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: 2024-25)

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 170 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	20*
2	Engineering Science Courses	15*
3	Professional Core Courses	66*
4	Professional Elective Courses (Relevant to chosen specialization/branch)	26*
5	Indian Knowledge System	2*
6	Multidisciplinary Open Electives Courses	15*
7	Humanities and Social Sciences including Management courses	6*
8	Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad	16*
9	Mandatory Non Credit Courses – Audit Course	(Non-Credit)
	Total Credits	**166***

**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	MAU
10	Project	PR
11	Internship	INT

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	Hours per week			Total Load Per Week	Credits	Examination Scheme (Marks)				Exam Duration in H
					Lecture (L)	Tutorial (T)	Practical (P)			Assessment	End Semester Examination		Total	
											Theory	Practical		
1	Basic Science Courses	C	BSC-MAT-101A	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	0	0	3	3	40	60		100	3
3	Engineering Science Courses	A	ESC-CSE-101A	Programming for Problem Solving	3	0	0	3	3	40	60		100	3
		B	ESC-ME-101A	Manufacturing Process	3	0	0	3	3	40	60		100	3
4	Engineering Science Courses	A	ESC-EE-101A	Basics of Electrical Engineering	3	1	0	4	4	40	60		100	3
	Humanities and Social Sciences including Management courses	B	HSMC-ENG-101A	Communication Skills for Professionals	2	0	0	2	2	40	60		100	3
5	Engineering Science Courses	A	LC-ME-102A	Engineering Graphics and Design	0	0	4	4	2	50		50	100	3
		B	ESC-ME-104A	Fundamental of Engineering	3	0	0	3	3	40	60		100	3
6	Basic Science Courses	A	Refer Table-III	Engineering Physics Lab	0	0	2	2	1	25		25	50	3
		B	Refer Table - IV	Engineering Chemistry Lab	0	0	2	2	1	25		25	50	3

7	Engineering Science Courses	B	LC-ME-103A	Workshop Practice	0	0	2	2	1	25		25	50	3
		A	LC-CSE-102A	Programming for Problem Solving Lab	0	0	2	2	1	25		25	50	3
8	Engineering Science Courses	A	LC-EE-102A	Basics of Electrical Engineering Lab	0	0	2	2	1	25		25	50	3
	Humanities and Social Sciences including Management courses	B	LC-ENG-102A	Language Lab	0	0	2	2	1	25	-	25	50	3
9	Value Added Course	A	LC-VAC-101A	Soft Skills and Personality Development	0	0	2	2	1	50		-	50	3
	Humanities and Social Sciences including Management courses	B	HSMC - ASH-103A	Universal Human Value-II	3	0	0	3	3	40	60		100	3
10	Mandatory Non Credit Courses – Audit Course	C	Refer Table - V	----------	0	0	2	2	-	-	-	-	-	-
TOTAL CREDITS									**21**				**700/750**	

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	Hours per week			Total Load Per Week	Credits	Examination Schedule (Marks)				Exam Duration in H
					L	T	P			Assessment	End Semester Examination		Total	
											Theory	Practical		
1	Basic Science Courses	C	Refer Table-VI	Engineering Mathematics-II	3	1	0	4	4	40	60		100	3
2	Basic Science Courses	A	Refer Table-II	Engineering Chemistry	3	0	0	3	3	40	60		100	3
		B	Refer Table-I	Engineering Physics	3	1	0	4	4	40	60		100	3
3	Engineering Science Courses	B	ESC-CSE-101A	Programming for Problem Solving	3	0	0	3	3	40	60		100	3
		A	ESC-ME-101A	Manufacturing Process	3	0	0	3	3	40	60		100	3
4	Humanities and Social Sciences including Management courses	A	HSMC-ENG-101A	Communication Skills for Professionals	2	0	0	2	2	40	60		100	3
	Engineering Science Courses	B	ESC-EE-101A	Basics of Electrical Engineering	3	1	0	4	4	40	60		100	3
5	Humanities and Social Sciences including Management courses	A	HSMC-ASH-103A	Universal Human Value-II	3	0	0	3	3	40	60		100	3
	Engineering Science Courses	B	LC-ME-102A	Engineering Graphics and Design	0	0	4	4	2	50		50	100	3
6	Engineering Science Courses	A	ESC-ME-104A	Engineering Fundamentals	3	0	0	3	3	40	60		100	3
	Value Added Course	B	LC-VAC-101A	Soft Skills and Personality Development	0	0	2	2	1	50		-	50	3

7	Basic Science Courses	A	Refer Table -IV	Engineering Chemistry Lab	0	0	2	2	1	25		25	50	3
		B	Refer Table - III	Engineering Physics Lab	0	0	2	2	1	25		25	50	3
8	Engineering Science Courses	B	LC-CSE-102A	Programming for Problem Solving Lab	0	0	2	2	1	25		25	50	3
		A	LC-ME-103A	Workshop Practice	0	0	2	2	1	25		25	50	3
9	Humanities and Social Sciences including Management courses	A	LC-ENG-102A	Language Lab	0	0	2	2	1	25	-	25	50	3
	Engineering Science Courses	B	LC-EE-102A	Basics of Electrical Engineering Lab	0	0	2	2	1	25		25	50	3
10	Mandatory Non Credit Courses – Audit Course	C	Refer Table -V	----------	0	0	2	2	-	-	-	-	-	-
TOTAL CREDITS									**21/23**				**750**	

Notes:

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

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

Table II

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

Table III

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

Table IV

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

Table V

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

Note: Refer Table V, Students who opt for MAU-101A in the first semester must choose MAU-103A in the second semester, and vice versa.

Table VI

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

Course Code	**BSC-MAT-101A**				
Category	Basic Science Courses				
Course Title	**Engineering Mathematics-I**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	3	1	0	**4**	
Course Objectives	The objectives 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**.**

Unit-III

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-101A**				
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.
- A Text 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 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-102 A**				
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, PHI Learning 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, 4thEdition, 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=PLU0oJASIjGxdZMtypwhvGrnmuzNnNdcKt&index=4
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=PLgMDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP&index=2
	London Equation	https://www.youtube.com/watch?v=QQzvQooUtJo&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h&index=7
	Superconductors	https://www.youtube.com/watch?v=SHoGV-sezNI&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h
	Introduction to Optical Fiber, Numerical Aperture	https://www.youtube.com/watch?v=LOVvUFZmRCg

Course Code	**BSC-PHY-103 A**				
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.

Unit-III

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, PHI Learning 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-101 A**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry-I**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	**3**	
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 Exam	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-102 A**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry-II**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	**3**	
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-101 A**				
Category	Engineering Science Courses				
Course Title	**Manufacturing Process**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	3	0	0	**3**	
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. • Po develop proficiency in casting and welding processes, identifying defects and applying suitable techniques for effective metal joining and fabrication.				
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	**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 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

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-103A**				
Category	Humanities and Social Sciences including Management courses				
Course Title	**Universal Human Values-II**				
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	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	**Define** various terms related human values and ethics.	Level 1: Remember
CO2	**Explain** the fundamental concepts, theories, policies, practices and responsibilities of the engineers etc.	Level 2: Understand
CO3	**Solve** real-life problems related to human behaviour based on his understanding of morals, values and ethics.	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 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

Introduction to Value Education: Understanding the need, basic guidelines, content and process for Value Education, Right Understanding; Relationship and Physical Facility; Understanding Value Education; Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity -the Basic Human Aspiration-Current Scenario and Method to Fulfill the Basic Human Aspirations.

Unit-II

Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Unit-III

Harmony in the Family and Society and Nature: Harmony in the Family – the Basic Unit of Human Interaction; 'Trust' – the Foundational Value in Relationship; 'Respect' – as the Right Evaluation: Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society; Vision for the Universal Human Order; Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature.

Unit-IV

Introduction to Professional Ethics: Basic concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skill, Emotional Intelligence, Thoughts of Ethics, Dimensions of Ethics, Profession and Professionalism, Professional Association, Professional Risk, Professional Accountabilities, Professional Success, Ethics & Profession.

Suggested Readings:

- 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.
- Human Values by A.N. Tripathi, New Age International Publishers, New Delhi, 2004.
- Professional Ethics: R. Subramaniam, Oxford University Press.

Latest books can be suggested by the course faculty/coordinator.

Useful Video links:

Topics	**Links**
Different Approaches to Ethics	https://www.youtube.com/watch?v=gS9eZ9u153o
Moral Thinking: An Introduction to Values and Ethics	https://www.youtube.com/watch?v=YMD_sCcnT9w&t=2s https://nptel.ac.in/courses/109104206

Course Code	**ESC-EE 101 A**				
Category	Engineering Science Courses				
Course Title	**Basics of Electrical Engineering**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/ II**
	3	1	0	**4**	
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	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	**Define** the technical terms related to Basic Electrical Engineering.	Level 1: Remember
CO2	**Explain** the concept of DC & AC circuits, Measuring instruments, wiring and installations.	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 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

DC Circuits: Kirchhoff's Law, Types of Sources, Current and voltage divide rule, Source Transformation, Mesh Analysis, Nodal Analysis, Star-Delta transformation.
Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, and Maximum power transfer theorem.

Unit-II

AC Circuits: Generation of AC Voltage, Basic terminology, Average Value, RMS Value, Pure R, L & C Circuit, Impedance triangle, true power, apparent power, power factor, Series R-L, R-C & R-L-C circuits, series resonance, Concept of Phasor. Parallel R-L, R-C & R-L-C circuits, Parallel resonance.

Three Phase AC circuits: Relationship between Line voltage or current and phase voltage or current for star & delta circuit, measurement of power and power factor in three phase circuit using two watt-meter method.

Unit-III

Measuring Instruments: Construction and Working Principle of Moving coil and Moving iron type instruments, Construction and working Principle of Induction type Voltmeter, Ammeter and Wattmeter, and Energy Meter.

Elementary overview of Electrical Machines: Construction and working principle of DC machine, Synchronous Machine and three phase induction machine, construction and working principle of single phase transformer.

Unit-IV

Electrical Installation: Types of Wires and wiring systems, Advantages and Disadvantages of different wiring systems, Fuses: types of fuse, its need and importance, MCB, MCCB, ELCB, Power rating of household appliances, Concept of earthing and its types.

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
- Basic Electrical Engineering by Mittle & Mittal, Tata McGraw Hill
- Basic Electric Engineering, DC Kulshrehtra, Tata McGraw Hill

Useful Video links:

Unit No.	Topics	Links
Unit-I	Basic concepts and laws	https://archive.nptel.ac.in/courses/108/105/108105112/
Unit-II	Single Phase AC Circuits	https://archive.nptel.ac.in/courses/108/102/108102185/
Unit-III	Moving Coil Instruments	https://youtu.be/n1MinLtvnPY
	Moving Iron Instruments	https://youtu.be/ziFWOGRcExk
	Integrating Type Instruments	https://youtu.be/NBAhl2UxvW0
Unit-IV	Fuses and circuit breakers	https://youtu.be/QsGn7H_14VY?list=PLLy_2iUCG87BIJ6ZliVIRCx2Crf9_fJMB

Course Code	**HSMC-ENG-101A**				
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	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	**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 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

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.

Unit-III

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

Unit-IV

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
	Verbal and 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	Vocabulary Building	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-102A**				
Category	Professional Core 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	50 Marks				
Practical Examination	50 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	**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.

Unit-IV

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-101A**				
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	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 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 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

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.

Unit-II

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
	Data types 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=PLEAYkSg4uSQ2k6GwNhpgSHodGT8wfvgwu&index=30
	File Handling	https://youtu.be/fWOnJFzOHYM?feature=shared
	Structures	https://youtu.be/Pg49AN6MvhQ?feature=shared

Course Code	**LC-PHY-101A**				
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	25 Marks				
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 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 modulus of Rigidity of the given wire 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 determine Planck'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-102 A**				
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	25 Marks				
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 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-103 A**				
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	25 Marks				
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 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-101A**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry Lab-I**				
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	25 Marks				
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	**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/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
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-102A**				
Category	Basic Science Courses				
Course Title	**Engineering Chemistry Lab-II**				
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	25 Marks				
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	**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-103 A**				
Category	Engineering Science Courses				
Course Title	**Workshop Practice**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	0	0	2	**1**	
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	25 Marks				
End Semester 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** 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	**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	Introduction of Turbo C IDE and Programming Environment.
2	Apply the concept of Arithmetic operator to perform addition of two numbers which uses variables along with type conversion method.
3	Apply the concept of mathematical library functions to find roots of a quadratic equation.
4	Apply the concept of control statements (if else) to find the largest of three numbers.
5	Apply the concept of switch case to create arithmetic calculator.
6	Apply the concept of "for" loop to generate the Fibonacci series of n-terms.
7	Apply the concept of do--while loop to find the sum of first 5 natural numbers.
8	Apply the concept of 1-D array to read and write elements in an array.
9	Apply the concept of 2-D array to implement the addition of two matrices.
10	Apply the concept of strings to implement various library functions.
11	Apply the concept of Call by Value to Swap two numbers.

12	Apply the concept of recursion to find the factorial of a number.
13	Apply the concept of pointers to get memory address of an element.
14	Apply the concept of structure to read and write basic information of a student.
15	Apply the concept of union to read and write basic information of a student.
16	Apply the concept of file handling to read and write data into a text file.
17	Analyze the applicability of control statement and iteration statements to implement linear search.
18	Analyze the applicability of control statement and iteration statements to implement bubble sorting

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=PLeCxvb23g7hrw27XlekHtfygUTQ0TmFfP&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=PLeCxvb23g7hrw27XlekHtfygUTQ0TmFfP&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-EE-102 A**				
Category	Engineering Science Courses				
Course Title	**Basics of Electrical 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	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	**Explain** the usage of common electrical measuring instruments.	Level 2: Understand
CO2	**Apply** wattmeter and ammeter method for the power measurement and electrical wiring for household systems.	Level 3: Apply
CO3	**Analyze** the response of different AC and DC electrical circuits.	Level 4: Analyze
CO4	**Verify** KCL, KVL & different theorems.	Level 5: Evaluate

List of Experiments

Sr. No.	Contents
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 and current law.
3	To verify Thevenin's theorem.
4	To verify Norton's theorem.
5	To verify Superposition theorem.
6	To Verify Maximum Power Transfer Theorem.
7	To determine the resonant frequency in RLC series AC circuit.
8	To determine the resonant frequency in RLC parallel AC circuit.
9	To measure power in three phase balanced circuit using two watt-meter method
10	To measure power in three phase circuit using three voltmeter and three ammeter method.
11	To demonstrate the working of MCB and ELCB.
12	To prepare wiring for household systems with switch control.

Virtual Lab Links

Experiment Name	Virtual Lab Links
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 Verify Maximum Power Transfer Theorem.	https://asnm-iitkgp.vlabs.ac.in/exp/maximum-power-transfer-theorem/
To determine the resonant frequency in RLC series AC circuit.	https://asnm-iitkgp.vlabs.ac.in/exp/rlc-series-circuit/
To measure power in three phase balanced circuit using two watt-meter method.	https://asnm-iitkgp.vlabs.ac.in/exp/three-phase-power-measurement/

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-102 A**					
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	25 Marks					
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	**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, PHI Learning, 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_2iUCG87CQhELCytvXh0E_y-bOO1_q&index=7 https://www.youtube.com/watch?v=jiPxwFVA9lE&list=PLLy_2iUCG87CQhELCytvXh0E_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=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=16 https://www.youtube.com/watch?v=PAISeBhtYqI&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&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_2iUCG87CQhELCytvXh0E_y-bOO1_q&index=47 https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=17
Group Discussion	https://www.youtube.com/watch?v=1DVO_f2gk1A&list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q&index=42 https://www.youtube.com/watch?v=R6RyBAZe94w&list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q&index=43 https://www.youtube.com/watch?v=UcEq_RsCyxY&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH&index
Presentation Skills	https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=17

Course Code	**LC-VAC-101A**				
Category	Value Added Courses				
Course Title	**Soft Skills and Personality Development**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	0	0	2	1	
Course Objectives	The objectives of this course are ● To prepare the students with stable mind, pleasing personality and determination in order to achieve the highest goal. ● To make the students aware about leadership and time management. ● To improve the communication skills. ● To understand the team building and conflict.				
Assessment	50 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	**Identify** the different skills required for becoming a person with good personality.	Level 1: Remember
CO2	**Explain** the importance of skills, personality, team, behaviour, managing time and stress.	Level 2: Understand
CO3	**Demonstrate** the knowledge, attitude and skills as a leader and/or as a team member.	Level 3: Apply
CO4	**Analyze** the personality, skills, factors affecting interpersonal relationships, roles and responsibilities of leadership and etiquettes.	Level 4: Analyze

Sr. No.	Contents
1	**Soft skills**: Introduction, Need for soft skills.
2	**Communication skills:** Introduction, Meaning, Purpose of communication, Process of communication, Key elements of communication, Characteristics of effective communication, Tools of communication, Verbal communication, Listening skills, Speaking skills, Non-verbal communication, Dealing with conflict Barriers to communication, Overcoming barriers.
3	**Writing:** Letter Format, Letter Writing, E-mail Writing, Paragraph Writing (Topic sentence, inductive and deductive logic), Essay Writing (Narrative, Descriptive, Expository and Persuasive), Resume Writing, Interview.
4	**MS Office:** Introduction of MS office tools.
5	**Presentation skills:** Introduction, Process Examples of presentation language, How to prepare the effective power point presentation.
6	**Personality Development:** Introduction, What is personality, Types of personality, Personality development, Elements of personality development, SWOT analysis, Goal setting Creativity Human values.
7	**Motivation:** Introduction to Motivation, Relevance and types of Motivation, Motivating the subordinates, Analysis of Motivation
8	**Interpersonal relationships:** Introduction, Importance of interpersonal relationship skills, Types of interpersonal relationships, Uses of interpersonal relationship skills, Factors affecting interpersonal relationships, How to accommodate different styles, Consequences of interpersonal relationships.

9	**Teambuilding:** Introduction, Importance of human relations, What is a team? Understanding behaviour, Comfort zones, Stepping stones to assertiveness, Getting to win/win, Assertiveness building blocks, Characteristics of high performance teams, Self-questionnaire.
10	**Leadership**: Introduction, Meaning of leadership, Importance of leadership, Leadership relationship, Approaches to leadership Task, team and individual functions, Functions and responsibilities of leadership, Styles of leadership.
11	**Time management:** Introduction, How do you manage time?
12	**Managing stress:** Introduction, What is stress Recognizing stress, Acknowledging stress, Common signs of stress Tackling the problem.
13	**Thinking skills**: Introduction Core thinking skills Categories of thinking.
14	**Problem solving**: Introduction, Need for problem solving, Skills for problem solving, Process of problem solving, Stages of problem solving, Methods of problem solving.
15	**Decision making:** Introduction, Features, Scope, Purpose, Types of Process.
16	**Workplace etiquette**: Introductions, Behaviour at work Personal etiquette, Using office utilities and resources, Travel etiquette.

Suggested Readings:

The course faculty can suggest the books/journals.

Course Code	**MAU-101A**				
Category	Mandatory Audit Courses				
Course Title	**Yoga and Sports**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I/II**
	2	0	0	-	
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	**MAU-102A**				
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-102 A**				
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 12^{th} 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

	Discrete Random variable & 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 of Hypothesis & 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-103 A**				
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 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.

Unit-III

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.

Unit-IV

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	**ESC-ME-104A**				
Category	Engineering Science Courses				
Course Title	**Engineering Fundamentals**				
Scheme and Credits	L	T	P	**Credits**	**Semester- II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are • To understand the engineering profession, its ethics, and the design process for solving real-world problems. • To apply engineering methods in product design, development, and effectively represent technical data using graphs and equations. • To develop skills in accurate measurement, statistical analysis, and estimation methods for precision in engineering applications. • To apply engineering economics principles for evaluating project feasibility using cost analysis, present/future worth, and depreciation.				
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** engineering principles, design processes, professional ethics, and responsibilities.	Level 1: Remember
CO2	**Explain** core concepts across engineering disciplines and economics.	Level 2: Understand
CO3	**Apply** engineering methods, design tools, statistical techniques, and economic analysis to solve real-world engineering problems.	Level 3: Apply
CO4	**Analyze** engineering data, design solutions, assess feasibility, cost-effectiveness, and sustainability for informed engineering decisions and improvements.	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

Engineering: Introduction, Engineering Profession, Engineering Career, Technology Team, Engineering Functions, Engineering Disciplines, Education for Engineering, Engineer as a professional, learning from Tragedy-Fukushima Disaster, Political influence, Ethics in Engineering Profession.

Engineering Design: Introduction, Design Process, Design and the Customer, Nature of Engineering Design, Experiencing the Design Process in Education, Design Opportunities and Challenges of the Future.

Unit-II

Product Design and Development: Introduction, Problem analysis, Engineering Methods, Problem Presentation, Standards of Problem Presentation, Product Development Process, Product Design, Steps in Product Design, Factors to consider in Product Design, Techniques and tools for Design Improvement.

Representation of Technical Information: Introduction, Collecting and Recording Data, General Graphing Procedures, Empirical Functions, Curve Fitting, Method of Selected Points and Least Squares, Empirical Equations: Linear, Power Curves, Exponential Curves.

Unit-III

Artificial Intelligence and Machine Learning: Introduction, AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation, Role of AI in different Engineering Disciplines, Role of Machine learning in different domains.

Statics: Introduction, Frequency Distribution, Measures of Central Tendency, Measure of variation, Linear Regression, Coefficient of Correlation.

Unit-IV

Introduction to Engineering Economics: Introduction, Simple and Compound Interest, Cash-Flow Diagram, Present Worth and Future Worth, Annual Worth and Gradients, Economic Decision Making, Depreciation and Taxes.

Suggested Readings:

- Engineering Fundamentals and Problem Solving, Eighth Edition by Arvid Eide, Roland Jenison, Larry Northup, Steven Mickelson, McGraw-Hill Education.
- Introduction to Engineering: An Assessment and Problem Solving Approach by Q. H. Mazumder, CRC Publishers
- Engineering Fundamentals: An Introduction to Engineering by Saeed Moaveni, Cengage Learning
- Process Engineering Problem Solving Avoiding "The Problem Went Away, But it Came Back" Syndrome by J. M. Bonem, Wiley
- Fundamentals of Engineering Economics, 3rd Ed. by Chan S. Park, Pearson Education
- Probability and Statistics (for Scientists and Engineers) by Rao V. Dukkipati, New Age International Publishers.
- Applied Statistics and Probability for Engineers, by Douglas C. Montgomery and George C. Runger, Wiley
- Artificial Intelligence – A Modern Approach by S. Russel and P. Norvig, Second Edition, Pearson Education

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Introduction to system Design	https://www.youtube.com/watch?v=FPp25m2KVcY
Unit-II	Product Design and Development	https://www.youtube.com/watch?v=ULt4aEst4mM&list=PLyqSpQzTE6M_RfjEQMK7_L-UvxAMhplUT&index=2
	Product Life Cycle	https://www.youtube.com/watch?v=qgVs8vskWl0&list=PLSGws_74K018yZOnbSaqWJZ837QyBB7vu&index=2
	Product Design Steps	https://www.youtube.com/watch?v=dcup4kRxSEs
Unit-III	Measures of central tendency and measures of variation	https://www.youtube.com/watch?v=kVopC1a2-ok
Unit-IV	Cash Flow Statement	https://www.youtube.com/watch?v=rR-yWCn6RP0

Course Code	**MAU-103A**				
Category	Mandatory Non-Credit Courses – Audit Course				
Course Title	**Design Thinking**				
Scheme and Credits	L	T	P	**Credits**	Semester-**II**
	0	0	2	-	
Course Objectives	The objectives of this course are to • Understand engineering design principles, prototyping techniques, and the use of tools for product development. • Apply design thinking, fabrication methods, and embedded systems to create functional prototypes and solutions. • Analyze and synthesize innovative engineering solutions, integrating design, prototyping, and testing for real-world applications.				
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 engineering design, product development, prototyping, fabrication tools, and intellectual property rights.	Level 1: Remember
CO2	**Understand** the design thinking process, basic hand tools, power tools, and methods of machining and joining materials.	Level 2: Understand
CO3	**Apply** design thinking, engineering tools, and prototyping techniques to create functional prototypes, integrating Arduino/Raspberry Pi programming.	Level 3: Apply
CO4	**Analyze** product designs and prototypes, evaluate customer needs, and assess design effectiveness, functionality, and feasibility through testing.	Level 4: Analyze

List of Experiments:

Sr. No.	**Contents**
1	Conduct survey and identify the problem either individual or group and frame the problem statement.
2	Identify demographic or focus group for problem statement and create persona and explicitly define the characteristics of the persona.
3	Design thinking and stages of design thinking process –Define, Research, Ideate, Prototype, Select, Implement, Learn.
4	Process of product design and alignment of customer expectations with product design.
5	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.
6	Basics of IPR and patents accessing and utilizing patent information in IDEA Lab.

7	Prototyping using subtractive cutting processes.
8	Machining of 3D geometry on soft material such as soft wood or modelling wax.
9	Basic welding, brazing and other joining techniques for assembly.
10	Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools, various types of drill bits.
11	Introduction to fire extinguishing media and small gears for rescue operations.
12	Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
13	Arduino and Raspberry Pi programming and use.
14	Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
15	Solving Practical Engineering Problem through Innovative Product Design & Creative Solution.

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	**MAU-104A**				
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.