	----------------	3	0	0	3	3	30	45		75	3
		B	LC-ME-103B	Workshop Practice	0	0	4	4	2	20		30	50	3
7	Basic Science Courses	A	Refer Table-IV	Engineering Physics Lab	0	0	2	2	1	10		15	25	3
		B	Refer Table - V	Engineering Chemistry Lab	0	0	2	2	1	10		15	25	3
8	Engineering Science Courses	A	LC-CSE-102B	Programming for Problem Solving Lab	0	0	2	2	1	10		15	25	3
		B	LC-EE-102B	Basics of Electrical and Electronics Engineering Lab	0	0	2	2	1	10		15	25	3

9	Humanities and Social Sciences including Management courses	A	LC-ENG-102B	Language Lab	0	0	2	2	1	10	-	15	25	3
		B	LC-DT-101B	Design Thinking	0	0	2	2	1	10		15	25	3
10	Mandatory Non Credit Courses – Audit Courses	C	Refer Table - VI	-----------------	0	0	2	2	-	-	-	-	-	-
				TOTAL CREDITS	**21**								**525**	

Note: The marks of Mandatory Non Credit Courses – Audit Course are not included in the total marks.

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)
Scheme of Studies and Examination
B.Tech – 2nd Semester
w.e.f. 2025-26

Sr. No.	Category	Notations	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Total Load Per Week	Credits	Assessment	Theory	Practical	Total	Exam Duration in H
					Hours per week						End Semester Examination			
1	Basic Science Courses	C	Refer Table-VII	Engineering Mathematics-II	3	1	0	4	4	40	60		100	3
2	Basic Science Courses	A	Refer Table-II	Engineering Chemistry	3	1	0	4	4	40	60		100	3
		B	Refer Table-I	Engineering Physics	3	1	0	4	4	40	60		100	3
3	Engineering Science Courses	A	ESC-EE-101B	Basics of Electrical and Electronics Engineering	3	0	0	3	3	30	45		75	3
		B	ESC-CSE-102B	Programming for Problem Solving	3	0	0	3	3	30	45		75	3
4	Engineering Science Courses	A	ESC-ME-102B	Manufacturing Process	2	0	0	2	2	20	30		50	3
		B	LC-ME-102B	Engineering Graphics and Design	0	0	4	4	2	20		30	50	3
5	Humanities and Social Sciences including Management courses	A	HSMC-ASH-103B	Universal Human Value-II: Understanding Harmony and Ethical Conduct	3	0	0	3	3	30	45		75	3
		B	HSMC-ENG-101B	Communication Skills for Professionals	2	0	0	2	2	20	30		50	3
6	Engineering Science Courses	A	LC-ME-103B	Workshop Practice	0	0	4	4	2	20		30	50	3
		B	Refer Table-III	----------------	3	0	0	3	3	30	45		75	3
7	Basic Science Courses	A	Refer Table - V	Engineering Chemistry Lab	0	0	2	2	1	10		15	25	3
		B	Refer Table-IV	Engineering Physics Lab	0	0	2	2	1	10		15	25	3
8	Engineering Science Courses	A	LC-EE-102B	Basics of Electrical and Electronics Engineering Lab	0	0	2	2	1	10		15	25	3
		B	LC-CSE-102B	Programming for Problem Solving Lab	0	0	2	2	1	10		15	25	3

9	Humanities and Social Sciences including Management courses	A	LC-DT-101B	Design Thinking	0	0	2	2	1	10		15	25	3
		B	LC-ENG-102B	Language Lab	0	0	2	2	1	10	-	15	25	3
10	Mandatory Non Credit Courses – Audit Courses	C	Refer Table - VI	-----------------	0	0	2	2	-	-	-	-	-	-
				TOTAL CREDITS	**21**								**525**	

Notes:
- The marks of Mandatory Non Credit Courses – Audit Course are not included in the total marks.

Important Notes: Significance of the 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.

Table I

Courses	Remarks
BSC-PHY-101B: Mechanics, Optics and Superconductors BSC-PHY-102B: Introduction to Electromagnetism and Optics BSC-PHY-103B: Semiconductor Physics and Optics	**BSC-PHY-101B: Mechanics, Optics and Superconductors** for Mechanical, Civil and Fire Technology and Safety **BSC-PHY-102B: Introduction to Electromagnetism and Optics** for Electrical Engineering and Electronics and Communication Engineering **BSC-PHY-103B: Semiconductor Physics and Optics** for Computer Science Engineering, CSE-AI& ML, CSE-Data Science

Table II

Courses	Remarks
BSC-CH-101 B: Engineering Chemistry -I BSC-CH-102 B: Engineering Chemistry -II	**BSC-CH-101B: Engineering Chemistry-I** for Mechanical, Civil and Fire Technology and Safety **BSC-CH-102B: Engineering Chemistry-II** for Electrical, Electronics and Communication Engineering, Computer Science Engineering, CSE-AI&ML, CSE-Data Science

Table III

Courses	Remarks
ESC-ME-101B	Basics of Mechanical Engineering
ESC-CE-101B	Basics of Civil Engineering
ESC-FTS-101 B	Fundamentals of Fire and Safety Engineering
ESC-CSE-101 B	Basics of Computer Science and Engineering
ESC-AI-101 B	Basics of Artificial Intelligence
ESC-DS-101 B	Basics of Data Science

Table IV

Courses	Remarks
LC-PHY-101B Mechanics, Optics and Superconductors Lab LC-PHY-102B Introduction to Electromagnetism and Optics Lab LC-PHY-103B Semiconductor Physics and Optics Lab	**LC-PHY-101B: Mechanics, Optics and Superconductors Lab** for Mechanical, Civil and Fire Technology and Safety **LC-PHY-102B: Introduction to Electromagnetism and Optics Lab** for Electrical and Electronics and Communication Engineering **LC-PHY-103B: Semiconductor Physics and Optics Lab** for Computer Science Engineering, CSE-AI & ML, CSE-Data Science

Table V

Courses	Remarks
LC-CH-101B: Engineering Chemistry-I Lab LC-CH-102B: Engineering Chemistry-II Lab	**LC-CH-101B: Engineering Chemistry-I Lab** for Mechanical, Civil and Fire Technology and Safety **LC-CH-102B: Engineering Chemistry-II Lab** for Electrical, Electronics and Communication Engineering, Computer Science Engineering, CSE-AI&ML, CSE-Data Science

Table VI

Courses	Remarks
MC-101B: Yoga and Sports MC-102B: Fire Ground Operation-I MC-103B: IDEA Lab Workshop MC-104B: Fire Ground Operation-II	**MC-101B:** Yoga and Sports for the students of B.Tech other than B.Tech Fire Technology and Safety. **MC-102B:** Fire Ground Operation-I for the students of B.Tech Fire Technology and Safety (First Semester) **MC-103B:** IDEA Lab Workshop for the students of B.Tech other than B.Tech Fire Technology and Safety. **MC-104B:** Fire Ground Operation-II for the students of B.Tech Fire Technology and Safety (Second Semester)

Note: Refer Table VI, Students who opt for MC-101B in the first semester must choose MC-103B in the second semester, and vice versa.

Table VII

Courses	Remarks
BSC-MAT-102B:Engineering Mathematics-II BSC-MAT-103B: Engineering Mathematics-II	**BSC-MAT-102B: Engineering Mathematics-II** for Computer Science and Engineering, CSE-AI&ML, CSE- Data Science **BSC-MAT-103B: Engineering Mathematics-II** for Mechanical, Civil, Electrical, Electronics and Communication Engineering, Fire Technology and Safety.

Course Code	**BSC-MAT-101B**				
Category	Basic Science Courses				
Course Title	**Engineering Mathematics-I**				
Scheme and Credits	L	T	P	**Credits**	Semester-I
	3	1	0	**4**	
Course Objectives	Theobjectives of this course are To develop understanding of matrices, multivariable calculus, and ordinary differential equations concepts and applications. To equip students with skills to apply linear algebra, calculus, and differential equations in real-world scenarios.				
Course Pre-requisite	Mathematics upto 12th Standard, Basic Knowledge of Mathematics				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** the basics of linear algebra, differential calculus and differential equations.	Level 1: Remember
CO2	**Explain** the properties and applications of linear algebra, differential calculus and differential equations.	Level 2: Understand
CO3	**Solve** mathematical problems using the concepts of matrices, Multivariable calculus and differential equations.	Level 3: Apply
CO4	**Analyze** mathematical problems and systems to identify patterns, validate Properties and interpret solutions in applied contexts.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Linear Algebra-Matrices: Elementary matrices, elementary transformations, Rank of a matrix, inverse using elementary transformations, system of linear equations, linear and orthogonal transformations, eigen values and eigen vectors, properties of eigen values, Cayley-Hamilton theorem, diagonalization of matrices, Applications of matrices.

Unit-II

Multivariable Differential Calculus: Limit, Continuity and Partial derivatives, Homogeneous functions, Euler's Theorem, Total differential, Composite functions, Jacobians, Taylor's and Maclaurin's expansion for the functions of two variables, Maxima and Minima, Lagrange's method of undetermined multipliers.

Ordinary Differential Equations of First Order: Linear and Bernoulli's equations, Exact differential equations, Equations reducible to exact differential equations, Applications of differential equations of first order and first degree to simple electric circuits, Newton's law of cooling, Heat flow and Orthogonal trajectories.

Unit-IV

Ordinary Differential Equations of Second and Higher Order: Linear differential equations of second and higher order, Complete solution, Complementary function and Particular integral, Method of variation of parameters to find particular integral, Cauchy's and Legendre's linear equations, Power series solutions, Legendre's and Bessel's functions.

Suggested Readings:
- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
- A textbook of Engineering Mathematics (Calculus & Linear Algebra) by H. Arora, S. K. Kataria & Sons.
- Advanced Engineering Mathematics by H.K. Dass, S. Chand.
- A textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.
- Engineering Mathematics by P. Sangwan, Vayu Education of India.
- Engineering Mathematics for first year by T. Veerarajan, Tata McGraw-Hill Publishing Company Limited.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Rank of a matrix	https://youtu.be/_RDF7My0Lfg?si=jKIVC67ONrJgcgCK
	Eigen values & Eigen vectors	https://youtu.be/h5urBuE4Xhg?si=B-bpVVFJMbxJAFwq
		https://youtu.be/LB-itmKrXag?si=0K4uF63wqZXDGC9y
		https://youtu.be/ATUN2BuukSs?si=G3bONxeV6JBvBFSt
	Eigen values & Eigen vectors: Diagonalization	https://youtu.be/k7rjICzxJ24?si=bonLfqlueLjjNy_n
Unit-II	Limit of function of two variables	https://youtu.be/ZBfu5_I-6mA?si=blx1gTuXOlpAu1TR
		https://youtu.be/Nz1EJQtFsG4?si=G6HFeprXNTCMcqc6
	Continuity of function of two variables	https://youtu.be/_98Di71evws?si=BTZpJB_Ti-QJr2jH
	Partial Derivatives-I	https://youtu.be/6tQTRlbkbc8?si=onT7x_3JAVV_8OeJ
	Partial Derivatives-II	https://youtu.be/8ZAucbZscNA?si=kSnabqSiT9PsKpRL
	Composite and Homogeneous Functions	https://youtu.be/qCQQT2P5ojY?si=dgUqT2iXA0epoprK
	Taylor's Theorem for functions of two variables	https://youtu.be/r6lDwJZmfGA?si=q8lockcYhAgTzhkO
Unit-III	Linear and Bernoulli's equations	https://youtu.be/QC3z-NUkOcE?feature=shared
	Exact Differential Equations	https://youtu.be/6r5jfT8xrXM?si=bOrUJM-thhDIgfNF
		https://youtu.be/Wx19LXs77mM?si=AdeHPdSOSengepmI
	Equations reducible to exact differential equations	https://youtu.be/dtbLHtoh_M0?feature=shared https://youtu.be/SxYI7EzLVDA?feature=shared
Unit-IV	Linear Differential Equations (First Order)	https://youtu.be/AEHTsXRaQmE?si=vuiCdUZ41dsKjcED
	Higher Order Linear Differential Equations	https://youtu.be/btOCUmJkrrg?si=r184ISpfnBQd1Kc7
	Cauchy-Euler Equations	https://youtu.be/b5io9_bJvEM?si=lZUGRuhLjGkphfQ2
	Power Series Solutions	http://sdnbvc.digimat.in/nptel/courses/video/111106100/L24.html
	Bessel Differential Equation	http://sdnbvc.digimat.in/nptel/courses/video/111106100/L28.html

Course Code	BSC-PHY-101B				
Category	Basic Science Courses				
Course Title	**Mechanics, Optics and Superconductors**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	1	0	**4**	
Course Objectives	The objectives of this course are • To make the students familiarize with the concepts and techniques of Mechanics, optics and Superconductors. • To enhance the ability of students to solve the complex engineering problems of their discipline using the principles and methods of Physics.				
Course Pre-requisite	Physics of 12th Standard, Basic Knowledge of Physics				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** the basic concepts of mechanics, thermal physics, wave optics and superconductors.	Level 1: Remember
CO2	**Explain** the concepts of mechanics, thermal physics, wave optics and superconductors.	Level 2: Understand
CO3	**Solve** engineering problems by using the methods and techniques of Mechanics, wave optics, superconductivity and magnetization.	Level 3: Apply
CO4	**Analyze** different engineering problems related to mechanics, thermal physics, optics, magnetic materials and superconductors.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Force and its effects: Newton's laws of motion - mass, inertia and force, units and measurement of force, application of Newton's second and third laws in two dimensions, free body diagram, velocity and acceleration vectors in two dimensions, characteristics of force vector representation, Bow's notation, types of forces in nature.

Force Systems: Space force systems, Coplanar, concurrent and non-concurrent forces, Resultant and components of forces, concept of equilibrium, parallelogram law of forces, super-position and transmissibility of forces, Lami's theorem.

Unit-II
Thermal Physics: Temperature and its measurement, heat, specific heat, latent heat, introduction to modes of heat transfer, thermal expansion, wavelength distribution of Black body radiation, Planck's constant, Stefan Boltzmann Law, Wien Displacement law, Kirchhoff's Law.

Phonons: Lattice vibration heat transfer, specific heat of solids, classical, Einstein and Debye Model, Ideal quantum gases: Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac statistics.

Unit-III

Interference: Coherent sources, conditions for sustained interference, Interference due to Division of wave- front and Division of Amplitude, Interference in Parallel thin Films and wedge-shaped films, Necessity of an extended source, Newton's Rings and its applications to determine wavelength and refractive index.

Diffraction: Difference between interference and diffraction, Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Diffraction grating, absent spectra, Rayleigh's criterion of resolution, Resolving power and dispersive power of grating.

Unit-IV

Magnetic Materials and Superconductors: Smart Materials, Magneto-rheology, Orbital diamagnetism, Magnetic moments, orbital diamagnetism, Classical theory of Para magnetism, Ferromagnetism, molecular field theory and domains, applications of magnetic materials, Type I and II Superconductors, Meissener Effect, BCS theory, London equation, Applications of superconductivity.

Suggested Readings:
- Concepts of Modern Physics by Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury 7th Edition, McGraw Hill Education India Private Limited.
- Engineering Physics, Second edition by H. K. Malik and A.K Singh, McGraw Hill Education India Private Limited.
- Modern Physics for Engineers by S. P. Taneja, R. Chand & CO, New Delhi.
- Applied Physics for Engineers by Neeraj Mehta, PHI Learning private Limited, New Delhi.
- Mechanics by D.S. Mathur, S. Chand Publishing.
- Optics by Ajoy K. Ghatak7th Edition, McGraw Hill Education India Private Limited.
- AText Book of Optics by Brijlal & Subramanian, S. Chand Publishing.
- A Textbook of Engineering Physics by M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Free Body Diagram	https://www.youtube.com/watch?v=9Yzsl05LGtw
	Force Systems-I	https://www.youtube.com/watch?v=6u_rjLjv-MY&t=153s
	Force Systems – II	https://www.youtube.com/watch?v=Fudcc0JoXdo
Unit-II	Wein's Law, Stephen Boltzmann Law, Blackbody Radiation Function	https://www.youtube.com/watch?v=TIFGm-QusM4
	Thermal Expansion	https://www.youtube.com/watch?v=Lzrjqy4PImE
	Kirchhoff's Law	https://www.youtube.com/watch?v=5o91GiS5uHE
	Phonons	https://www.youtube.com/watch?v=J4CwGFpgt1I
Unit-III	Coherence	https://www.youtube.com/watch?v=5Za948EKAes
	Interference	https://www.youtube.com/watch?v=_vnEfLfXxIs
	Interference	https://www.youtube.com/watch?v=_vnEfLfXxIs
	Interference due to Division of wave-front	https://www.youtube.com/watch?v=P01aKhKxdx8
	Interference due to Division of Amplitude	https://www.youtube.com/watch?v=n65gZGwiZtk
	Diffraction	https://www.youtube.com/watch?v=rZATW8dpiQA
Unit-IV	Superconductors	https://www.youtube.com/watch?v=SHoGV-sezNI&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h
	London Equation	https://www.youtube.com/watch?v=QQzvQooUtJo&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h&index=7

Course Code	**BSC-PHY-102B**				
Category	Basic Science Courses				
Course Title	**Introduction to Electromagnetism and Optics**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	1	0	**4**	
Course Objectives	The objectives of this course are • To familiarize the students with concepts and techniques of electromagnetism and optics. • To enhance the ability of students to apply physics fundamentals to various modern applications in their discipline.				
Course Pre-requisite	Physics of 12th Standard, Basic Knowledge of Physics				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** the basic concepts of optics, Laser, Electromagnetism, Semiconductors and Superconductors.	Level 1: Remember
CO2	**Explain** the concepts of optics, laser, electromagnetism, semiconductors and superconductors.	Level 2: Understand
CO3	**Solve** engineering problems using the Principles and Techniques of optics, Laser, Electromagnetism, Semiconductors and Superconductors.	Level 3: Apply
CO4	**Analyze** different engineering problems related to optics, laser, optical fiber, Electromagnetism, semiconductors and superconductors.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Interference: Coherent sources, conditions for sustained interference, Interference due to Division of wave- front and Division of Amplitude, Interference in Parallel thin Films and wedge-shaped films, Necessity of an extended source, Newton's Rings and its applications to determine wavelength and refractive index.

Diffraction: Difference between interference and diffraction, Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Diffraction grating, absent spectra, Rayleigh's criterion of resolution, Resolving power and dispersive power of grating.

Unit-II

Polarization: Polarized and un-polarized light, Malu's Law, Brewster Law, Double Refraction, Nicol Prism, quarter and half wave plate, Production and detection of Plane, Elliptically and Circularly polarized light, Application of polarization, Optical activity and specific rotation.

Laser: Interaction of radiation with matter, Einstein's coefficients, Laser action, Characteristics of Laser, Spatial and temporal coherence, Ruby Laser, He-Ne Laser, Recent applications of Laser in engineering and technology.

Unit-III

Basic laws of electricity and magnetism: Gradient, Divergence and Curl (Electric field and Magnetic field), line, surface and volume charge distribution, Gauss divergence theorem, Stoke's theorem (No derivation), Continuity equation for current density, Displacement current, Dielectrics, Electric polarization, Relation between three electric vectors, Maxwell's equation in differential and integral form (vacuum and non- conducting medium), their derivation and physical significance, Energy in an electromagnetic field, Poynting vector and Poynting theorem.

Unit-IV

Type of electronic materials: Metals, Semiconductor and Insulators, Intrinsic and Extrinsic semiconductors, Fermi level and Fermi Energy, Dependence of Fermi level on carrier concentration and temperature, carrier generation and recombination, carrier transport: diffusion and drift, P-N Junction, Semiconductor materials of interest for optoelectronics devices.

Superconductors: Introduction to superconductors, temperature dependence of resistivity, Type I and Type II superconductors, Meissner effect, London equations, BCS theory (elementary idea), Application of superconductors.

Fiber Optics: Optical fiber, Acceptance angle, Numerical aperture-number, Classification of optical fibers, Attenuation and Dispersion in optical fibers, Applications of optical fiber.

Suggested Readings:

- A Text Book of Optics by Brijlal & Subramanian, S. Chand Publishing.
- Modern Physics for Engineers by S. P. Taneja, R. Chand & CO, New Delhi.
- Applied Physics for Engineers by Neeraj Mehta, PHILearning private Limited, New Delhi.
- Optics by Ajoy K. Ghatak 7th Edition, McGraw Hill Education India Private Limited.
- Concepts of Modern Physics by Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury 7th Edition, McGraw Hill Education India Private Limited.
- Introduction to Electrodynamics, D.J. Griffith, 4th Edition, Pearson Education India Learning Private Limited.
- Engineering Physics, Second edition by H. K. Malik and A. K Singh, McGraw Hill Education India Private Limited.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Coherence	https://www.youtube.com/watch?v=5Za948EKAes
	Interference	https://www.youtube.com/watch?v=_vnEfLfXxIs
	Interference due to Division of wave- front	https://www.youtube.com/watch?v=P01aKhKxdx8
	Interference due to Division of amplitude	https://www.youtube.com/watch?v=n65gZGwiZtk
	Diffraction	https://www.youtube.com/watch?v=rZATW8dpiQA
Unit-II	Malu's Law, Brewster Law	https://www.youtube.com/watch?v=cmCB_FOEstQ
	Double Refraction	https://www.youtube.com/watch?v=Pt5wvYyguq0
	Einstein Coefficients	https://www.youtube.com/watch?v=PQTMBlHhCY8&list=P
Unit-III	Gradient, Divergence and Curl	https://www.youtube.com/watch?v=v3ZC4Mo1fS0
	Stoke's Theorem	https://www.youtube.com/watch?v=QPw4GYz5Unc
	Electric Polarization	https://www.youtube.com/watch?v=GJNynbp5bxk
	Maxwell Equations	https://www.youtube.com/watch?v=XUR-dnDa7eI
Unit-IV	Semiconductors	https://www.youtube.com/watch?v=JA3sCmrv11M&list=PLg MDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP&index=2
	London Equation	https://www.youtube.com/watch?v=QQzvQooUtJo&list=PLw dnzlV3ogoU1IvWa-_5u9iGVimN2uT3h&index=7
	Superconductors	https://www.youtube.com/watch?v=SHoGV- sezNI&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h

Course Code	**BSC-PHY-103B**				
Category	Basic Science Courses				
Course Title	**Semiconductor Physics and Optics**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	1	0	**4**	
Course Objectives	The objectives of this course are • To familiarize the students with concepts and techniques of semiconductor physics and optics. • To enhance the ability of students to apply physics fundamentals to various modern applications in their discipline.				
Course Pre-requisite	Physics of 12th Standard, Basic Knowledge of Physics				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	**Skills Demonstrated**	**RBT Level**
CO1	**Recall** the basic concepts of quantum mechanics, semiconductor physics, fiber optics and laser.	Level 1: Remember
CO2	**Describe** the concepts of quantum mechanics of electrons in solid, semiconductor physics, fiber optics and lasers.	Level 2: Understand
CO3	**Apply** methods and techniques of semiconductor physics, quantum mechanics, fiber optics and Laser to solve engineering problems.	Level 3: Apply
CO4	**Analyze** different engineering problems related to quantum theory, semiconductors, optical fiber and lasers.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Quantum Theory: Introduction to wave-particle duality, De-Broglie matter waves, Heisenberg's uncertainty principle and its applications, Phase and Group velocity, Wave function and its significance, normalization of wave function, Time-dependent and time-independent Schrödinger's wave equations, Eigen functions and Eigen values, Expectation Value, Particle in one-dimensional rigid box, Basics of Bose-Einstein and Fermi- Dirac distribution.

Unit-II

Free Electron theory: Classical and Quantum free electron theory, Density of states, Fermi level and Fermi energy, Fermi-Dirac probability distribution function, Kronig-Penney Model, E-K Diagrams, Effective Mass, and Classification of materials on the basis of energy band, concept of phonons**,** Direct and indirect band gaps.

Physics of Semiconductors: Intrinsic and extrinsic semiconductor, carrier concentration in intrinsic and extrinsic semiconductors, dependence of Fermi level on carrier concentration and temperature, carrier transport (diffusion and drift), P-N Junction diode, Energy band diagram, V-I Characteristics; Construction and Working of Photodiode, LED & Solar cell, Semiconductor materials of interest for optoelectronics devices, Hall Effect and its Applications.

Unit-IV

Fiber Optics: Introduction to fiber optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fiber, Attenuation and Dispersion in optical fibers, Applications of optical fiber in communication and other fields.
Laser: Interaction of radiation with matter, Einstein's coefficients, Requisites of Laser, Elements of a laser, Ruby Laser, He-Ne Laser, Recent applications of Laser in Engineering and Technology.

Suggested Readings:

- Introduction to Quantum Mechanics by David J. Griffiths, Pearson Education.
- A Text Book of Optics by Brijlal & Subramanian, S. Chand Publishing
- Applied Physics for Engineers by Neeraj Mehta, PHILearning private Limited, New Delhi
- Semiconductor Optoelectronic Devices by Bhattacharya, Prentice hall of India.
- Modern Physics for Engineers by S. P. Taneja, R. Chand & CO, New Delhi.
- Semiconductor Devices: Physics and Technology by S. M. Sze, Wiley.
- Engineering Physics, Second edition by H. K. and A.K Singh Mc Graw Hill Ed.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Wave Particle Duality	https://www.youtube.com/watch?v=Yf_4Qv-A55Q
	Heisenberg's uncertainty principle	https://www.youtube.com/watch?v=TcmGYe39XG0
	Phase velocity and Group velocity	https://www.youtube.com/watch?v=yZW4dmn5kvM
	Eigen functions and Eigen values	https://www.youtube.com/watch?v=qp5X9sKDgAE
	Schrodinger Equation: Particle in a One Dimensional Box	https://www.youtube.com/watch?v=vy-qStGSy0g&t=10s
Unit-II	Free Electron Theory	https://www.youtube.com/watch?v=L-eOdZFt9BY
	Kronig-Penney Model	https://www.youtube.com/watch?v=ZemvjQdLffo
	Direct and indirect band gaps	https://www.youtube.com/watch?v=-ga2S2LOtjs
	Phonons	https://www.youtube.com/watch?v=J4CwGFpgt1I
Unit-III	Semiconductors	https://www.youtube.com/watch?v=JA3sCmrv11M&list=PLgMDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP&index=2
	Carrier Concentration of Intrinsic Semiconductors	https://www.youtube.com/watch?v=PxzXP4URY8s
	Charge carrier density in n-type and p-type semiconductors	https://www.youtube.com/watch?v=qvJr4N2s3Ro
	Hall Effect	https://www.youtube.com/watch?v=Tt8zwiniSPc
Unit-IV	Introduction to Optical Fiber, Numerical Aperture	https://www.youtube.com/watch?v=LOVvUFZmRCg
	Einstein Coefficients	https://www.youtube.com/watch?v=PQTMBlHhCY8&list=PLU0oJASIjGxdZMtypwhvGrnmuzNnNdcKt&index=4

Course Code	**BSC-CH-101B**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry-I**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	1	0	**4**	
Course Objectives	The objectives of this course are ● To impart the knowledge of fundamentals of water and soil chemistry and its associated properties. ● To provide the basic understanding on corrosion and the importance of green chemistry. ● To introduce the students with the concept, classifications and applications of different fuels, lubricants, ceramics and polymers. ● To develop the student's ability to apply knowledge of different instrumental methods for chemical analysis.				
Course Pre-requisite	Chemistry of 12th Standard, Basic Knowledge of Chemistry				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	**Skills Demonstrated**	**RBT Level**
CO1	**Recall** the basic concepts of applied and engineering chemistry.	Level 1: Remember
CO2	**Explain** the water treatment, soil composition, green technology, corrosion, engineering materials and analytical techniques.	Level 2: Understand
CO3	**Solve** the engineering problems by applying the methods and techniques of engineering chemistry.	Level 3: Apply
CO4	**Analyze** different engineering problems to address the real life issues.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I
Water Chemistry: Physical and chemical properties of water, Introduction to hardness and its types, DO, COD, BOD, TDS, BIS and WHO standards, Methods of water softening (Lime soda process, Zeolite Process, Demineralization process), Sewage treatment plant process.
Soil Chemistry: Chemical composition of soils, Soil components, types and properties of soil colloids, Mechanism- diffused double layers, sorption processes, Cation and Base Exchange.

Unit-II
Corrosion: Introduction, Pilling Bedworth rule, Types and mechanism of dry and wet corrosion, Forms of corrosion, Pourbaix diagram (Iron-water system), Factors affecting corrosion and methods of prevention- Design of material, Anodic and Cathodic Protection, Protective surface coating, Overview to Chemical and Electrochemical Surface Treatment.

Green Chemistry: Introduction, 12 Principles with their explanations and examples, Green Solvents (Water, Ionic liquids, Supercritical carbon dioxide, Bio-based solvents), Importance of green synthesis, Examples of Microwave and Ultrasound Assisted reactions.

Unit-III

Fuel: Introduction to fuel and its properties, Calorific value, LCV, HCV, Determination of calorific value (Bomb's Calorimeter), Characteristic of good fuel, Knocking and chemical constitution of fuel, Octane and Cetane number, Overview on Gaseous Fuel: LPG, CNG, H_2, Syngas, Bio-diesel, Biogas and Landfill Gas.

Combustion: Chemistry of combustion, Introduction to explosive and flammable hazards and flame retardants chemicals.

Lubricants: Introduction to Lubricant, Classification (Liquid Lubricants, Solid Lubricants, Semi- solid Lubricants), Properties, Mechanism of Lubrication (Hydrodynamic Lubrication, Boundary Lubrication and Extreme Pressure Lubrication), Application of Lubricants.

Unit-IV

Ceramics: Introduction, Types of Ceramics, Cement and Glass-Chemical composition, Types, Properties, Manufacture and overview of technological applications**.**

Polymers: Introduction to Polymers, Classification of polymers, Types of polymer composites and engineering application of Thermoplastic (PVC, Polystyrene, Teflon), Thermosetting Plastics (Phenoplasts, Polyurethanes), Conducting and biodegradable Polymers.

Analytical techniques: Principle and Applications of Volumetric Titrimetry (Acid-base, complexometry, pH-metry), Thermogravimetry - TGA, and UV-Visible spectroscopy.

Suggested Readings:

- Essentials of Analytical Chemistry by Shobha Ramakrishnan and Banani Mukhopadhyay, Pearson Publications, 2018
- Engineering Chemistry by K. Sesha Maheshwaramma, Mridula Chugh. Pearson Publications, 2016
- Engineering Chemistry (NPTEL Web-book) by B. L. Tembe, Kamaluddin and M. S. Krishnan
- Introduction to polymer chemistry by G. S. Misra, New Age International Publishers, 2008
- New Trends in Green Chemistry by V. K. Ahluwalia, and M. R. Kidwai, Anamalaya Publishers, 2005
- Chemistry of Soils by G. Sposito, Oxford University Press, 2008
- Fuels and Combustion by Samir Sarkar, Universities Press, 2009

Useful Video links:

Unit No	Topics	Links
Unit-I	Water Chemistry	http://ecoursesonline.iasri.res.in/mod/page/view.php?id=124277
		https://archive.nptel.ac.in/courses/105/107/105107207/
		https://youtu.be/d_0Peuu6wI?si=0n45O3_MjSl61DXI
	Soil Chemistry	https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20- ar05/
Unit-II	Corrosion	https://nptel.ac.in/courses/113104082
	Green Chemistry	https://www.youtube.com/watch?v=0LtMaJvVt0s
Unit-III	Fuel, Combustion and Lubricants	https://archive.nptel.ac.in/courses/103/105/103105110/
		https://www.youtube.com/watch?v=7mH3jmdemIA
		https://www.youtube.com/watch?v=p8XQeKQd6rA
		https://www.youtube.com/watch?v=HTIzwP8BKC8
Unit-IV	Material Chemistry	https://www.youtube.com/watch?v=LtlxTDOcbXI
		https://nptel.ac.in/courses/113105028
		https://nptel.ac.in/courses/104103071
		https://nptel.ac.in/courses/104103019
		https://www.youtube.com/watch?v=xT9zzPR2dI0
		https://www.youtube.com/watch?v=XMGmnAc4KBs
	Titrimetry	https://www.youtube.com/watch?v=AvqYHCuOxLU
	TGA	https://nptel.ac.in/courses/115103030
		https://www.youtube.com/watch?v=h8g1K2z1yBw
	Ultraviolet and Visible Spectrophotometry	https://youtu.be/m33OeLsp8o0?si=PYpoSDyMYtjsJUpw
		https://nptel.ac.in/courses/104101130

Course Code	**BSC-CH-102B**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry-II**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	1	0	**4**	
Course Objectives	The objectives of this course are ● To provide the students the knowledge of atomic-molecular structure, electrochemistry and their associated theories and applications. ● To provide fundamental understanding and importance of green chemistry and e-waste recycling approaches. ● To lay the foundation for concept, classifications and applications of different nanomaterials and polymers. ● To develop the student's ability to apply knowledge of different instrumental methods for chemical analysis.				
Course Pre-requisite	Chemistry of 12th Standard, Basic Knowledge of Chemistry				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** the basic concepts of applied and engineering chemistry.	Level 1: Remember
CO2	**Explain** atomic and molecular structure, electrochemical process, green technology, e-waste, engineering materials and analytical techniques.	Level 2: Understand
CO3	**Solve** the engineering problems by applying the methods and techniques of engineering chemistry.	Level 3: Apply
CO4	**Analyze** different engineering problems to address the real life issues.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Atomic and Molecular Structure: Overview of Electromagnetic radiation, Photoelectric Effect, De Broglie Equation, Schrodinger wave equation, Quantum numbers and Atomic orbitals, Molecular orbital energy level diagrams of diatomic molecules (N_2, O_2, F_2, CO, NO, CN), Pi-molecular orbitals of butadiene, Crystal field splitting energy diagram for octahedral and tetrahedral complexes, Band structures of solids and semiconductor doping, Band theory of Semiconductors.

Unit-II

Electrochemistry and Energy Systems: Introduction, Electrode potential, Conductance, Overview to Nernst Equation, Electrochemical Cells (Galvanic and Concentration cells), Energy storage

systems (Batteries: Primary and Secondary Cell, Super capacitors: EDLC, Pseudo and Hybrid), Energy conversion devices (typical Inorganic and organic solar cells) and their materials, chemical reactions, working and applications.

Unit-III

Green Chemistry: Introduction, 12 Principles with their explanations and examples, Green Solvents (Water, Ionic liquids, Supercritical carbon dioxide, Bio-based solvents) Importance of green synthesis, Examples of Microwave and Ultrasound Assisted reactions.

E-Waste: Introduction, sources of e-waste, Composition and Characteristics. Toxic materials used in manufacturing electronic and electrical products, Different approaches of recycling (thermal treatments, hydrometallurgical extraction, pyrometallurgical methods).

Unit-IV

Nanomaterials: Introduction to Nanomaterial and its types, synthesis (vapor deposition, sol gel methods, combustion, microwave and ultrasound technique), classification- inorganic, semiconducting, carbon-based and quantum nanomaterials and their various applications.

Polymers: Introduction to Polymers, Classification of polymers, Types of polymer composites and engineering application of Thermoplastic (PVC, Polystyrene, Teflon), Thermosetting Plastics (Phenoplasts, Polyurethanes), Conducting and biodegradable Polymers.

Analytical techniques: Principle and Applications of Volumetric Titrimetry (Acid-base, complexometry, pH-metry), Conductometry and UV-Visible spectroscopy.

Suggested Readings:
- Essentials of Analytical Chemistry by Shobha Ramakrishnan and Banani Mukhopadhyay, Education Pearson, 2018
- Engineering Chemistry by K.Sesha Maheshwaramma, Mridula Chugh. Pearson Publications, 2016
- Engineering Chemistry (NPTEL Web-book) by B. L. Tembe, Kamaluddin and M. S. Krishnan
- Introduction to polymer chemistry by G. S. Misra, New Age International Publishers, 2008
- New Trends in Green Chemistry by V. K. Ahluwalia and M.R. Kidwai, Anamalaya Publishers 2005
- Introduction to Nanochemistry by Frank Owens Charles Poole, Wiley, 2010

Useful Video Links:

Unit No	Topics	Links
Unit-I	Atomic and Molecular Structure	https://archive.nptel.ac.in/courses/104/106/104106083/
		https://nptel.ac.in/courses/104106096
		https://nptel.ac.in/courses/104101130
Unit-II	Electrochemistry and Energy Systems	https://nptel.ac.in/courses/104106137
		https://archive.nptel.ac.in/courses/104/106/104106137/
		https://www.youtube.com/watch?v=nh2xbyOaERw
		https://archive.nptel.ac.in/courses/115/107/115107116/
Unit-III	Green Chemistry	https://www.youtube.com/watch?v=0LtMaJvVt0s
	E-Waste Management	https://nptel.ac.in/courses/105105169
Unit-IV	Material Chemistry	https://nptel.ac.in/courses/113105028
		https://nptel.ac.in/courses/104103019
	Titrimetry	https://www.youtube.com/watch?v=AvqYHCuOxLU
	Conductometry	https://www.youtube.com/watch?v=A4XzBj2zmUg
	Ultraviolet and Visible Spectrophotometry	https://youtu.be/m33OeLsp8o0?si=PYpoSDyMYtjsJUpw
		https://nptel.ac.in/courses/104101130

Course Code	**ESC-ME-102B**			
Category	Engineering Science Courses			
Course Title	**Manufacturing Process**			
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	2	0	0	**2**	
Course Objectives	The objectives of this course are • To gain a comprehensive understanding of various manufacturing processes and engineering materials with their applications in industrial production. • To acquire proficiency in cold and hot working techniques and select appropriate methods based on material properties and production needs. • To develop proficiency in casting and welding processes, identifying defects and applying suitable techniques for effective metal joining and fabrication.			
Assessment	20 Marks			
End Semester Examination	30 Marks			
Total	50 Marks			
Duration of Exam	03 Hours			

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Define** terminologies related to manufacturing processes.	Level 1: Remember
CO2	**Explain** the manufacturing processes, safety measures in industries and plant layouts.	Level 2: Understand
CO3	**Differentiate** manufacturing processes, engineering materials on technical parameters.	Level 2: Understand
CO4	**Use** appropriate manufacturing processes based on material properties, design requirements, and production constraints.	Level 3: Apply

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 4 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 6 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Manufacturing Processes: Introduction to Manufacturing Processes and their Classification, Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accident, Methods of Safety, First Aid, Objectives of Layout, Types of Plant Layout and their Advantages. **Engineering Materials:** General Properties and Applications of Engineering Materials, Mild Steel, Medium Carbon Steel, High Carbon Steel, High Speed Steel and Cast Iron.

Unit-II

Cold Working (Sheet Metal Work): Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining, Advantages and Limitations.

Hot Working Processes: Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, Wire Drawing.

Unit-III

Metal Casting: Principles and Basic Steps in Casting Processes, Pattern materials, types and allowance, Study of moulding, sand moulding, tools, moulding materials, classification of moulds, core, elements of gating system, casting defects, description and operation of cupola: special casting processes e.g. die-casting, permanent mould casting, centrifugal casting, investment casting.

Unit-IV

Welding: Introduction to welding, Classification of Welding Processes, GAS Welding- Oxy- Acetylene Welding, Resistance Welding- Spot and Seam Welding, Arc Welding- Metal Arc, TIG & MIG, Welding Defects and Remedies, Soldering & Brazing.

Suggested Readings:

- Manufacturing Engineering and Technology by S. Kalpakjian and S.R. Schmid, Pearson.
- Manufacturing Science by Amitabha Ghosh and A. K. Mallick East-West Press Pvt. Ltd. 2010.
- Manufacturing Technology (Foundation Forming & Welding) by P.N. Rao, Tata McGraw Hill.
- Principles of manufacturing materials and processes by J. S. Campbell, Tata McGraw Hill.
- Elements of Workshop Technology, Hajra & Choudhary, Media Promotors & Publishers Pvt. Ltd.
- Workshop Practices, H. S. Bawa, Tata Mc Graw Hill

Useful Video Links:

Unit No.	Topic	Link
Unit-I	Types of Plant Layout	https://www.youtube.com/watch?v=PRI0wNoUfqk
	Engineering Materials	https://www.youtube.com/watch?v=m9l1tVXyFp8
Unit-II	Hot and Cold Working	https://www.youtube.com/watch?v=dNbVsmVgOnM
Unit-III	Patterns and Allowances	https://www.youtube.com/watch?v=H78qWl4sf54
Unit-IV	Classification of Welding Processes	https://www.youtube.com/watch?v=NPi9L2fI4EI

Course code	**HSMC-ASH-103B**				
Category	Humanities and Social Sciences including Management courses				
Course title	**Understanding Harmony and Ethical Human Conduct.**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	**3**	
Course Objectives	The objective of this course is to inculcate human values to grow as responsible human beings with a proper personality.				
Course Pre-requisite	None				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total Marks	75				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define various terms related to harmony and ethical human conduct.	Level 1: Remember
CO2	**Explain** the fundamental concepts, theories, policies, practices and responsibilities of the engineers.	Level 2: Understand
CO3	**Solve** real-life problems related to human behavior based on his understanding of morals and values.	Level 3: Apply
CO4	**Analyze** essentials of human values and skills, the role of harmony in family, society and universal order, self-exploration, happiness and prosperity.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to Value Education: Understanding the need, basic guidelines, content and process for Value Education,

Self-Exploration–what is it? – Its content and process; 'Natural Acceptance' and experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity – A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility – the basic requirements for the fulfilment of aspirations of every human being with their priority. Understanding Happiness and Prosperity rightly- A critical appraisal of the current Scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit-II

Harmony in the Human Being: Understanding human beings as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Self-regulation (Sanyam) and Health; correct appraisal of Physical needs, the meaning of Prosperity in detail. Programs to ensure Self-regulation (Sanyam) and Health.

Unit-III

Harmony in the Family and Society and Nature: Understanding values in a human-human relationship; the meaning of Justice (nine universal values in relationships) and the program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, the difference between respect and differentiation; the other salient values in a relationship. Understanding the harmony in the society (society being an extension of the family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.

Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Unit-IV

Understanding Harmony in Nature and Existence – Whole existence as Coexistence: Understanding the Harmony in Nature. Interconnectedness and mutual fulfilment among the four orders of nature – recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Suggested Readings

1. A Foundation Course in Human Values and Professional Ethics by R R Gaur, R Asthana, G P Bagaria, 2ⁿᵈ Revised Edition, Excel Books, New Delhi, 2019.

2. Human Values by A.N. Tripathi, New Age International Publishers, New Delhi, 2004.

3. Professional Ethics by R. Subramaniam, Oxford University Press.

4. Ethics in Engineering by Mike W. Martin and Roland Schinzinger, Tata McGraw Hill, New Delhi, 2003.

Useful Video links

Unit No	Topics	Links
UNIT-I	Exploring Human Values	https://nptel.ac.in/courses/109104068
UNIT-II	Understanding Human Being	https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
UNIT-III	Harmony in the Family and Society and Nature	https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
UNIT-IV	Understanding Harmony in Nature and Existence	https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

Course Code	**ESC-EE 101B**				
Category	Engineering Science Courses				
Course Title	**Basics of Electrical and Electronics Engineering**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/ II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are To impart basic knowledge of the DC and AC circuits and their applications. To familiarize the students with the basic knowledge of measuring instruments, electrical machines and installations.				
Assessment	30Marks				
End Semester Examination	45Marks				
Total	75 Marks				
Duration of Exam	3 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	Define the technical terms related to Basic Electrical and Electronics Engineering.	Level 1: Remember
CO2	Explain the concept of DC & AC circuits, Measuring instruments, semiconductor devices.	Level 2: Understand
CO3	Apply various laws and theorems for solving the real life problems.	Level 3: Apply
CO4	Analyze the characteristics and properties of circuits, instruments and electrical systems.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

DC Circuits: Ohm's Law, Kirchhoff's Law, Types of Sources, Mesh Analysis, Nodal Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, analysis of simple circuits with dc excitation, representation of Sinusoidal waveforms, RMS value and Average Value, phasor representation, power triangle, power factor, analysis of single-phase AC circuits consisting R, L and C. Three phase balanced circuits, voltage and current relation for star and delta connection.

Unit-II

Transformer: Single Phase Transformer: Ideal and Practical Transformer with phasor diagram, losses, equivalent circuit, transformer tests and Efficiency, Auto transformer.

Electrical Machine: Construction and working Principle of DC machine, Synchronous Machine and three-phase induction machine, single phase induction motor (Capacitor start, capacitor start/capacitor run and split phase).

Semiconductor Devices and circuits: P-N Junction diode: V-I characteristics, Bi-polar Junction Transistors: Introduction, CB, CE and CC configurations, Introduction to SCR, DIAC, TRIAC, MOSFET and UJT, Operation of Rectifier (half wave and full wave), Active Filters.

Unit-IV

Digital Electronics: Introduction to Logic gates and universal gates, number system and Boolean algebra, SOP and POS form, Flip-Flops, Minimization of Logic functions, Karnaugh Maps, Logic implementation using Gates.

Suggested Readings:

- Fundamentals of Electric Circuits by C.K. Alexander and M.N.O. Sadiku; TATA McGraw-Hill.
- Principles of Electrical Engineering by V. Del Toro; Prentice Hall International.
- Electrical and Electronics Technology by Edward Hughes; Pearson.
- Basic Electrical Engineering by D P Kothari, I.J. Nagarath; Tata McGraw Hill
- Electrical Technology by B. L. Thareja and A. K. Thareja; S. Chand.
- Basic Electrical Engineering by Ritu Sahdev, Khanna Book Publishing
- Principles of Electronic Devices and Circuits by B. L. Theraja and R.S. Sedha, S.Chand.
- Electronics Device & Circuit Theory By Nagrath, I.J., PHI Learning

Useful Video links:

Unit No.	Topics	Links
Unit-I	Basic concepts and laws	https://archive.nptel.ac.in/courses/108/105/108105112/
	Single Phase AC Circuits	https://archive.nptel.ac.in/courses/108/102/108102185/
Unit-II	Ideal transformer and Phasor diagram	https://youtu.be/8r9B8COLeiU
	Equivalent circuit	https://youtu.be/dNCvDaJNXes
	Introduction to DC machine	https://youtu.be/PRdLNTQ2fRE
Unit-III	Diode circuits	https://youtu.be/fSV8dhjuaoM
	BJT	https://youtu.be/_KXldjWyYXI
	Rectifier	https://youtu.be/y5jjTQYQMmo
Unit-IV	Introduction to Digital electronics	https://youtu.be/pyFyUsAeYPQ
	Boolean Algebra	https://youtu.be/1kn6tY8TWBQ
	K-Map	https://youtu.be/jheob0v0CU4

Course code	**LC-EE-102B**				
Category	Engineering Science Courses				
Course title	**Basics of Electrical and Electronics Engineering Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	1	
Course Objectives	The objectives of this course are ● To teach the fundamentals of electrical engineering, essential for the development of new technologies to all branches of engineering. ● To give exposure and training to handle different instruments used in various experiments of Electrical Engineering.				
Course Pre-requisite	Physics of 12th Standard				
Assessment	25 Marks				
End Semester Practical Examination	25 Marks				
Total Marks	50				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

COs	Skill Demonstrated	RBT Level
CO1	Understand the usage of common electrical measuring instruments.	Level 2: Understand
CO2	Verify KCL, KVL & different theorems, V-I characteristics of semiconductor devices.	Level 3: Apply
CO3	Determine the resonant frequency in RLC Circuits, rectifier operation.	Level 4: Analyze
CO4	Evaluate tests on single phase transformer.	Level 5: Evaluate

List of Experiments

Sr. No.	Content
1	Basic Safety precautions, introduction and use of measuring instruments such as ammeter, voltmeter, wattmeter, practical resistors, capacitors, inductors, and multi-meter.
2	To verify Kirchhoff's voltage law and current law.
3	To verify Thevenin's theorem.
4	To verify Norton's theorem.
5	To verify Superposition theorem.
6	To determine the resonant frequency in RLC series AC circuit.
7	To determine the resonant frequency in RLC parallel AC circuit.
8	To perform open-circuit test and short-circuit test on a single-phase transformer.
9	To perform load test on a single-phase transformer.
10	To plot V-I characteristics of diode.
11	To plot V-I characteristics of BJT.
12	To measure power in three phase balanced circuit using two watt-meter method
13	To perform half wave rectifier circuit operation.
14	To perform full wave rectifier circuit operation.

Virtual Lab Links

Experiment Name	Virtual Lab Link
To verify Thevenin's theorem.	https://asnm-iitkgp.vlabs.ac.in/exp/verification-thevenin-theorem/
To verify Norton's theorem.	https://asnm-iitkgp.vlabs.ac.in/exp/verification-norton-theorem/
To verify Superposition theorem.	https://asnm-iitkgp.vlabs.ac.in/exp/verification-superposition-theorem/
To determine the resonant frequency in RLC series AC circuit.	https://asnm-iitkgp.vlabs.ac.in/exp/rlc-series-circuit/
To Study the efficiency of single phase transformer by load test.	https://bes-iitr.vlabs.ac.in/exp/single-phase-transformer/
Determination of Transformer equivalent circuit from Open Circuit and Short Circuit Test.	https://ems-iitr.vlabs.ac.in/exp/circuit-parameters-oc-test/
VI Characteristics of a Diode	https://be-iitkgp.vlabs.ac.in/exp/characteristics-diode/
To plot V-I characteristics of BJT.	https://be-iitkgp.vlabs.ac.in/exp/common-base-characteristics/
Half wave Rectification	https://be-iitkgp.vlabs.ac.in/exp/half-wave-rectification/
Full wave Rectification	https://be-iitkgp.vlabs.ac.in/exp/full-wave-rectification/

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

Course Code	**HSMC-ENG-101B**				
Category	Humanities and Social Sciences including Management Courses				
Course Title	**Communication Skills for Professionals**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	2	0	0	**2**	
Course Objectives	The objectives of this course are • To establish foundational communication skills by enhancing LSRW abilities. • To enhance self-presentation and interview techniques for success in academic and professional settings.				
Assessment	20 Marks				
End Semester Examination	30 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	**Skills Demonstrated**	**RBT Level**
CO1	**Describe** the fundamental concepts and key components of effective communication.	Level 1: Remember
CO2	**Explain** the techniques for improving LSRW skills and overcoming communication barriers.	Level 2: Understand
CO3	**Apply** communication principles to enhance LSRW skills and expand vocabulary for effective professional communication.	Level 3: Apply
CO4	**Apply** self-presentation and interview skills to excel in professional interactions.	Level 3: Apply

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 4 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 6 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Fundamentals of Communication: Definition, Nature and Importance of Communication, Communication Process, Types of Communication-Verbal and Non-verbal, 7 C's of communication, Barriers to Effective Communication and overcoming strategies, Communication Networks.

Unit-II

Enhancing LSRW Skills (Listening, Speaking, Reading, and Writing): Listening Skills, Cognitive process of listening, Active Listening Techniques, Barriers to Effective Listening, Speaking Skills Effective Speaking Techniques, Public Speaking, Reading Skills, Reading Techniques, Comprehension Strategies, Writing Skills, Writing Techniques.

<div align="center">**Unit-III**</div>

Basic Vocabulary: Vocabulary Building Techniques, Word Formation- Prefix Suffixes, Expanding Vocabulary- Antonyms-Synonyms, Homophones -Homonyms, Words often confused, One-word Substitutes, Idioms and Phrases.

<div align="center">**Unit-IV**</div>

Effective Self-Presentation and Interview Skills: Self-Presentation Skills, Importance of self- image, Dress Code and Personal grooming, Effective Presentation Techniques, creating a Strong First Impression, Body Language, Strategies for building self-confidence, Interview Skills- Preparing for Interview Skills, Professional Etiquettes.

Suggested Readings:
- Business Communication by Shukla, Preeti, Mahaveer Publication, 2016.
- Word Power Made Easy by Norman Lewis, 2018, Goyal Publishers & Distributors Pvt Ltd.
- Business Communication by Magan, Sangeeta, International Book House, 2012.
- Business Communication by Meenakshi Raman and Prakash Singh, Oxford University Press.
- Effective Technical Communication by by M. Ashraf Rizvi, Tata McGraw-Hill Education, 2018.
- Business Communication Skills by Thakur Veera and Singh,Tripti, Thakur Publication, 2017.
- Communication Skills by Dr. F.C.Sharma, Mahavir Publishing Company, 2023-24.
- English for Professionals by Dr. Seema Miglani and Dr. Shikha Goel, Vayu Education of India, 2010.

Useful Video Links

Unit No.	Topic	Link
Unit-I	Barriers to Communication	https://www.youtube.com/watch?v=CQ6D_bxZyxg&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH&index=2
	Verbaland Non-verbal Communication	https://www.youtube.com/watch?v=p1-etClsXdk&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH&index=5
	Fundamentals of Communication	https://www.youtube.com/@rabianawaz5108
Unit-II	Reading and Listening	https://www.youtube.com/watch?v=PAISeBhtYqI&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=5
	Types of listening	https://www.youtube.com/watch?v=mdE3thfUQ8Y&list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q&index=15
	Listening and Group Discussion	https://www.youtube.com/watch?v=JIKU_WT0Bls&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH&index=10
	Effective Speaking	https://www.youtube.com/watch?v=B53VM3FKag0&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=16
	Public Speaking	https://www.youtube.com/watch?v=RB3MJt3dfrg
Unit-III	VocabularyBuilding	https://www.youtube.com/watch?v=HATeh6e7Gv0
	Phrasal Verbs	https://www.youtube.com/watch?v=rUVEYAsVwVo&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=21
	Word formation	https://www.youtube.com/watch?v=ht-rk26E0mw&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=23
Unit-IV	Formal Presentation	https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=17
	Interview Skills	https://www.youtube.com/watch?v=45uNWLmAZR8&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb&index=7
	Presentation Skills	https://www.youtube.com/watch?v=z-ce7fcKe1E&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH&index=31
	Interview Skills	https://www.youtube.com/watch?v=45uNWLmAZR8&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH&index=22

Course Code	**LC-ME-102B**				
Category	Engineering Science Courses				
Course Title	**Engineering Graphics and Design**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	4	**2**	
Course Objectives	The objectives of this course are • To understand techniques of drawings in various fields of engineering. • To enhance the graphic skills of students. • To develop skills in preparation of basic drawings. • To provide skills in reading and interpretation of engineering drawings.				
Assessment	20 Marks				
End Semester Practical Examination	30 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Define** basic terminologies and concepts of engineering graphics & drawing.	Level 1: Remember
CO2	**Explain** the different types of engineering drawings, projections and standards.	Level 2: Understand
CO3	**Apply** principles of projection to solve the engineering problems related to design.	Level 3: Apply
CO4	**Analyze** the multi-view of orthographic projection to identify relationships between views.	Level 4: Analyze

Unit-I

Introduction to Engineering Drawing: Drawing instrument and their uses, lines, lettering and dimensioning, type of scale, plain and diagonal scale.

Projection: Introduction, principle of projection, method of projection, Planes of projection, Four quadrant, first and third angle projection, reference line, symbols for methods of projection, orthographic projection.

Unit-II

Projection of Point: Introduction, point situated in first, second, third & fourth quadrant. **Projection of lines:** Introduction, line parallel to one or both the planes, line contained by one or both the planes, line perpendicular to one of the planes, line inclined to one plane and parallel to other, line inclined to both the planes, traces.

Unit-III

Projection of Planes: Introduction, types of planes, projection of planes, projection of planes perpendicular to both the reference planes, perpendicular to one plane and parallel to other plane, perpendicular to one plane and inclined to the other plane, Inclined to both planes.

Projection of Solids: Introduction, type of solid, projections of solids in simple position, projection of solids with axes inclined to one of the reference planes and parallel to the other, projections of solids with axes inclined to both H.P. and the V.P.

Section of Solids: Sectional planes, section of solids, true shape of section.

Development of Surfaces: Introduction, method of development, development of lateral surfaces of right solids, cube, prisms, cylinders, pyramids & cone.

Overview of Computer Graphics: Demonstrating the knowledge of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension).

Suggested Readings:

* Elementary Engineering Drawing by Bhatt, N.D., Charotar Publishing Co.
* Engineering Graphics by K.L. Narayana and P. Kannaiah, Scitech Publications (India) Pvt.Ltd.
* Engineering Drawing by PS Gill, Katson Books.

Useful Video links:

Unit No.	Topics	Links
Unit I	Introduction to engineering graphics, Uses of drawing equipment's, Symbols, Types of lines, Lettering	https://archive.nptel.ac.in/courses/124/107/124107157/
Unit II	Projection of a point and line	https://drmcet.digimat.in/nptel/courses/video/112102304/L14.html
Unit III	Measures of Central Tendency	https://drmcet.digimat.in/nptel/courses/video/112102304/L17.html
Unit IV	Sectional views	https://drmcet.digimat.in/nptel/courses/video/112102304/L22.html
	Development of Surfaces	https://www.youtube.com/watch?v=GSCiOdybqv0

Course Code	**ESC-CSE-102B**				
Category	Engineering Science Courses				
Course Title	**Programming for Problem Solving**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are ● To understand different levels of programming languages, translators, and their functions in machine, assembly, and high-level languages. ● To develop problem-solving skills using algorithms, pseudocodes, flowcharts, and approaches like top-down, bottom- up, and modular. ● To learn C language concepts such as data types, control statements, functions, arrays, strings, and pointers. ● To equip the skills in the students for file handling, dynamic memory allocation, structures, unions, debugging, and real-world applications of C programming.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** the fundamentals of C programming language.	Level 1: Remember
CO2	**Understand** the basic concepts of C programming language.	Level 2: Understand
CO3	**Apply** the concepts of C programming language and problem solving techniques to solve engineering problems.	Level 3: Apply
CO4	**Analyze** the performance of various elements in C language to solve programming problems.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to Programming Language: Different levels of Programming languages- Machine language, Assembly language, Low level & High Level languages; language translator- Assembler, Compiler, Interpreter, Debugger, Linker, Loader.

Problem Solving: Problem definition, Introduction to problem solving, Program Design- Program development life cycle, Problem Solving approaches (Top-down, bottom-up, modular), Problem-solving techniques (Algorithms, Pseudocodes and Flowcharts representation), real world applications of problem solving.

Overview of C: Introduction to C language, Data types, 'C' Tokens, Pre-processor, Header Files, Arithmetic expressions and precedence, I/O: Unformatted and formatted I/O functions in C, Types of errors, operators. **Control statements:** if, if-else, nested if, switch case, Repetition / Iterations: entry and exit controlled loops, break, continue and go to statements.

Unit-III

Functions: Definition and Types of functions (built in & user defined functions), Working of a function, Declaring, Defining and Calling User defined functions, Call by value, Call by reference, Function as an argument, Recursive functions with examples.

Arrays: Definitions, types, initialization, processing an array, String handling functions, passing arrays to functions, returning arrays from functions.

Unit-IV

Structures and Unions: Definition, processing, passing to functions, and their uses.

Pointers: Idea of pointers, Definition, Dynamic memory allocation: calloc(), malloc(), free(), realloc(), basics of file handling.

Suggested Readings:
1. Programming in C: A Practical Approach by A. Mittal, Pearson Education.
2. Programming in ANSI C by E. Balaguruswamy, Tata McGraw-Hill
3. Let Us C by Y. Kanetkar, BPB Publication.
4. Schaum's Outline of Programming with C by B. Gottfried, McGraw-Hill
5. C: The Complete Reference by H. Schildt, McGraw Hill Education
6. The C Programming Language by B. W. Kernighan, D. Ritchie, Pearson Education India

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Introduction to Programming Language	https://youtu.be/E6jtj-7xJoA?feature=shared
	Introduction to Language Translator	https://youtu.be/qcEBXrqFLe8?feature=shared
	Algorithms	https://youtu.be/5AHRXOtn9bY?feature=shared
	Flow Chart	https://youtu.be/O8vPR3zh5go?feature=shared
Unit-II	Introduction To C Programming	https://youtu.be/IoT0zP4YlMk?feature=shared
	Datatypes in C	https://www.youtube.com/watch?v=0GJD1Cu4Koc
	Types of errors	https://www.youtube.com/watch?v=vzkcKq1e_yw
	Control Statements	https://youtu.be/kfZEZj1IOBE?feature=shared
Unit- III	Functions	https://www.youtube.com/watch?v=CUBwN0rHxvg
	Call By value & Call By reference	https://youtu.be/8mDj5h1Wwbg?feature=shared
	Recursion	https://www.youtube.com/watch?v=DxrhZJAwYY4
	Arrays	https://youtu.be/I9828WOCEMg?feature=shared
	String	https://youtu.be/V7AZuMuJmXY?feature=shared
Unit- IV	Structures	https://youtu.be/Pg49AN6MvhQ?feature=shared
	Pointers	https://www.youtube.com/watch?v=vbqEsRYpSh8&list=PLEA YkSg4uSQ2k6GwNhpgSHodGT8wfvgwu&index=30
	File Handling	https://youtu.be/fWOnJFzOHYM?feature=shared
	Structures	https://youtu.be/Pg49AN6MvhQ?feature=shared

Course Code	**LC-PHY-101B**			
Category	Basic Science Courses			
Course Title	**Mechanics, Optics and Superconductors Lab**			
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	**1**	
Course Objectives	The objectives of this course are ● To teach the fundamentals of physics essential for the development of new technologies to engineering. ● To give exposure and training to handle different instruments used in various experiments of physics in technological field.			
Course Pre-requisite	Physics of 12th Standard, Basic Knowledge of Physics			
Assessment	10 Marks			
End Semester Practical Examination	15 Marks			
Total	25 Marks			
Duration of Exam	03 Hours			

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Describe** the principles of Hooke's Law, torsional oscillation, sextant and other physics concepts to determine the spring constant, modulus of rigidity and other parameters.	Level 2: Understand
CO2	**Apply** experimental methods to calculate values such as frequency of oscillations and thermal conductivity from experimental data.	Level 3: Apply
CO3	**Analyze** the results obtained from various experiments such as diffraction grating, Hall coefficient, energy gap and hysteresis loss.	Level 4: Analyze
CO4	**Evaluate** the effectiveness of different experimental methods to find Planck's constant and wavelength of light and relate findings to theoretical concepts.	Level 5: Evaluate

List of Experiments:

Sr. No.	Contents
1	To determine the spring constant by Hooke's Law.
2	To determine moment of inertia of irregular body using torsional oscillation method.
3	To determine the frequency of a simple pendulum or vibrating bar or turning fork.
4	To determine the wavelength of monochromatic light by Newton's rings.
5	To determine Planck's constant using photocell
6	To determine thermal conductivity of a metallic material
7	To determine the force applied to various objects using a spring balance and verify the unit of force (Newton).
8	To determine wavelength of light using diffraction grating.

9	To determine the specific rotation of sugar solution using polarimeter.
10	To determine the height of distant object using sextant.
11	To determine displacement and conducting currents through a dielectric.
12	To determine band gap of a semiconductor.
13	To determine Hysteresis loss of a ferromagnetic material
14	To study Hall Effect in semiconductors and measure the Hall coefficient.

Virtual Lab links:

Experiment Name	Virtual Lab Links
To determinePlanck's constant	vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1
To determine the thermal conductivity of a metallic material.	https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=801&cnt=1

Note: At least 10 experiments are to be performed by the students from the above list. The faculty members can add extra experiment if he/she feels important to add.

Course Code	**LC-PHY-102B**				
Category	Basic Science Courses				
Course Title	**Introduction to Electromagnetism and Optics Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	**1**	
Course Objectives	The objectives of this course are ● To teach the fundamentals of physics essential for the development of new technologies to engineering. ● To give exposure and training to handle different instruments used in various experiments of physics in technological field.				
Course Pre-requisite	Physics of 12th Standard, Basic Knowledge of physics				
Assessment	10 Marks				
End Semester Practical Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Describe** the characteristics, working principle and applications of Semiconductor devices, solar cells and optical fibers.	Level 2: Understand
CO2	**Apply** experimental methods to study the forward and reverse characteristics of diodes, He-Ne laser and performance of solar cells.	Level 3: Apply
CO3	**Analyze** experimental data to calculate parameters such as planck's constant, Hall coefficient, Numerical aperture and energy gap and wavelength of light and specific rotation.	Level 4: Analyze
CO4	**Evaluate** the performance of semiconductor and optical devices in different practical scenarios and relate findings to theoretical concepts.	Level 5: Evaluate

List of Experiments:

Sr. No.	Contents
1	To study the forward and reverse characteristics of P-N junction diode.
2	To find thickness of hair using He-Ne laser.
3	To study the characteristics of Solar cell and find out the fill factor
4	To determine the wavelength of monochromatic light by Newton's rings.
5	To determine Planck's constant using photocell
6	To determine numerical aperture of an optical fiber.
7	To study Hall Effect in semiconductors and measure the Hall coefficient
8	To verify inverse square law with the help of a photovoltaic cell

9	To find capacitance of condenser using flashing and quenching experiment.
10	To determine specific rotation of sugar solution using polarimeter .
11	To determine energy gap by four probe method
12	To determine wavelength of light using diffraction grating.

Virtual Lab links:

Experiment Name	Virtual Lab Links
To determine Planck's constant	vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1
To find thickness of hair using He-Ne laser	https://bop-iitk.vlabs.ac.in/exp/he-ne-laser-polarization/

Note: At least 10 experiments are to be performed by the students from the above list. The faculty members can add extra experiment if he/she feels important to add.

Course Code	**LC-PHY-103B**				
Category	Basic Science Courses				
Course Title	**Semiconductor Physics and Optics Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	**1**	
Course Objectives	The objectives of this course are • To develop skills to measure various parameters using appropriate instruments. • To gain comprehensive knowledge of different electronic components and integrated circuits.				
Course Pre-requisite	Physics of 12th Standard, Basic Knowledge of Physics				
Assessment	10 Marks				
End Semester Practical Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Describe** the characteristics, working principles, and applications of semiconductor devices, solar cells, transistors, and optical fibers.	Level 2: Understand
CO2	**Apply** experimental methods to study the forward and reverse characteristics of diodes, the performance of solar cells, and the behavior of transistors, JFETs, and capacitors.	Level 3: Apply
CO3	**Analyze** experimental data to calculate and interpret parameters such as Planck's constant, Hall coefficient, numerical aperture, and energy gap.	Level 4: Analyze
CO4	**Evaluate** the performance of semiconductor devices in different practical scenarios and relate findings to theoretical concepts.	Level 5: Evaluate

List of Experiments:

Sr. No.	Contents
1	To study the forward and reverse characteristics of P-N junction diode.
2	To describe the process of determining the thickness of hair using a He-Ne laser.
3	To investigate the performance characteristics of a solar cell and determine its fill factor.
4	To demonstrate the reverse characteristics of a Zener diode and its voltage regulation capabilities in a practical circuit setup.
5	To analyze the data obtained from the photoelectric effect experiment and interpret the results to calculate the value of Planck's constant.
6	To analyze Hall voltage, magnetic field and current to determine the hall coefficient and identify charge carrier.
7	To verify inverse square law with the help of a photovoltaic cell.
8	To find energy gap by four probe method.

9	To find numerical aperture of optical fiber.
10	To study common base and common emitter characteristics of PNP/NPN transistor
11	To study characteristics of JFET.
12	To determine capacitance of a capacitor by flashing and quenching.

Virtual Lab links:

Experiment Name	Virtual Lab Link
To determine Planck's constant	vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1
To find thickness of hair using He-Ne laser	https://bop-iitk.vlabs.ac.in/exp/he-ne-laser-polarization/

Note: At least 10 experiments are to be performed by the students from the above list. The faculty members can add extra experiment if he/she feels important to add.

Course Code	**LC-CH-101B**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry-I Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	1	
Course Objectives	The objectives of this course are ● To teach the fundamentals of chemistry essential for the development of new technologies to all branches of engineering. ● To give exposure and training to handle different apparatus and instruments used in various experiments of chemistry in technological field.				
Course Pre-requisite	Chemistry of 12th Standard, Basic Knowledge of Chemistry				
Assessment	10 Marks				
End Semester Practical Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	**Skills Demonstrated**	**RBT Level**
CO1	**Explain** the use of various equipment, conditions and processes for performing chemistry experiments.	Level 2: Understand
CO2	**Apply** chemical principles and mathematical calculations using laboratory instruments and appropriate formulas.	Level 3: Apply
CO3	**Examine** the physical and chemical properties of various samples through laboratory experiments and measurements.	Level 4: Analyze
CO4	**Analyze** the different properties of water samples, oils and pigments.	Level 4: Analyze

List of Experiments

Sr. No.	**Contents**
1	To interpret the viscosity of different samples.
2	To calculate the surface tension of given liquids.
3	To prepare urea formaldehyde resin.
4	To estimate the total alkalinity of the water sample.
5	To determine the hardness of a given water sample by EDTA method.
6	To calculate the saponification value of a given oil sample.
7	To examine the amount of Fe (II) present in the given solution by volumetric titration.
8	To prepare the biodiesel from vegetable/waste cooking oil.
9	To analyze Flash and Fire Points of different oil samples.
10	To analyze Aniline Point of different petroleum samples.

Virtual Lab Links

Experiment Name	Virtual Lab Links
Experiment on calorimetry	https://media.pearsoncmg.com/bc/bc_0media_chem/chem_sim/c alorimetry/Calor.php
Experiment on spectrophotometry	https://vlab.amrita.edu/index.php?sub=2&brch=190& sim=338& cnt=1 https://biomodel.uah.es/en/lab/abs/espectro.htm
To find BOD	https://ee1-nitk.vlabs.ac.in/List%20of%20experiments.html
To determine COD	https://vlab.amrita.edu/index.php?sub=2&brch=193&sim =1548 &cnt=1

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

Course Code	**LC-CH-102B**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry-II Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	1	
Course Objectives	The objectives of this course are ● To teach the fundamentals of chemistry essential for the development of new technologies to all branches of engineering. ● To give exposure and training to handle different apparatus and instruments used in various experiments of chemistry in technological field.				
Course Pre-requisite	Chemistry of 12th Standard, Basic Knowledge of Chemistry				
Assessment	10 Marks				
End Semester Practical Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Explain** the use of various equipment, conditions and processes for performing chemistry experiments.	Level 2: Understand
CO2	**Apply** chemical principles and mathematical calculations using laboratory instruments and appropriate formulas.	Level 3: Apply
CO3	**Examine** the physical and chemical properties of various samples through laboratory experiments and measurements.	Level 4: Analyze
CO4	**Analyze** the different properties of water samples, oils and pigments.	Level 4: Analyze

List of Experiments:

Sr. No.	Contents
1	To interpret the viscosity of different samples.
2	To calculate the surface tension of given liquids.
3	To prepare urea formaldehyde resin.
4	To estimate the total alkalinity of the water sample.
5	To determine the hardness of a given water sample by EDTA method.
6	To calculate the saponification value of a given oil sample.
7	To examine the amount of Fe (II) present in the given solution by volumetric titration.
8	To calculate the strength of strong acid by conductometric titrating it with a strong base.
9	Photoreduction of benzophenone to benzopinacol in the presence of sunlight.
10	To extract copper from waste PCBs.

Virtual Lab Links:

Experiment Name	Virtual Lab Links
Experiment on calorimetry	https://media.pearsoncmg.com/bc/bc_0media_chem/chem_sim/calorimetry/Calor.php
Experiment on Spectrophotometry	https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=338&cnt=1 https://biomodel.uah.es/en/lab/abs/espectro.htm

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

Course Code	**LC-ME-103B**				
Category	Engineering Science Courses				
Course Title	**Workshop Practice**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	4	**2**	
Course Objectives	The objectives of this course are • To provide exposure to the students with hands on experience on machines and tools. • To have a study and hands-on-exercise on carpentry components. • To have a practice of welding, foundry and fitting operations, etc.				
Assessment	20 Marks				
End Semester Examination	30 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Describe** various manufacturing methods, operations and machine tools used in manufacturing Industries.	Level 2: Understand
CO2	**Prepare** the job on the different machines.	Level 3: Apply
CO3	**Analyze** the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.	Level 4: Analyze
CO4	**Design** and develop small products/elements of their interest by assembling different components.	Level 6: Create

List of Experiments:

Sr. No.	Contents
	(A) General
1	To study various measuring tools used in different shops.
2	To determine the least count of micrometer, Vernier caliper, screw gauge, height gauge etc.
	(B) Manufacturing operations
3	To study various manufacturing methods.
4	To study different machine tools used in manufacturing industries.
5	To prepare a job on a lathe involving facing, outside turning taper turning, step turning, radius making and parting-off. (Practice)
6	To prepare a job involving side and face milling on a milling machines. (Practice)
	(C) CNC machining, Additive manufacturing
7	To study basics of CNC Machine tool.
8	To study the basics of additive manufacturing.
9	To simulate CNC Part program for a CNC Milling machine.(Practice)
10	To simulate CNC Part program for a CNC Turning machine.(Practice)

(D) Fitting operations	
11	To Study various Fitting operations and tools used in Fitting shop.
12	To make a V-groove and V-notch in MS flat. (Practice)
(E) Carpentry operations	
13	To study steps various tools used in Carpentry shop.
14	To make wooden halving joint (or Cross-Joint) of soft wood. (Practice)
(F) Metal Casting operations	
15	To study various components of Sand Mould and operations involved in the casting process used in Foundry shop.
16	To test different properties of Sand Mould. (Practice)
(G) Welding operations	
17	To study various processes and tools used in welding shop.
18	To make a Butt joint using the given two M.S pieces by arc welding. (Practice)
19	To make a Lap joint using the given two M.S pieces by arc welding. (Practice)

Note: At least one experiment may be performed from each of the categories from A to G (Preferably from Practice type). In total at least 10 experiments need to be performed by the students.

Course code	**ESC-CE-101B**				
Category	**Engineering Science Courses**				
Course title	**Basics of Civil Engineering**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	3	
Course Objectives:	The objectives of this course are to • To provide the students an overview of the profession of Civil Engineering. • To give the students an illustration of the Civil engineering, properties of various building material, basic requirements of a building and explain the building construction aspects.				
Class work	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	Recall the basic concepts and terminology related to civil engineering, masonry, stones, timber, paints, and varnishes.	Level 1: Remember
CO2	Explain the functions and importance of various building components such as roofs, floors, doors, windows, cavity walls, and foundations.	Level 2: Understand
CO3	Apply appropriate construction methods and materials for specific building components like masonry work, damp-proofing, and fire protection based on site conditions.	Level 3: Apply
CO4	Analyze the environmental, social, and economic impact of civil engineering practices and select sustainable materials and green building solutions.	Level 4: Analyze

Note: Examiner will set nine questions in total. Questions one will be compulsory. Question one will have 6 parts (preferably 2 from each units/section) of 1.5 marks each and remaining 8 question of 9 marks each to be set by taking two questions from each units. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Module 1: Masonry Construction
Introduction and history to masonry construction, and terminology, Classification and properties of bricks: traditional and fly ash bricks, hollow bricks, AAC blocks, Bonds in brickwork, Laying and curing practices, Defects in masonry, Stone masonry: types, structural applications, finishes, Composite masonry and applications, Glass block masonry: uses. Introduction to green building concept.
Module 2: Stones and Tiles
Stones: Classification, requirements of good structural stone, quarrying, blasting, dressing of stones and seasoning of stone; Tiles: Manufacturing of tiles: ceramic, vitrified, and cement-based, Use of terracotta and faience in modern construction.

Unit-II

Module 3: Timber, paints and varnishes
Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, Plywood and fiber boards, Important Indian timbers; Basic constituents of paints, types of

paints, constituents of varnishes, characteristics and types of varnishes.

Module 4: Roofs and Floors

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings. Doors and Windows: Locations, sizes, types of doors and windows including UPVC, fixtures and fasteners for doors and windows.

<div align="center">

Unit-III

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Module 5: Cavity, Partition Walls and Foundations

Cavity walls and its position, advantages of cavity wall, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall. Types of foundations, sub-surface investigation, Foundation in water logged areas, Masonry wall foundation, Introduction to deep foundations.

Module 6: Stairs & Stair cases

Suitability of location, stairs in multi-storeyed buildings, Residential and public buildings, dimensions, Requirements, classification, types of stairs, Lift & escalators.

<div align="center">

Unit-IV

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Module 7: Damp-Proofing, Water-Proofing and Fire protection

Dampness and its causes, prevention of dampness, materials used, Damp-proofing treatment in buildings; Water proofing: water- proofing treatment of roofs including Latest Materials; Fire protection: Fire resisting construction, fire protection requirements for buildings.

Module 8: Sound insulation and Acoustics

Classification, measurement and transmission of sound, sound insulation of buildings, Acoustical materials and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other emerging materials including properties and uses.

Suggested Readings:
1. Building Construction By Sushil Kumar, Standard Pub., N. Delhi
2. Building Material By Rangawala
3. Construction Engineering By Y.S. Sane
4. Building Construction By Gurcharan Singh, Standard Pub., N. Delhi

Useful Video links:

Unit No.	Topics	Links
1	**Basics of Civil Engineering**	https://youtu.be/CsKddkqgwVk?si=6EFtfcMai-Q30sMm&t=97
2	**seasoning of timber**	https://youtu.be/tjYDnrMSHX0?si=b03FVrA0Gv3o_I-f
3	**Types of doors and windows**	https://youtu.be/VqveWrgpT0g?si=aHaAZpTW2M4JQhZl
4	**Damp-Proofing**	https://youtu.be/rkO9eqvFG-4?si=4xBa38PhH8fdQWza

Course code	ESC-ME-101B	
Category	Basic Science Courses	
Course title	**Basics of Mechanical Engineering**	
Scheme and Credits	L | T | P | **Credits**	Semester-I/II
	3 | 0 | 0 | 3	
Course Objectives:	The objectives of this course are • To introduce the fundamental concepts of mechanical engineering. • To provide knowledge of thermodynamics, heat engines, and energy systems. • To familiarize with manufacturing processes, machine tools, and workshop practices. • To offer insights into fluid mechanics, hydraulic systems, and their practical utilities.	
Assessment	30 Marks	
End Semester Examination	45 Marks	
Total Marks	75	
Duration of Exam	03 Hours	

Course Outcomes: After studying this course, the students will be able to:

CO	**Skill Demonstrated**	**RBT Level**
CO1	Define the fundamental concepts of mechanical engineering.	Level 1: Remember
CO2	Explain the principles of machine tools, thermal, fluid, and mechanical systems.	Level 2: Understand
CO3	Apply engineering concepts to solve problem related to mechanical systems.	Level 3: Apply
CO4	Analyze the behavior and performance of mechanical elements in practical scenarios.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction to Commonly used Machine Tools in a Workshop: Construction details and working of Lathe, Shaper, Planer, Milling, Drilling and Grinding.
Introduction to Manufacturing Systems: Fundamentals of Numerical Control (NC). Advantage of NC systems, Classifications of NC, Comparison of NC and CNC.

UNIT-II

Thermodynamics: Introduction to Thermodynamics, Types of Systems, Thermodynamic Equilibrium, Properties, State, Path, Process and Cycle, Elementary introduction to Zeroth, First and Second laws of thermodynamics, Heat and Work Interactions for various non-flow and flow processes.
Refrigeration & Air conditioning: Concept of Heat Engine, Heat Pump & Refrigerator, Unit and Rating of refrigeration machines, Coefficient of performance, simple refrigeration vapour compression cycle, Psychrometric charts and its usage.

UNIT-III

Steam Generator: Classification of boiler, introduction to fire tube and water tube with simple sketches, comparison between water tube & fire tube boiler, explain with sketches Lancashire, Cochran, babcock & wilcox boilers, Boiler mountings - functions with sketches of stop valve, safety valve, water level indicator, pressure gauge, Fusible plug, Boiler accessories - function with sketches of feed pump, economizer, super heater, air preheater.

Hydraulic Turbines & Pumps: Introduction, Classification, Construction details and working of Pelton, Francis and Kaplan turbines, Construction details and working of Reciprocating and Centrifugal pumps.

UNIT-IV

Power Transmission Methods and Devices: Introduction to Power transmission, Belt, Rope, Chain and Gear drive, Types and functioning of clutches.

Stresses and Strains: Mechanical properties of materials, concept & types of stresses and strains, poison's ratio, Hook's law, stress-strain diagrams, Elastic constants & their relationships. stresses and strains in simple and compound bars under axial loading.

Suggested Readings

1. Elements of Mechanical Engineering- R.K. Rajput Laxmi Pub., Delhi.
2. Elements of Mechanical Engineering- D.S. Kumar, S.K. Kataria and Sons
3. Engineering Thermodynamics - P.K. Nag TMH, New Delhi.
4. Refrigeration & Air conditioning- Arora & Domkundwar, Dhanpat rai & Co. Pvt. Ltd.
5. Workshop Technology Volt. I & II – Hazra & Chowdhury, Asian Book Comp., New Delhi.
6. Process and Materials of Manufacture- Lindberg, R.A. Prentice Hall of India, New Delhi.
7. Principles of Manufacturing Materials and Processes- Campbell, J.S. - McGraw Hill.

Useful Video links

Unit No.	Topic	Link
UNIT-I	Machine Tools in a Workshop	https://archive.nptel.ac.in/courses/112/105/112105233/
	NC and CNC	https://archive.nptel.ac.in/courses/112/105/112105211/
UNIT-II	Basic thermodynamics	https://archive.nptel.ac.in/courses/112/103/112103316/
	Refrigeration & Air conditioning:	https://archive.nptel.ac.in/courses/112/105/112105129/
UNIT-III	Boilers mountings & accessories	https://archive.nptel.ac.in/courses/112/107/112107216/
	Hydraulic Turbines & Pumps	https://archive.nptel.ac.in/courses/112/104/112104117/
UNIT-IV	Power Transmission Devices	https://nptel.ac.in/courses/116102012
	Basics of strength of materials	https://archive.nptel.ac.in/courses/112/107/112107147/

Course Code	**ESC-FTS-101B**				
Category	Engineering Science Courses				
Course Title	**Fundamentals of Fire and Safety Engineering**				
Scheme and Credits	L	T	P	**Credits**	**Semester- I / II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are • To provide foundational knowledge of fire science, fire behavior, safety management and safety audit. • To develop understanding of emergency preparedness, fire prevention measures, building codes related to fire safety, safety provisions and safety training. • To familiarize learners with various fire protection systems and technologies essential for minimizing fire and safety-related risks. • To train students in the application of firefighting techniques, Safety systems and procedures across various industries and environments.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	3 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	Recall the basic terminology of fire and safety.	Level 1: Remember
CO2	Explain the fundamental concepts of Fire and Safety Engineering.	Level 2: Understand
CO3	Apply fire and safety engineering knowledge to deal with the real life scenarios related to fire and safety.	Level 3: Apply
CO4	Analyze the effectiveness of fire safety strategies, emergency response plans, firefighting operations, safety training, and fire audit safety management system in diverse scenarios and industries.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Fire Engineering Science: Fire, Elements of fire, Classification of fire, Flash point, Fire point, Causes of fire, Phases of fire, Physical properties of matter, Temperature, Heat, Heat transmission, Thermal expansion, Hydraulics, Specific heat, Latent heat, Combustion, Types of combustion, Smoke, Electricity.
Buildings: Classification of buildings based on occupancy (as per latest National Building Code of India).

Unit-II

Fire Prevention: Elements of Construction, Elements of Structure, Fixed Installations–Fire doors, Smoke Ceiling, Compartmentation, Pressurization, Fire Safety Practice, Fire Safety Management.

Fire Protection: Fire Alarm and Detection Systems, Fire Extinguishers, Fire Hose Reels, Fire Hose Cabinets, Fire Hydrants, Fire Pumps, etc., Fire Sprinkler Systems, Fire Suppression Systems, Kitchen Fire Safety, General Requirements and Guidelines for the Installation of Fire Detection and Alarm System in the Buildings.

Unit-III

Accident: Introduction, Types of accidents, Causes of accidents, Principle of accident prevention, Accident investigation, and process of investigation, Onsite and offsite emergency response plan, and cost of accident, Emergency Evacuation, Process of Emergency Evacuation, Evacuation Plan, Means of Escape.

Safety: Introduction to safety, Need for integration of health and environment safety, Safety and productivity, Points for consideration of safety, General instructions for safety, Personal safety, Personal protective equipment, Objectives of safety management, Principles of safety management, Responsibilities of management, Plant manager, Engineers, individuals, Line supervisors, Safety managers, Workers and trade unions in the field of safety, Contractor, government, Social organization, Safety committee, Role of safety committee, advantages.

Unit-IV

Safety Education and Training: Elements of training cycle, Objectives of training, Training methods, Types of training, Behavior oriented training, Communication, purpose, barrier to communication, causes of preventable injuries, Death off the job.
Safety Audit: Safety audits, Types of audit, Audit goals, Responsibilities of audit team, Audit procedure, Safety in design, engineered safety.

Suggested Readings:

- Manual of Firemanship by HMSO
- Fire Safety in Buildings by V K Jain, New Age publishers, New Delhi
- Principles of Fire Safety Engineering by A. K. Das, PHI Publishers.
- Fundamentals of Fire Safety in Building Design by Dr. Than Singh Sharma, Aayush Publications, New Delhi
- Handbook of Fire Technology by R.S.Gupta, Orient Longman Pvt. Ltd., Kolkata
- Manual of Fire Safety by N. Sesha Prakash, CBS Publishers & Distributors Pvt. Ltd.
- National Building Code (NBC) Part-4 Life and Safety (Latest Edition)- Bureau of Indian Standards
- Fundamentals of Industrial Safety & Health by K.U.Mistry, Siddharth Prakashan.
- Industrial Safety Health and Environment management Systems by Jain and Rao, Khanna Publishers
- Safety Management by R.K. Mishra- AITBS Publishers.
- Safety Management in Industry by N.V. Krishnan, Jaico Publishing House, 1997
- Industrial Safety by Ronald P. Blake, Prentice Hall, New Delhi, 1973
- Occupational Safety and Health by David L. Goetsch, Prentice Hall
- Modern Accident Investigation and Analysis by Ted S. Ferry, John Wiley & Sons

Useful Video Links

Unit No.	Topic	Link	Source
Unit-I	Basics of Fire-Part 1	https://youtu.be/eLeZ2zc2hgI?si=VeWVsuhIkwRf-XYd	NPTEL (IIT Madras)
	Basics of Fire-Part 2	https://youtu.be/NzIbiOAJONc?si=7H_mIiQm18vvULrd	NPTEL (IIT Madras)
	Combustion	https://youtu.be/n6HAyxdup_U?si=IMSS2Ye7w01SQQNz	NPTEL (IIT Delhi)
Unit-II	Safety practices for Fire protection	https://youtu.be/-XRu7BSouvY?si=ogFdjHXtUbAbHWly	NPTEL (IIT Madras)
	Fire safety: Internal planning, Detection and Suppression	https://youtu.be/e3Orj5XDj2M?si=YghWp5QRE9ECcIKA	NPTEL (IIT Delhi)
	Sprinklers I	https://youtu.be/ZKsqIPM810M?si=5uIMn1w6so-tb7oU	NPTEL (IIT Roorkee)
	Sprinklers II	https://youtu.be/Z82ypLX2gn8?si=bdPqswwPWQ-DB613	NPTEL (IIT Roorkee)
Unit-III	Accident, Accident Investigation	https://youtu.be/VhuZ6M7a8N8?si=AJ0gXnTGKOd9KPFK	NPTEL (IIT Kharagpur)
	Emergency Scene Management (ESM)	https://youtu.be/uibCRbELVbA?si=z9JrmlCfMjKvDR4g	NPTEL (IIT Kanpur)
	Safety Engineering & Accident causing mechanisms	https://youtu.be/91YpCY-1Fy0?si=4L5f1y_NiOLGSm-4	NPTEL (IIT Kharagpur)
	Personal Protective Equipment	https://youtu.be/eLnv6Eb2Pq0?si=cbAkgLUqZ9QEJoWQ	NPTEL (IIT Delhi)
	Safety Committee Meeting	https://youtu.be/N12BEnI1hCY?si=TdR-4HO58IZsM5mp	NPTEL- IITC
Unit-IV	Safety Education	https://youtu.be/v-eltsixu4I?si=2T9UetPJdllhk7YN	NPTEL (IIT Kharagpur)
	Safety Audit	https://youtu.be/HuYIDi0QQm8?si=y_vJEkJHAVaP81WS	NPTEL (IIT Kharagpur)

Course code	**ESC-CSE-102B**				
Category	Engineering Science Courses				
Course title	**Basics of Computer Science and Engineering**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	3	
Course Objectives:	The objectives of this course are • To provide insight about the fundamentals of logic design, number systems, and basic data structures with their operations. • To explore foundational knowledge of database management systems and computer networking principles, architectures, and devices. • To explain software development methodologies and operating system functions, types, and real-world applications. • To develop awareness of cybersecurity threats, preventive practices, and analyze emerging trends and ethical issues in modern computing.				
Class work	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	Level
CO1	Recall fundamental concepts of logic design, data structures, database systems, computer networks, operating systems, software engineering, cybersecurity, and current computing trends.	Level 1: Remember
CO2	Explain the working principles, classifications, and roles of key computing components and technologies such as data models, SDLC models, OS types, and network topologies.	Level 2: Understand
CO3	Apply logical reasoning, data structure operations, and networking principles to basic problem-solving scenarios in computing and software environments.	Level 3: Apply
CO4	Analyze cybersecurity threats and emerging computing technologies to identify their components, interactions, and implications for system security and societal impact.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to Logic Design: Logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), Number Systems (Decimal, Binary, Octal, Hexadecimal), Conversion between number systems.

Data Structures: Introduction to data structure, Operations on data structures (insertion, deletion, traversal), Types (linear, non-linear).

Unit-II

Database Management System: Introduction, Definition, Applications, Advantages, Data abstraction, Database Vs File Systems, Data Models (Relational, Hierarchical, Object Oriented, Network, Entity-Relationship Model).

Computer Network: Introduction, Types of networks (LAN, WAN, MAN, Internet), Basic networking concepts (IP addresses, DNS, WWW, ISP, Email), Network devices and components (Routers, Switches, Modems), Network topologies (Bus, Star, Ring, Tree, Mesh, Hybrid).

Unit-III

Software Engineering: Introduction to Software Development Life Cycle, SDLC Models (Waterfall, Spiral and Prototype model), Requirements Analysis and Specification.

Operating System: Introduction to Operating system, Functions of an OS, Types of OS (Batch, Multiprogramming, Multi-Processing, Multi-Tasking, Time-Sharing, Distributed, Network, Real-Time Operating System), Popular operating systems (Windows, Mac OS, Linux).

Unit-IV

Cybersecurity Fundamentals: Introduction to cybersecurity, Common threats (Viruses, Malware, Trojans, Ransomware, Spyware, Adware, Phishing), Basic security practices (Password management, Firewalls, IDS), Authentication Vs Authorization.

Current Trends in Computing: Emerging technologies (AI, Machine Learning, Blockchain, IoT, Cloud Computing, Big Data, Generative AI), Impact of technology on society, Ethical considerations in computing.

Suggested Readings:
1. Fundamental of Computers and Programming with C, by A.K.Sharma, Dhanpat Rai Publications, New Delhi.
2. Digital Logic and Computer Design by M. Morris Mano.
3. Database System Concepts by Abraham Silberschatz, Henry Korth, and S. Sudarshan.
4. Data Communications and Networking by Behrouz A. Forouzan, McGraw-Hill.
5. Software Engineering: A Practitioner's Approach by Roger S. Pressman, Bruce R. Maxim, McGraw-Hill Education.
6. Operating System Principles by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley India Pvt. Limited.
7. The Fourth Industrial Revolution by Klaus Schwab.
8. Modern Digital Electronics by R. P. Jain, McGraw Hill
9. Computer Networks by Tanenbaum, Pearson.
10. Operating Systems by William Stallings, Pearson Education
11. Fundamentals of Database System, by Elmasri Ramez and Navathe Shamkant, Pearson Education

Useful Video links:

Unit No.	Topics	Links
Unit-I	Logic Gates & Number System	https://archive.nptel.ac.in/courses/108/105/108105113/
	Data Structures	https://youtu.be/zWg7U0OEAoE
Unit-II	Database Management System	https://onlinecourses.nptel.ac.in/noc22_cs91/preview
	Computer Network	https://archive.nptel.ac.in/courses/106/105/106105183/
Unit-III	Software Engineering	https://archive.nptel.ac.in/courses/106/105/106105182/
	Operating System	https://archive.nptel.ac.in/courses/106/105/106105214/
Unit-IV	Cyber Security Fundamentals	https://archive.nptel.ac.in/courses/106/106/106106129/
	Introduction to Artificial Intelligence	https://archive.nptel.ac.in/courses/106/102/106102220/
	Big Data Computing	https://archive.nptel.ac.in/courses/106/104/106104189/
	Cloud Computing	https://archive.nptel.ac.in/courses/106/105/106105167/

Course Code	**ESC-DS-101B**				
Category	Engineering Science Courses				
Course Title	**Basics of Data Science**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are ● Introduce the core concepts, evolution, and applications of data science along with the role of Python in data analysis. ● Explain statistical techniques for descriptive data analysis, including measures of central tendency, dispersion, distribution, and correlation. ● Develop the ability to perform data wrangling tasks such as data cleaning, organization, enrichment, and validation for preparing data for analysis. ● Enable students to visualize data effectively using Python libraries and select appropriate visualization methods for different types of datasets.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total Marks	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	**Skill Demonstrated**	**RBT Level**
CO1	Define the fundamental concepts and terminologies of data science, including data types, data preprocessing, statistical measures, and visualization techniques.	Level 1: Remember
CO2	Explain the data science process, roles of data scientists, statistical principles, data wrangling steps, and the importance of visualization tools.	Level 2: Understand
CO3	Apply data preprocessing, statistical methods, and Python-based visualization techniques to analyze and interpret real-world datasets.	Level 3: Apply
CO4	Analyze datasets to identify patterns, trends, and correlations using statistical and visualization methods, and assess the effectiveness of predictive models and recommender systems.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to Data Science: Evolution of Data Science, Applications of Data Science in various fields, Need of Python for data analysis, Data scientist roles and responsibilities, Types of Data, Data objects and attributes types, Data science process, Data Pre-processing, Trend & predictive mining, Recommender systems.

Unit-II

Descriptive Data Analysis: Central tendency (mean, mode, median), Dispersion (range, variance, and standard deviation), shape of the distribution of datasets, Normal distribution, Covariance, correlation, importance of correlation, Correlation metric.

Unit-III

Data Wrangling: Introduction of Data Wrangling, Data Wrangling process, steps-Discover, Organization, Cleaning, Data enrichment, Validation, Publishing, Use cases of data wrangling, Advantages of Data Wrangling.

Unit-IV

Data Visualization: Importance of Data Visualization, Basic Visualization tools, Specialization Visualization tools, Information dashboards, python packages-matplotlib, seaborn, Types of plots-line, bar, histogram, pie, scatter, Distribution plots, selecting best plot according to data.
Suggested Readings

1. Data Science For Dummies by Lillian Pierson, 2nd edition, John Wiley & Sons, 2017.
2. Beginners Guide to Data Visualization: How to Understand, Design, and Optimize Over 40 Different Charts by Elizabeth Clarke, Kenneth M Fornari, 2022.
3. The Art of Data Science by Roger D. Peng, Elizabeth Matsui, illustrated, 2016.
4. Data Science for Beginners by Andrew Park, 2021.
5. Data Wrangling: Concepts, Applications and Tools by M. Niranjan Murthy, Kavita Sheoran, 2023.
6. Fundamentals of Data Visualization by Claus O. Wilke, 2019.

Useful Video links

Unit No.	Topics	Links
Unit-I	Introduction to Data Science	https://youtu.be/MTjOuCbdBCo
	Data Preprocessing	https://youtu.be/lOh2x-UACaU?list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J
Unit-II	Descriptive Data Analysis	https://youtu.be/jnuYqmeYiWY?si=uhtB3Zxr5u4R6KVT
	Covariance and correlations	https://youtu.be/ZZsVkC0PIkc?si=px-Qs-WZB9w2x6We
Unit-III	Data Wrangling	https://youtu.be/eI9Ze4kOkC8?si=lUJ6k_Y1KxhME6Ax
Unit-IV	Data Visualisation	https://youtu.be/eFByJkA3ti4?si=AxQPVKmI_P8yfFPa

Course Code	**ESC-AI-101B**				
Category	Engineering Science Courses				
Course Title	**Basics of Artificial Intelligence**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are • To introduce the fundamental concepts, history, types, and applications of Artificial Intelligence, including intelligent agents and expert systems. • To develop understanding of AI problem-solving methods, including search strategies and knowledge representation techniques. • To familiarize students with the basics of machine learning, its types, and its role within AI systems and applications. • To explore ethical considerations in AI and examine real-world applications across various domains such as healthcare, finance, and security.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total Marks	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	**Skill Demonstrated**	**RBT Level**
CO1	Recall foundational concepts, terminology, and components of Artificial Intelligence including problem-solving methods, knowledge representation, machine learning types, and real-world applications.	Level1: Remember
CO2	Explain search strategies, knowledge representation techniques, and machine learning models, and describe their role in AI systems.	Level2:Understand
CO3	Apply appropriate search algorithms and machine learning techniques to solve real-world AI problems.	Level 3: Apply
CO4	Analyze the ethical issues, biases, and societal impacts of AI technologies and evaluate the effectiveness of AI applications across various domains.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to AI: Definition, History, Applications, Intelligent agents, AI problem-solving techniques, AI vs. Human Intelligence, Types of AI (Narrow, General, Super AI), Intelligent agents and environments, Introduction to Expert Systems, Components of an expert system (knowledge base, inference engine, user interface), Examples: MYCIN, DENDRAL, Rule-based systems (if-then rules).

Unit-II
Search Strategies: Problem formulation, Search tree and state space, Uninformed search (BFS, DFS), Informed search (A*, Best-First Search), Heuristic search, Constraint satisfaction problems. Knowledge

Representation & Reasoning: Propositional Logic, First-Order Predicate Logic, Logic-based representation, Semantic networks, Frames and Scripts, Ontologies.

Unit-III

Machine Learning in AI: Machine Learning basics, Types of ML: Supervised and Unsupervised, Machine Learning vs. Traditional Programming, Applications of Machine Learning, Decision trees, Neural networks, Reinforcement learning, Introduction to Neural Networks and Deep Learning basics.

Unit-IV

AI Ethics & Applications: Introduction to AI Ethics, Need for ethics in AI systems, ethical frameworks, Bias in AI, Data bias and algorithmic bias, Mitigating bias in AI systems, Case studies (e.g., biased hiring tools, facial recognition). AI in Healthcare, Finance, and Autonomous Systems, AI in Cyber security, AI in Law and Order, AI in Business and Marketing.

Suggested Readings:
1. Artificial Intelligence: A Modern Approach – Stuart Russell & Peter Norvig, Pearson.
2. Introduction to AI – Patrick Henry Winston, MIT Press.
3. Deep Learning – Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press.
4. Artificial Intelligence: Foundations of Computational Agents – David Poole, Alan Mackworth.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Introduction to AI	https://www.youtube.com/watch?v=GHpchgLoDvI&list=PLp6ek2hDcoNB_YJCruBFjhF79f5ZHyBuz
	Expert Systems	https://www.youtube.com/watch?v=nE5c5w4aizU
Unit-II	Uninformed search	https://www.youtube.com/watch?v=ayP0KCeBK_U
	Semantic networks	https://www.youtube.com/watch?v=dU9WsMglBSM&t=317s
Unit-III	Machine Learning	https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77
	Neural networks	https://www.youtube.com/watch?v=xbYgKoG4x2g&list=PL53BE265CE4A6C056
Unit-IV	Bias in AI	https://www.youtube.com/watch?v=Y0m136XU65o
	Cyber security	https://www.youtube.com/watch?v=OYsY5B9pqYU&list=PLyqSpQzTE6M-jkJEzbS5oHJUp2GWPsq6e

Course Code	**LC-CS-102A**				
Category	Engineering Science Courses				
Course Title	**Programming for Problem Solving Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	**1**	
Course Objectives	The objectives of this course are • To perform arithmetic calculations like addition and type conversions. • To solve problems with loops, decision-making, and mathematical computations. • To apply advanced concepts like arrays, pointers, structures, and recursion for data handling. • To develop modular programs using file handling, sorting, and searching techniques.				
Assessment	25 Marks				
End Semester Practical Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	Describe the usage of Turbo C IDE and basic C programming techniques.	Level 2: Understand
CO2	Apply Turbo C IDE, arithmetic operators, control statements, and functions for basic programming tasks.	Level 3: Apply
CO3	Implement arrays, strings, recursion, pointers, structures, unions, and file handling for efficient data manipulation.	Level 3: Apply
CO4	Analyze the applicability of control statement and iteration statements to implement linear search and bubble sorting.	Level 4:Analyze

List of Experiments

Sr. No.	Content
1	Study Turbo C IDE Programming Environment.
2	Write a C program to perform the addition of two numbers using arithmetic operators and variables, along with type conversion.
3	Write a C program to find the roots of a quadratic equation using mathematical library functions.
4	Write a C program using `if-else` to find the largest of three numbers.
5	Write a C program using `switch-case` to create an arithmetic calculator.
6	Write a C program using `for` loop to generate the Fibonacci series for n terms.
7	Write a C program using `do-while` loop to find the sum of the first 5 natural numbers.
8	Write a C program using 1-D array to read and write elements in an array.
9	Write a C program using a 2-D array to implement the addition of two matrices.
10	Write a C program to implement various string functions using the concept of strings.
11	Write a C program using Call by Value to swap two numbers.
12	Write a C program using recursion to find the factorial of a number.

13	Write a C program using pointers to get the memory address of an element.
14	Write a C program using structures to read and write basic information of a student.
15	Write a C program using union to read and write basic information of a student.
16	Write a C program using file handling to read and write data into a text file.
17	Write a C program to implement linear search using control and iteration statements.
18	Write a C program to implement bubble sort using control and iteration statements.

Virtual Lab Links:

Experiment Name	Virtual Lab Links
Introduction of Turbo C IDE and Programming Environment.	https://www.youtube.com/watch?v=oyEjuHlOd58
Apply the concept of mathematical library functions to find roots of a quadratic equation	https://www.youtube.com/watch?v=3QiItmIWmOM&list=PLeCxvb23g7h rw27XlekHtfygUTQ0TmFfP&index=2
Apply the concept of switch case to create arithmetic calculator.	https://www.youtube.com/watch?v=HHuaYKKoMR4
Apply the concept of 2-D array to implement the addition of two matrices.	https://www.youtube.com/watch?v=ukA_X29Wy6c
Apply the concept of structure to read and write basic information of a student.	https://www.youtube.com/watch?v=cCnYT5TSHSA&list=PLeCxvb2 3g7hrw27XlekHtfygUTQ0TmFfP&index=14
Apply the concept of file handling to read and write data into a text file.	https://www.youtube.com/watch?v=AHkkRS_VsRg

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

Course Code	**LC-ENG-102B**				
Category	Humanities and Social Sciences including Management courses				
Course Title	**Language Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	**1**	
Course Objectives	The objectives of this course are • To develop the ability to communicate effectively in social and professional contexts. • To improve the Pronunciation and Phonemic knowledge of the students.				
Assessment	10 Marks				
End Semester Practical Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Explain** the spoken language in various contexts and enhance overall comprehension skills.	Level 2: Understand
CO2	**Describe** the International Phonetic Alphabet and improve clarity and pronunciation.	Level 2: Understand
CO3	**Apply** their knowledge and skills to excel in Group Discussions, Debates, Extempore, Speeches and Presentations.	Level 3: Apply
CO4	**Apply** the communication strategies effectively in social and professional settings for impactful interactions.	Level 3: Apply

List of Experiments:

Sr. No.	Contents
1	Listening Comprehension
2	Recognition of Phonemes in the International Phonetic Alphabet
3	Self- Introduction and Introducing Others
4	Conversational Skills and Dialogues in Everyday Situations.
5	Workplace Communication
6	Telephonic Communication
7	Speeches for Special Occasions (Welcome Speeches, Introduction Speeches, Felicitation Speeches and Farewell Speeches)
8	Group Discussions
9	Debates
10	Presentation Skills

Suggested Readings:
- Communicative English for Engineers and Professionals by Nitin Bhatnagar and Mamta Bhatnagar, Pearson Education, 2013.
- Practical English Usage by Michael Swan, 3rd Edition OUP,1995.
- Practical Course in Spoken English, J. K. Gangal, PHILearning, 2015.
- Communication Skills for Professionals by Nira Konar, PHI Learning, 2009.
- Spoken English by R.K. Bansal and J.B. Harrison, Orient Longman, 1983.
- Communication Skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning, 2015.

Useful Video links:

Topics	Links
Listening Comprehension	https://www.youtube.com/watch?v=Q5WwWn7PD6o&list=PLLy_2iUCG87CQhELCy tvXh0E_y-bOO1_q&index=7 https://www.youtube.com/watch?v=jiPxwFVA9lE&list=PLLy_2iUCG87CQhELCytv Xh0E_y-bOO1_q&index=8
Phonemes and Allophones	https://www.youtube.com/watch?v=fAfI-UkMoVA
Self- Introduction and Introduction of others	https://www.youtube.com/watch?v=QgjkjsqAzvo https://www.youtube.com/watch?v=TwZ7LgrPwR0
Conversation and Dialogues in Everyday Situations	https://www.youtube.com/watch?v=H6n3iNh4XLI
Workplace Communication	https://www.youtube.com/watch?v=B53VM3FKag0&list=PLzf4HHls QFwIQUeZq_yk EVB6qZrTRnJZn&index=16 https://www.youtube.com/watch?v=PAISeBhtYqI&list=PLzf4HHlsQ FwIQUeZq_ykE VB6qZrTRnJZn&index https://www.youtube.com/watch?v=j4tCTRrYC1Q
Telephonic Communication	https://www.youtube.com/watch?v=xROJzUo5Apc
Speeches, Debates and Oral Presentation	https://www.youtube.com/watch?v=xG23Ufhkizs&list=PLLy_2iUCG8 7CQhELCytvX h0E_y-bOO1_q&index=47 https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQ FwIQUeZq_yk EVB6qZrTRnJZn&index=17
Group Discussion	https://www.youtube.com/watch?v=1DVO_f2gk1A&list=PLLy_2iU CG87CQhELCytv Xh0E_y-bOO1_q&index=42 https://www.youtube.com/watch?v=R6RyBAZe94w&list=PLLy_2i UCG87CQhELCyt vXh0E_y-bOO1_q&index=43 https://www.youtube.com/watch?v=UcEq_RsCyxY&list=PLbMVog Vj5nJSZB8BV29_ sPwwkzMTYXpaH&index
Presentation Skills	https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQ FwIQUeZq_yk EVB6qZrTRnJZn&index=17

Course Code	**LC-DT-101B**				
Category	Humanities and Social Sciences including Management courses				
Course Title	**Design Thinking**				
Scheme and Credits	L	T	P	**Credits**	Semester-**I/II**
	0	0	2	1	
Course Objectives	The objectives of this course are to • Develop an understanding of Design Thinking, its need, objectives, and stages, along with creative thinking and problem-solving processes. • Apply Design Thinking in engineering product design, including prototyping, testing, and alignment with customer expectations • Explore individual differences through discussions and activities that foster acceptance, appreciation, and collaboration in design. • Assess market strategies for production, costs, business models, and sustainability to optimize product success.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** the key concepts of Design Thinking, including its necessity, objectives, and various stages in the creative problem-solving process.	Level 1: Remember
CO2	**Understand** Design Thinking and its product design stages, including prototyping and testing, while fostering appreciation for individual differences.	Level 2: Understand
CO3	**Apply** Design Thinking to solve customer challenges, enhance user experience, and refine products through Rapid Prototyping and testing.	Level 3: Apply
CO4	**Analyze** market strategies for production, costs, business models, and sustainable design, assessing their impact on product success and future trends	Level 4: Analyze

List of Experiments:

Sr. No.	Contents
1.	Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concept and Brainstorming, Stages of Design Thinking Process- Empathize, Define, Ideate, Prototype, Test.
2.	Understanding Creative Thinking Process, Understanding Problem Solving, Testing Creative Problem Solving.

3.	Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment- Engineering Product Design.
4.	What is Prototype? Why Prototype, Rapid Prototype Development process, Testing, Sample.
5.	Understanding Individual differences and Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of individual differences.
6.	Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of customer Expectations with Product Design.
7.	Feedback loop, Focus on User Experience, Address "ergonomic challenges, user focused design, rapid prototyping and testing, final product, Final Presentation-"Solving Practical Engineering Problem through Innovative Product Design & Creative Solution".
8.	Conduct survey and identify the problem either individual or group and frame the problem statement.
9.	Implementation & Market Integration- Design for Production, Cost considerations, Business Models.
10.	Reflection & Future Trends- Evolution of Design Thinking, Sustainable Design, Career Pathways

Note: At least 8 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

Course Code	MC-101B
Category	Mandatory Non-Credit Courses- Audit Courses
Course Title	**Yoga and Sports**

Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	**-**	

Course Objectives	The objective of this course are • To make the students understand the importance of sound health and fitness principles as they relate to better health. • To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness. • To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury. • To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.
Duration of Exam	03 Hours

Course Outcomes: After studying this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** the key concepts and terminologies of Physical Education	Level 1: Remember
CO2	**Describe** the importance of physical fitness, wellness, lifestyle changes, and the concept of positive lifestyle for improving health.	Level 2: Understand
CO3	**Apply** physical fitness, wellness, yoga techniques, first aid techniques and sports psychology strategies to manage emotions, stress, anxiety, sports injuries and enhance performance.	Level 3: Apply
CO4	**Analyze** the psychological aspects such as motivation, emotions, and stress to understand their impact on sports performance and athlete behavior.	Level 4: Analyze

Unit-I

Introduction to Physical Education: Meaning & definition of Physical Education, Aims & Objectives of Physical Education, Changing trends in Physical Education, Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga.

Awards: Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Unit-II

Physical Fitness, Wellness and Lifestyle: Meaning & Importance of Physical Fitness & Wellness, Components of Physical fitness, Components of Health related fitness, Components of wellness, Preventing Health Threats through Lifestyle Change, Concept of Positive Lifestyle.

Yoga and Asana: Meaning & Importance of Yoga, Elements of Yoga, Introduction - Asanas,

Pranayama, Meditation & Yogic Kriyas, Yoga for concentration, Relaxation Techniques for improving concentration - Yog-nidra, Asanas as preventive measures, Sukhasana, Tadasana, Padmasana, Shashankasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Shavasana, Hastasana, Trikonasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Paschimottasana, Chakrasana, Gomukhasana, Parvatasana, Matsyasana.

Unit-III

Psychology & Sports: Definition & Importance of Psychology in Physical Edu. and Sports, differentiate between growth & development, Adolescent problems & their Management.
Emotion: Concept, Type & Controlling of emotions, Meaning, Concept & Types of Aggressions in Sports, Psychological benefits of exercise, Anxiety & Fear and its effects on Sports Performance, Motivation, its type & techniques, Understanding Stress & Coping Strategies.

Unit-IV

Sports / Games: Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc. History of the Game/Sport, Latest General Rules of the Game/Sport, Specifications of Play Fields and Related Sports Equipment, Important Tournaments and Venues, Sports Personalities, Proper Sports Gear and its Importance.
Sports Medicine: First Aid – Definition, Aims & Objectives, Sports injuries: Classification, Causes & Prevention, Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries.

Note:

The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.

Course Code	**MC-102B**				
Category	Mandatory Non-Credit Courses – Audit Course				
Course Title	**Fire Ground Operation-I**				
Scheme and Credits	L	T	P	**Credits**	Semester-**I** (For B.Tech Fire Tech & Safety Students)
	0	0	2	-	
Course Objectives	The objectives of this course are • To instill discipline and professionalism by teaching ground decorum, proper communication with superiors, and adherence to dress codes. • To provide a strong foundation in drill techniques, including the principles, history, and practical execution of various formations and movements. • To equip trainees with practical firefighting skills, focusing on the use of fire safety equipment such as fire extinguishers, hoses, and breathing apparatus. • To foster teamwork and leadership through group drills, enhancing coordination, following instructions, and executing synchronized movements.				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** key concepts of ground decorum, basic drill movements, fire extinguisher procedures, and firefighting equipment.	Level 1: Remember
CO2	**Explain** the principles, history, and instructional methods of drills, along with the purpose of various firefighting tools and equipment.	Level 2: Understand
CO3	**Demonstrate** proper interaction with senior officers, faculty members, and peers, as well as execute basic drill movements such as saluting and quick march.	Level 3: Apply
CO4	**Analyze** the sequence and coordination required for complex drill movements such as forming file from single file or changing direction by wheeling.	Level 4: Analyze

List of Experiments

Sr. No.	Contents
1	Introduction to ground decorum, talking with senior officers, faculty members, ground instructors and seniors, dress code.
2	To study the aim, principle, instruction method and history of drill.
3	To perform the positions of attention, stand at ease, stand easy, sizing, right dress, dismiss, step forward/backward march and side step.
4	To perform the dressing, open and close order march, forming up in three ranks, numbering, proving, sizing, dismissing and falling out.
5	To perform the position of march and pace, turning by numbers, mark time, the halt, marching in squad, quick march and the halt (on the move).

6	To perform the position of right (or left)- turn, changing direction by wheeling and changing steps on the march, forming file from single file and forming single file from file.
7	To study the tricks of parade inspection, how and whom to salute and perform the position of saluting.
8	To perform saluting at the halt, saluting on the march, marching off in single file, reforming three ranks.
9	To perform the fire extinguisher drill.
10	Introduction to the basic concept of Hose, Hydrant, Ladder, Knots & Lines, Pump, Foam, B. A set.

The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.

Course Code	**BSC-MAT-102B**				
Category	Basic Science Courses				
Course Title	**Engineering Mathematics-II**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	3	1	0	**4**	
Course Objectives	The objectives of this course are ● To develop a comprehensive understanding of probability theory, discrete and continuous distributions, and statistical methods for analyzing data. ● To equip students with the skills to apply probability distributions, statistical analysis, and tests of significance in practical scenarios. ● To foster the ability to model real-world problems using probability and statistical techniques, including hypothesis testing and regression analysis.				
Course Pre-requisite	Mathematics upto 12th Standard and Engineering Mathematics-I				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** fundamental concepts, definitions, and theorems related to probability, random variables, distributions, and statistical measures.	Level 1: Remember
CO2	**Explain** the core concepts such as probability theorems, properties of distributions, and statistical methods for data analysis.	Level 2: Understand
CO3	**Apply** probability theory and statistical techniques to solve problems in real-world scenarios.	Level 3: Apply
CO4	**Analyze** statistical data and probability distributions to identify relationships between variables, evaluate assumptions, and interpret the implications of test results.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Basic Statistics: Definition, Scope and Application of Statistics, Measures of Central Tendency, Measures of Dispersion, Moments, Skewness and Kurtosis.

Correlation and Regression: Rank Correlation, Curve Fitting by the Method of Least Squares - Fitting of Straight lines, Second Degree Parabolas and more General Curves.

Unit-II

Basic Probability & Discrete Probability Distributions: Random Experiment, Sample Space, Events and its Types, Various Definitions of Probability, Addition Theorem, Multiplication Theorem, Conditional Probability, Bayes' Theorem.

Random Variables: Random Variables, Discrete Random Variable, Probability Mass Function, Expectation, Variance and Moments of Discrete Random Variables.

Discrete Probability Distributions: Bernoulli, Binomial and Poisson along with their Properties and Limiting/Approximation Cases.

Unit-III

Continuous Random Variables: Continuous Random Variables and their Properties, Distribution Functions, Probability Density Function, Expectation, Variance, Moments of Continuous Random Variables, Two Dimensional Random Variables- Joint, Marginal and Conditional Distributions of Random Variables.

Continuous Probability Distributions: Uniform, Normal and Exponential along with their Properties and Limiting/Approximation Cases.

Unit-IV

Applied Statistics: Test of Significance: Large Sample Test for Single Proportion, Difference of Proportions, Single Mean, Difference of Means, and Difference of Standard Deviations.

Small Samples: Test for Single Mean, Difference of Means and Correlation Coefficients; Test for Ratio of Variances, Chi-Square Test for Goodness of Fit and Independence of Attributes.

Suggested Readings:
- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
- Advanced Engineering Mathematics by H.K. Dass, S. Chand.
- A textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.
- Mathematical Statistics by P. Mukhopadhyay, Books and Allied Private Limited, Kolkata.
- Fundamentals of Mathematical Statistics by S.C. Gupta, and V. K. Kapoor, S. Chand & Sons, New Delhi.
- Business Statistics by T.R. Jain and S.C. Aggarwal, VK Global Publications Pvt. Ltd.
- R. E. Walpole, R. H. Myers, S. L. Myers, and K. E. Ye, Probability and Statistics for Engineers and Scientists, 9 edition. Pearson.

Useful Video links:

Unit No.	Topics	Links
Unit I	Measures of Central Tendency	https://youtu.be/XaHFNhHfXwQ?si=oir6QOmcf8ZQLpKa
	Correlation	https://youtu.be/TWd42yUBZkk?si=V6exIcI1CtbRwBEg
	Regression	https://youtu.be/_pbAib0He0Y?si=cG_TU71Js3Pq7jvq
Unit II	Introduction of Probability	https://youtu.be/60vHy2lA4o4
	Random Variables	https://youtu.be/2CP3m3EgL1Q

	Topics	Links
	Discrete Randomvariable & Probability Distribution	https://youtu.be/Sv9UYnp9tbs?si=eHqwSJETA5SO3NFI
Unit III	Continuous Probability distribution	https://youtu.be/o2LB3KQME3U?si=NWaP0TY_K8tPaAfu
	Bivariate Probability distribution	https://youtu.be/h-8hJN74O7g?si=K53Y3COL4g_qrWi-
	Probability distributions	https://youtu.be/Hw8KHNgRaOE
Unit IV	Testing ofHypothesis & Levels of significance	https://youtu.be/14PQawp_rjk
	Large Sample Test	https://auece.digimat.in/nptel/courses/video/111105090/L72.html
	Chi-Square Test	https://youtu.be/SlCsNb-VXds?feature=shared

Course Code	**BSC-MAT-103B**				
Category	Basic Science Courses				
Course Title	**Engineering Mathematics-II**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	3	1	0	**4**	
Course Objectives	Theobjectives of this course are • To develop an understanding of multivariable integral calculus, vector calculus, Fourier series, Fourier transform and complex analysis. • To familiarize with the applications of engineering mathematics in engineering domain that would enhance their analytical thinking skills.				
Course Pre-requisite	Mathematics upto 12th Standard and Engineering Mathematics-I				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** fundamental concepts of multivariable integrals, vector calculus, Fourier series, Fourier transform and complex analysis.	Level 1: Remember
CO2	**Explain** the principles and applications of multivariable integrals, vector calculus, Fourier series, Fourier transform and functions of complex variables.	Level 2: Understand
CO3	**Solve** the problems using techniques of integrals, vector calculus, Fourier series expansions, Fourier transform and complex analysis.	Level 3: Apply
CO4	**Analyze** complex mathematical problems associated with multivariable integrals, vector calculus, Fourier series and transform and complex function theory.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Multivariable Integral Calculus: Evaluation of definite and improper integrals, double integrals, Evaluation of double integrals (Cartesian and polar coordinates), Change of order of integration, Change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Applications of double integral to find area enclosed by plane curves, Triple integrals, Applications of triple integrals, Beta and Gamma functions.

Unit-II
Vector Calculus: Differentiation of vectors, scalar and vector point functions, Gradient of a scalar point function, Directional derivative, Curl and divergence, Statement of Green's, Stoke's and Gauss divergence theorems, Verification and evaluation of vector integrals using these theorems.

<center>**Unit-III**</center>

Fourier Series and Fourier Transforms: Euler's formulae, Dirichlet's conditions, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

<center>**Unit-IV**</center>

Functions of Complex Variable–Differentiability and Analyticity, Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations, Harmonic functions, Integration of complex functions, Cauchy-integral theorem and formula (without proof), Taylor's series, Laurent's series, Zeros of analytic functions, Singularities, Residues, Cauchy-Residue theorem (without proof).

Suggested Readings:
- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
- Advanced Engineering Mathematics by H.K. Dass, S. Chand.
- A textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.
- Engineering Mathematics for first year by T. Veerarajan, Tata McGraw-Hill Publishing Company Limited.
- Engineering Mathematics- Calculus, Differential Equations and Linear Algebra by P. Sivaramakrishna Das, C. Vijayakumari, Pearson Education.

Useful Video links:

Unit No.	Topic	Link
Unit-I	Multiple Integrals	https://youtu.be/mIeeVrv447s?si=ZxrHvWcK3RQTaOyp
	Change of order of integration	https://youtu.be/4rc3w1sGoNU?si=GmMACWg459ppFGyn
	Change of variables	https://youtu.be/wtY5fx6VMGQ?si=bSR0rySP3bql6Ngh
Unit-II	Vector Differentiation	https://youtu.be/Qj0KM9Uh7xw?si=9gLE1lLBgoYnyi8v
	Gradient of a scalar field and Directional derivative	https://youtu.be/JTJXHcLrxgM?si=kuqQlxeT4Y0N9Xeo
	Gradient, Divergence and Curl	https://youtu.be/v_sTlDeCUdU?si=yf6yzC0hazmWzYEh
	Line integral	https://youtu.be/yCqLvRiVtng?si=iqbOrl9Bq28F9HIL
	Applications of Line integrals	https://youtu.be/mMBSb_dtkYU?si=rtFe1esglErwBr3b
	Green's Theorem	https://youtu.be/34aX-fNMS-c?si=v1hj0iSsVQ2ypsJp
	Divergence Theorem of Gauss	https://youtu.be/DtqTXJ5X3xo?si=J5KIjrjWImISylNH
	Stoke's Theorem	https://youtu.be/q-fgRrPayJY?si=MI5sFHwamcF8gApa
Unit-III	Fourier series	https://youtu.be/ygOjw0_Kh8k?si=eSrcBHLRFtk4NemO
	Examples on Fourier series of a Periodic Signal	https://youtu.be/yQQH-3eftIE?si=ZdvDoXAk3UC8TSrQ
Unit-IV	Introduction to Complex Numbers	https://www.youtube.com/watch?v=gFjlBKW8aZU
	Analytic functions of a complex variable	https://youtu.be/b5VUnapu-qs?si=odZ34Xpop2x-xcob https://www.youtube.com/watch?v=q01b-lV6y5Q
	Calculus of residues (Part I)	https://youtu.be/o77UV7YrWvw?si=9T5nTIJ3krNNYKx4
	Calculus of residues (Part II)	https://youtu.be/Aq6K0lmv3Qw?si=rWyCcSJMlEVpimr6

Course Code	**MC-103B**				
Category	Mandatory Non-Credit Course – Audit Course				
Course Title	**IDEA Lab Workshop**				
Scheme and Credits	L	T	P	**Credits**	Semester-**I/II**
	0	0	2	-	
Course Objectives	The objectives of this course are to • Develop proficiency in using hand tools and power tools by understanding their applications, handling techniques, and safety measures for effective prototyping and machining. • Gain foundational knowledge of Intellectual Property Rights (IPR) and patents to access and utilize patent information in the IDEA Lab for innovation and design purposes. • Apply subtractive manufacturing processes and basic joining techniques to fabricate prototypes, assemble components, and machine 3D geometry on soft materials. • Integrate embedded systems and electronics into projects by designing circuits, programming microcontrollers like Arduino and Raspberry Pi, and implementing functional hardware enclosures using machining or 3D printing.				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	Recall the functions, applications, and safety measures of various hand tools and power tools used in prototyping and machining.	Level 1: Remember
CO2	Understand the importance of Intellectual Property Rights (IPR) and patents, demonstrating the ability to access and utilize patent information for innovation in the IDEA Lab.	Level 2: Understand
CO3	Apply subtractive manufacturing processes and basic joining techniques to fabricate prototypes and machine 3D geometry on soft materials with precision.	Level 3: Apply
CO4	Analyze the integration of embedded systems and electronics by designing circuits, programming microcontrollers, and developing functional hardware enclosures through machining or 3D printing.	Level 4: Analyze

List of Experiments:

Sr. No.	Contents
1.	Introduction to basic hand tools - Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading, Adhesives.
2.	Basics of IPR and patents accessing and utilizing patent information in IDEA Lab.

3.	Prototyping using subtractive cutting processes.
4.	Machining of 3D geometry on soft material such as soft wood or modelling wax.
5.	Basic welding, brazing and other joining techniques for assembly
6.	Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools, various types of drill bits.
7.	Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
8.	Arduino and Raspberry Pi programming and use.
9.	Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
10.	Implementation and Documentation of Mini Project (Report and Video)

The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.

Course Code	**MC-104B**				
Category	Mandatory Non-Credit Courses – Audit Course				
Course Title	**Fire Ground Operation-II**				
Scheme and Credits	L	T	P	**Credits**	Semester-**II**
	0	0	2	-	
Course Objectives	The objectives of this course are to • Develop comprehensive physical fitness and mental resilience • Understand firefighting techniques and equipment handling • Learn teamwork, communication and rescue operations • Ensure safety and protection through personal protective equipment (PPE) and breathing apparatus				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated	RBT Level
CO1	**Recall** key terms, classifications, and features related to physical fitness, yoga, firefighting equipment and personal protective equipments.	Level 1: Remember
CO2	**Explain** the principles and purpose of fitness monitoring, squad drills, extinguishers, hose drills, hydrants, knots, and foam types.	Level 2 :Understand
CO3	**Solve** basic and advanced tasks such as operating and refilling portable extinguishers, executing hose drills and practicing knots and lacing techniques.	Level 3: Apply
CO4	**Analyze** the suitability of different hoses and ladders for specific scenarios, and assess fitness data to provide feedback.	Level 4: Analyze

List of Experiments:

Sr. No.	Contents
1	**Physical Exercise:** Monitoring Levels of Fitness, Pulse, Blood Pressure, Body fat
2	**Yoga & Mediation**
3	**Squad Drill:** Clarification, Correction of faults, Inspection, Handling a squad, Questions, Communication drill and mutual drill
4	**Extinguishers:** Operation of portable extinguishers, Refilling of portable extinguishers, Inspection requirement of portable extinguishers
5	**Hose & Hose Fitting:** Types, (Delivery Hose, Suction Hose, Hose Reel-Hose), Hose binding/patching g/washing, Hose drill: Lifting, Lowering, Carrying, Laying, Connect, Disconnect, Removal of kinks, Under - running, Roll
6	**Hydrant:** Types of Hydrants, Hydrant Installation (underground and pillar post)
7	**Ladder:** Types of ladders: Hook ladder, Roof ladder, 35 ft Aluminum extension ladder, 45 ft Aluminum extension ladder, Truss - type and non-truss –type
8	**Knots:** Introduction, Types of ropes, Rope construction, Types of knots, Types of lacing, (Round lasing, diagonal lasing, Figure of eight lasing, Square lasing), Types of lacing, knot

	practice (Over hand, figure of eight, Reef, Chair knot
9	**Pump:** Types of pumps
10	**Foam:** Introduction, Part identification and specification: FB -2, FB -10, FB - 5X, FB -10X, MFG - 5A, MFG -10A
11	**B. A set:** Construction features, uses
12	**P.P.E:** Introduction

The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.