SYLLABUS

B.TECH.

2025 – 2029

(Onwards)

Common to all B.Tech Engineering Program (Other than Biotech Engg)

Physics Group		B.Tech All Branches (I Semester) (Other than Biotech Engg)											w.e.f 2024-28 Batch
S.No	Course Code	Course Name	Component NEP	Component AICTE Nomenclature	Credit	L	T	P	Contact Hr.	CIE	MSE	ESE	Total
1	THU101	Professional Communication	AEC	HSMC	2	2	0	0	2	25	25	50	100
2	TPH101/201	Engineering Physics	DSC	BSC	3	3	0	0	3	25	25	50	100
3	TMA101	Engineering Mathematics-I	DSC	BSC	3	2	1	0	3	25	25	50	100
4	TEE101/201	Basic Electrical Engineering	DSC	ESC	2	2	0	0	2	25	25	50	100
5	TCS101	Fundamental of Computer & Introduction to Programming	DSC	ESC	3	3	0	0	3	25	25	50	100
6	HSMC 101/201	Design Thinking	VAC	ESC	1	0	0	2	2	25	25	50	100
7	PEE151/251	Basic Electrical Engineering Lab	DSC	LC	1	0	0	2	2	25	25	50	100
8	PPH151/251	Physics Lab	DSC	LC	1	0	0	2	2	25	25	50	100
9	PME151/251	Workshop And Manufacturing Practices	SEC	LC	2	0	0	4	4	25	25	50	100
10	PCS151	Computer Lab-I	DSC	LC	2	0	0	4	4	25	25	50	100
				Total	20	12	1	14	27	250	250	500	1000

MNG Course

1	THF101/201	Healthy Living & Fitness	VAC	MNG	2	2	0	0	2	Qualified/ NoN Qualified			

Chemistry Group		B.Tech All Branches (II Semester) (Other than Biotech Engg)											w.e.f 2024-28 Batch
S.No	Course Code	Course Name	Component NEP	Component AICTE Nomenclature	Credit	L	T	P	Contact Hr.	CIE	MSE	ESE	Total
1	THU201	Advanced Professional Communication	AEC	HSMC	2	2	0	0	2	25	25	50	100
2	TCH101/201	Engineering Chemistry	DSC	BSC	3	3	0	0	3	25	25	50	100
3	TMA201	Engineering Mathematics-II	DSC	BSC	3	2	1	0	3	25	25	50	100
4	TCS201	Programming for problem solving	DSC	ESC	3	3	0	0	3	25	25	50	100
5	TEC101/201	Basic Electronics Engineering	DSC	ESC	2	2	0	0	2	25	25	50	100
6	PCH151/251	Chemistry Lab	DSC	LC	1	0	0	2	2	25	25	50	100
7	PME153/253	Engineering Graphics and Design Lab	SEC	LC	2	0	0	4	4	25	25	50	100
8	PCS251	Computer Lab - II	DSC	LC	2	0	0	4	4	25	25	50	100
9	PEC151/251	Basic Electronics Engineering Lab	DSC	LC	1	0	0	2	2	25	25	50	100
10	PCE151/251	Basic Civil Engg Lab	DSC	LC	1	0	0	2	2	25	25	50	100
11	GP201	General Proficiency-I	SEC	SEC	1	-	-	-	-	100	-		100
				Total	21	12	1	14	27	350	250	500	1100

MNG Course

1	TEV101/201	Environmental Science	VAC	MNG	2	2	0	0	2	Qualified/ NoN Qualified			

Semester I		B.Tech Biotech Engineering- (I Semester)												w.e.f 2024-28 Batch
S.No	Course Code	Course Name	Component NEP	Component AICTE Nomenclature	Credit	L	T	P	Contact Hr.	CIE	MSE	ESE	Total	
1	THU101	Professional Communication	AEC	HSMC	2	2	0	0	2	25	25	50	100	
2	TCH101	Engineering Chemistry	DSC	BSC	3	3	0	0	3	25	25	50	100	
3	TBT101	Fundamental of Medical Biotechnology	SEC	BSC	3	2	1	0	3	25	25	50	100	
4	TCS101	Fundamental of Computer & Introduction to Programming	DSC	ESC	3	3	0	0	2	25	25	50	100	
5	EEC101	Basic Electrical and Electronics Engineering	DSC	ESC	4	3	1	0	4	25	25	50	100	
6	PCH151	Chemistry Lab	DSC	LC	1	0	0	2	2	25	25	50	100	
7	PME153	Engineering Graphics and Design Lab	SEC	LC	2	0	0	4	4	25	25	50	100	
8	PCS151	Computer Lab - I	DSC	LC	2	0	0	4	4	25	25	50	100	
9	EEC151	Basic Electrical and Electronics Engineering Lab	DSC	LC	1	0	0	2	2	25	25	50	100	
				Total	**21**	**13**	**2**	**12**	**26**	**225**	**225**	**450**	**900**	

MNG Course

| 1 | TEV101/201 | Environmental Science | VAC | MNG | 2 | 2 | 0 | 0 | 2 | Qualified/ NoN Qualified | | | | |

Semester II		B.Tech B.Tech Biotech Engineering (II Semester)												w.e.f 2024-28 Batch
S.No	Course Code	Course Name	Component NEP	Component AICTE Nomenclature	Credit	L	T	P	Contact Hr.	CIE	MSE	ESE	Total	
1	THU201	Advanced Professional Communication	AEC	HSMC	2	2	0	0	2	25	25	50	100	
2	TPH201	Engineering Physics	DSC	BSC	3	3	0	0	3	25	25	50	100	
3	TMA202	Engineering Mathematics	DSC	BSC	3	2	1	0	3	25	25	50	100	
4	TCH202	Advanced Organic Chemistry	DSC	ESC	3	3	0	0	3	25	25	50	100	
5	TCS201	Programing for problem solving	DSC	ESC	3	3	0	0	3	25	25	50	100	
6	HSMC201	Design Thinking	VAC	ESC	1	0	0	2	2	25	25	50	100	
7	PPH251	Physics Lab	DSC	LC	1	0	0	2	2	25	25	50	100	
8	PCS251	Computer Lab-II	DSC	LC	2	0	0	4	4	25	25	50	100	
9	GP201	General Proficiency-I	SEC	SEC	1	-	-	-	-	100	-		100	
				Total	**19**	**13**	**1**	**8**	**22**	**300**	**200**	**400**	**900**	

MNG Course

| 1 | THF101/201 | Healthy Living & Fitness | VAC | MNG | 2 | 2 | 0 | 0 | 2 | Qualified/ NoN Qualified | | | | |

<table>
<tr><td colspan="14">Graphic Era (Deemed to be University)
B.Tech. in Computer Science and Engineering (AI and ML)
Scheme of Teaching and Evaluation 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS) as per NEP 2020
(Effective from the academic year 2025-26)</td></tr>
</table>

Semester I													
COURSE MODULE				**TEACHING PERIODS**					**WEIGHTAGE : EVALUATION**				
COURSE				**Credits**	**L**	**T**	**P**	**Contact Hr.**	**CIE**	**MSE**	**ESE**	**Total**	
Code	**Title**	**NEP Component**	**AICTE Component**										
TPH101/ 201	Engineering Physics	DSC	BSC	3	3	-	-	3	25	25	50	100	
TMA102	Mathematics for AI-I	DSC	BSC	3	2	1	-	3	25	25	50	100	
TEE101/ 201	Basic Electrical Engineering	DSC	ESC	2	2	-	-	2	25	25	50	100	
TCS102	Introduction to Python Programming	DSC	ESC	3	3	-	-	3	25	25	50	100	
PPH151/ 251	Physics Lab	DSC	LC	1	-	-	2	2	25	25	50	100	
PEE151/ 251	Electrical Engineering Lab	DSC	LC	1	-	-	2	2	25	25	50	100	
PCS152	Python Programming Lab	DSC	LC	2	-	-	4	4	25	25	50	100	
PME151/ 251	Workshop And Manufacturing Practices	SEC	LC	2	-	-	4	4	25	25	50	100	
THU101	Professional Communication	AEC	HSMC	2	2	-	-	2	25	25	50	100	
HSMC 101/201	Design Thinking	VAC	HSMC	1	-	-	2	2	25	25	50	100	
			Total	**20**								**1000**	

Mandatory Non-Graded Course												
THF101/ 201	Healthy Living & Fitness	MNG	MC	2	2	-	-	2	-	-	100	100
									Qualified/ Non-Qualified			

<table>
<tr><td colspan="15">Graphic Era (Deemed to be University)
B.Tech. in Computer Science and Engineering (AI and ML)
Scheme of Teaching and Evaluation 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS) as per NEP 2020
(Effective from the academic year 2025-26)</td></tr>
</table>

Semester II														

COURSE MODULE Physics/Chemistry Group					TEACHING PERIODS				WEIGHTAGE : EVALUATION					
COURSE				Credits	L	T	P	Contact Hr.	CIE	MSE	ESE	Total		
Code	Title	NEP Component	AICTE Component											
TCH101/ 201	Engineering Chemistry	DSC	BSC	3	3	-	-	3	25	25	50	100		
TMA203	Mathematics for AI-II	DSC	BSC	3	2	1	-	3	25	25	50	100		
TCS202	Programming in C	DSC	ESC	3	3	-	-	3	25	25	50	100		
TEC101/ 201	Basic Electronics Engineering	DSC	ESC	2	2	-	-	2	25	25	50	100		
TCS203	Fundamentals of AI and ML	DSC	PCC	3	3	-	-	3	25	25	50	100		
PCH151 /251	Chemistry Lab	DSC	LC	1	-	-	2	2	25	25	50	100		
PCS252	C Programming Lab	DSC	LC	2	-	-	4	4	25	25	50	100		
PEC151/ 251	Electronics Engineering Lab	DSC	LC	1	-	-	2	2	25	25	50	100		
PME153 /253	Engineering Graphics and Design Lab	SEC	LC	2	-	-	4	4	25	25	50	100		
PCE151/ 251	Basic Civil Engg Lab	DSC	LC	1	-	-	2	2	25	25	50	100		
PCS253	AI and ML Lab using Python	DSC	LC	1	-	-	2	2	25	25	50	100		
GP201	General Proficiency-I	SEC	SEC	1	-	-	-	-	100	-	-	100		
			Total	23								1200		

Mandatory Non-Graded Course														
TEV101/201	Environmental Science	MNG	MC	2	2	-	-	2	-	-	100	100		
									Qualified/ Non-Qualified					

DEPARTMENT OF ALLIED SCIENCES -PHYSICS

SEMESTER I/II

Name of Department: - Allied Sciences (Physics)

1. Subject Code: | TPH 101/201 | Course Title: | Engineering Physics |

2. Contact Hours: **L:** 3 **T**: 0 **P**: 0

3. Examination Duration (Hrs): **Theory** 3 **Practical** 0

4. Relative Weight: **CIE** 25 **PRS** 0 **MSE** 25 **SEE** 50 **PRE** 0

5. Credits: 3

6. Semester: I/II

7. Category of Course: DSC

8. **Pre-requisite**: Basic Knowledge of Physics

9. **Course Outcome:**	After completion of the course the students will be able to**:** **CO1:** Define the wave nature of light through different phenomenon. **CO2:** Extend the knowledge of Laser, fiber optics and polarization in engineering problems. **CO3:** Understand the concept of theory of relativity. **CO4:** Discuss quantum theory of radiation and applications of Schrodinger wave equations. **CO5:** Examine the behavior of superconductors and quantum computers. **CO6:** Explain the Maxwell's equations and nanomaterials.

10. **Details of the Course:**

UNIT	CONTENTS	Contact Hrs
Unit/Module-I	**Interference:** Conditions of interference, Spatial and temporal coherence, Bi-prism, interference in wedge shaped film, Newton's rings. **Diffraction:** Fraunhofer diffraction at single slit and n-slits (Diffraction Grating). Rayleigh's criteria of resolution. Resolving power of grating.	9
Unit/Module- II	**Polarization:** Basic theory of double refraction, Malus law, Ordinary and Extra-ordinary ray, Production, and detection of plane, elliptically and circularly polarized light, specific rotation and polarimeters. **Laser:** Spontaneous and Stimulated emission of radiation, Einstein Coefficients, Principle of laser action. Construction and working of Ruby and He-Ne laser photovoltaic effect.	9
	Fiber Optics: Introduction to fiber optics; types of fiber, acceptance angle and cone angle, numerical aperture.	
Unit/Module-III	**Special theory of relativity:** Inertial and non-inertial frames, Galilean transformation, Michelson-Morley experiment (qualitatively), Einstein's postulates of special theory of relativity, Lorentz transformation equations, length contraction, time dilation, variation of mass with velocity, mass-energy relation.	8

Unit/ Module-IV	**Quantum Mechanics:** Quantum concept and radiation, Wave particle duality (de-Broglie concept of matter waves), Heisenberg's uncertainty principle, wave function and its significance, Schrodinger's equations, Schrodinger's wave function for a particle confined in one-dimensional infinite potential box (rigid box), Eigen values and Eigen functions. **Quantum computers:** Introduction to quantum computing, principles, Nanocomputing, prospects and challenges.	8
Unit/ Module-V	**Superconductivity:** Essential properties of superconductors, zero resistivity, Type I, Type II superconductors, and their properties. **Electromagnetism:** Displacement current, Maxwell's Equations in differential form. **Nano Physics**: Density of states, Nanostructures, fabrication, and characterization techniques (qualitatively).	8
		Total 42

Text Books:

S.No.	Name of Authors/Books/Publishers/Place of Publication	Edition	Year of Publication/ Reprint
1.	Ajoy Ghatak, "Optics", Tata Mc Graw Hill.	4th Edition	2009
2.	N. Subrahmanyam Brijlal& M. N. Avadhanulu, "Optics:", S. Chand.	24th Edition	2010
3.	A. Beiser, "Concepts of Modern Physics", Tata Mc Graw Hill.	1st Edition	
4.	Resnick, Krane, Halliday, "Physics (vol I&II)", Wiley.	5th Edition	2007
5.	Robert Resnick, "Introduction to Special Relativity", Wiley Publishers.	1st Edition	2007
6.	N. David Mermin, Quantum computer Science, Cambridge University Press.	1st Edition	2007
7.	Adam Smith, "The Beginner's guide to quantum computing & mechanics", A. Smith Media.	1st Edition	2022
	Reference Books	1st Edition	
1.	John R. Taylor, Chris D. Zafiratos, Michael A. Dubson, "Modern Physics", Pearson Education.	1st Edition	2007
2.	Gerd Keiser, "Optic Fiber Communication", Tata Mc. Graw Hill.	5th Edition	2017
3.	Alastair I M Rae, Jim Napolitano, "Quantum Mechanics" Wiley.	6th Edition	2015
4.	David J. Griffiths, "Introduction to Electrodynamics", Prentice.	3rd Edition	2011
5.	Charles P. Poole, Jr. Frank J. Owens, "Introduction to Nanotechnology", Wiley.		2017
6.	Hug D. Young & Roger A. Freedman, "University Physics", Edition, Pearson Publication.	12th Edition	2008
7.	Alan Giambattista, Betty Mc. Carthy Richardson, Robert C Richardson, "Fundamentals of Physics", Tata Mc Graw Hill.	1st Edition	2009
8.	Parag Lala, "Quantum computing", Tata Mc Graw Hill.	1st Edition	2019
9.	Nielsen, "Quantum computation and quantum information "Cambridge University Press.	1st Edition	2007

Semester I/II

Name of Department: - Allied Sciences (Physics)

1. Subject Code: **PPH 151/251** Course Title: **Physics Lab**

2. Contact Hours: **L:** **0** **T**: **0** **P**: **2**

3. Examination Duration (Hrs): **Theory** **0** **Practical** **2**

4. Relative Weight: **CIE** **0** **PRS** **25** **MSE** **25** **SEE** **0** **PRE** **50**

5. Credits: **1**

6. Semester: **I/II**

7. Category of Course: **DSC**

8. Pre-requisite: Basic Knowledge of Experiments in Physics

9. **Course Outcome:**	After completion of the course the students will be able to**:** CO1: Find the electrical and magnetic properties of materials and extend the knowledge of nanotechnology using electroplating. CO2: Understand the principle and characteristics of photo devices and optical fiber. CO3: Apply the methods of calibration to analog instruments. CO4: Determine the refractive index of liquid, wavelength of light and specific rotation of optically active substance through experiments based on phenomena of optics.

10. **Details of the Course:**

Sl. No.	Contents	Contact Hours
	Students have to perform any twelve experiments: 1. To determine the wavelength of monochromatic light by Newton's ring experiment. 2. To determine refractive index of transparent liquid by Newton's ring experiment. 3. To determine the specific resistance of the constantan wire using Carey- Foster's bridge. 4. To determine the wavelength of monochromatic light using Fresnel Biprism experiment 5. To determine the energy band gap of given semiconductor by Four-probe method. 6. (a) To determine the wavelengths of spectral line of Mercury light using plane transmission grating.	2
	(b) To determine the wavelengths of given Laser light using plane transmission grating. 7. To study the variation of magnetic field with distance along the axis of circular coil carrying current and to determine the radius of coil. 8. To determine the magnetic susceptibility of a paramagnetic substance by Quincke's method. 9. To determine the specific rotation of Sugar Solution using Half Shade Polarimeter. 10. To study the characteristics of Solar Cell 11. a) To calibrate Voltmeter by using potentiometer. b) To calibrate Ammeter by using potentiometer. 12. To determine Planck's constant by photoelectric method and study the variation of intensity with distance. 13. To determine the electro chemical equivalent of Copper. 14. To Verify Law of Malus. 15. To study Hall Effect and determine the hall voltage, hall coefficient, current density and carrier mobility of a given semiconductor. 16. To determine the numerical aperture and acceptance angle of an optical fiber. 17. To measure the refractive index of transparent liquid using Laser. 18. To determine the dielectric constant of air. 19. To determine wavelength of monochromatic light using Michelson interferometer.	

Department of Mathematics						
Program: B.Tech. (All Branches Except Bio-Tech.)						
Semester	I	**Course Title**	**Engineering Mathematics-I**		**Code**	TMA 101
Course Components		**Credits**		**L**	**T**	**P**
Discipline Specific Course (DSC)		03	**Contact Hours**	02	01	00
Examination Duration (Hrs)		**Theory**	**Practical**	**Weightage Evaluation**	**CWA**	**MSE**	**ESE**
		03	00		25	25	50

Pre-requisite	Basic Knowledge of Mathematics

Course Outcomes	
CO1	Analyze the concept of matrices and its application for finding the solution of system of linear equations.
CO2	Implement the concepts of differential calculus in various disciplines of Engineering.
CO3	Evaluate maxima / minima of function of several variables.
CO4	Determine area and volume of different curves and shapes using multiple integrals.
CO5	Explain vector calculus for different Engineering problems.

Unit No.	Content	Contact Hours
Unit -1	**Matrices:** Linear dependency and independency of vectors, Inverse of a matrix, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian and orthogonal matrices, Rank of a matrix, Rank-Nullity theorem, System of linear equations, Characteristic equation, Cayley-Hamilton theorem, Eigenvalues and eigenvectors, Orthogonal transformation, Diagonalization of matrices.	11
Unit -2	**Calculus I:** Rolle's Theorem, Mean value theorem and its applications, Extreme value of functions, Indeterminate forms and L'Hospital's rule, Linear approximation, Successive differentiation, Leibnitz's theorem, Limits, Continuity and differentiability of function of two variables, Taylor's and Maclaurin's theorems with remainders.	8
Unit -3	**Calculus-II:** Partial Differentiation, Total derivative, Homogeneous function, Euler's theorem, Extrema (Maxima/ Minima) of functions of several variables and saddle points, Method of Lagrange's multipliers, Introduction of Jacobian and its properties.	8
Unit -4	**Calculus-III:** Evaluation of definite and improper integrals, Beta and Gamma functions with their properties, Double integrals (Cartesian coordinates), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: area and volume, Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds.	10

Unit -5	**Vector Calculus:** Introduction to vectors, Scalar line integrals, Vector line integrals, Gradient, Curl and Divergence, Scalar surface integrals, Vector surface integrals, Directional derivatives, Gradient, Tangent plane and normal line, Green, Gauss and Stokes theorems (without proof).	8
	Total Hours	45

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
C. B. Gupta, S. R. Singh and Mukesh Kumar	Engineering Mathematics for Semesters I and II	1st	McGraw Hill Education	2015
N.P. Bali and Manish Goyal	A text book of Engineering Mathematics	9th	Laxmi Publications, Reprint, 2008	2016
Gorakh Prasad and Chandrika Prasad	Textbook of differential calculus	11th	Pothishala Pvt. Ltd, Allahabad	1968
R. K. Jain and S. R. K. Iyengar	Advanced Engineering Mathematics	5th	Narosa Publication	2019
Erwin Kreyszig	Advanced Engineering Mathematics	9th	Wiley Publications	2014
G. B. Thomas and R. L. Finney	Calculus and Analytic geometry	9th	Addison-Wesley Publishing Company	2010
B. V. Ramana	Higher Engineering Mathematics	6th	Tata McGraw Hill publications	2006

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
B. S. Grewal	Higher Engineering Mathematics	44th	Khanna Publications, India	2022
Tom M. Apostol	Calculus-Volume 2	2nd	Wiley Publications	2022
Reena Garg	Advanced Engineering Mathematics	1st	Khanna Book Publishing Company 2021	2022
T. Veerarajan	Engineering Mathematics (for First Year)	5th	Tata McGraw-Hill, New Delhi	2008

Department of Mathematics						
Program: B.Tech. (All Branches Except Bio Tech.)						
Semester	II	**Course Title**	**Engineering Mathematics -II**	**Code**		TMA 201
Course Components		**Credits**		**L**	**T**	**P**
Discipline Specific Course (DSC)		03	**Contact Hours**	02	01	00
Examination		**Theory**	**Practical**	**Weightage**	**CWA**	**MSE**	**ESE**
Duration (Hrs)		03	00	**Evaluation**	25	25	50
Pre- requisite Basic Knowledge of Mathematics						

Course Outcomes

CO1	Classify ordinary differential equations to solve different Engineering problems.
CO2	Implement the series solution for solving ordinary differential equations.
CO3	Analyze the concept of limit of sequence and convergence of infinite series.
CO4	Examine complex analytic functions and its applications.
CO5	Evaluate integrals of complex variable functions having singularities in the given domain.

Unit No.	Content	Contact Hours
Unit -1	**Ordinary differential equations:** Ordinary differential equation of first order (Exact, linear and Bernoulli's equations), Equations of first order but not of first degree: equations solvable for p, equations solvable for y and equations solvable for x, Clairaut's type, Linear differential equations of nth order with constant coefficients, Complementary functions and particular integrals, Cauchy-Euler differential equation, Second order linear differential equations with variable coefficients, Method of variation of parameters and applications of ODE.	12
Unit -2	**Series solution and special function:** Power series solutions: Legendre's equations and Legendre polynomials, Frobenius method, Bessel's equation and Bessel's functions of the first kind and their properties.	8
Unit -3	**Sequences and series:** Limits of sequence, Infinite series, Tests for convergence, Power series, Taylor and Maclaurin series, Convergence of Taylor series, p series test, Comparison test, Cauchy root test, Ratio test and Rabbe's test.	8
Unit -4	**Complex variable I:** Limit, Continuity and Differentiability of complex variable function, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Finding harmonic conjugate, Elementary analytic functions (exponential, trigonometric, logarithmic) and their properties, Conformal mapping, Liner transformation, Mobius transformation and its properties.	8
Unit -5	**Complex variable II:** Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Taylor's series, Laurent's series, Zeros of analytic functions, Singularities, Residues, Cauchy-Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.	9
	Total Hours	45

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Erwin Kreyszig	Advanced Engineering Mathematics	9th	Wiley India	2014
C. B. Gupta, S. R. Singh and Mukesh Kumar	Engineering Mathematics for Semesters I and II	1st	McGraw Hill Education	2015
C. B. Gupta, S. R. Singh and Mukesh Kumar	Engineering Mathematics for Semesters III and IV	1st	McGraw Hill Education	2016
B. S. Grewal	Higher Engineering Mathematics	44th	Khanna Publications	2022
S. L. Ross	Differential Equations, Ed.	3rd	Wiley India	1984
J. W. Brown and R. V. Churchill	Complex Variables and Applications, Ed.	7th	Mc-Graw Hill	2004

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Reena Garg	Advanced Engineering Mathematics	1st	Khanna Book Publishing Company	2022
Tom M. Apostol	'Calculus' Volume 2	2nd	Wiley Publications	2022
T. Veerarajan	Engineering Mathematics for first year	5th	Tata McGraw-Hill, New Delhi, 2008	2008
E. A. Coddington	An Introduction to Ordinary Differential Equations	1st	Prentice Hall India	1995
E. L. Ince	Ordinary Differential Equations	1st	Dover Publications	1958
J. W. Brown and R. V. Churchill	Complex Variables and Applications, Ed.	7th	Mc-Graw Hill	2004
R. K. Jain and S. R. K. Iyengar	Advanced Engineering Mathematics	5th	Narosa Publication	2009

Department of Mathematics						
Program: B.Tech. (Biotechnology)						
Semester	Two	**Course Title**	**Engineering Mathematics**		**Code**	TMA 202
Course Components		**Credits**		**L**	**T**	**P**
Discipline Specific Course (DSC)		03	**Contact Hours**	02	01	00
Examination Duration (Hrs)		**Theory**	**Practical**	**Weightage Evaluation**	**CWA**	**MSE**	**ESE**
		03	00		25	25	50
Pre-requisite	Basic Knowledge of Mathematics					
Course Outcomes						
CO1	Develop the concept of matrices for various Engineering problems.					
CO2	Evaluate maxima / minima of function of several variables.					
CO3	Implement the concepts of differential calculus in various problems.					
CO4	Demonstrate definite Integrals and its application in finding areas and volumes of different curves and shapes.					
CO5	Analyze the concept of sequence and series.					

Unit No.	Content	Contact Hours
Unit -1	**Matrices:** Introduction to matrices, Symmetric, Skew-symmetric and orthogonal matrices, Determinants, Inverse and rank of a matrix, System of linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem.	11
Unit -2	**Calculus I:** Rolle's theorem, Mean value theorem, Taylor and Maclaurin theorems with remainders, Indeterminate forms and L'Hospital's rule.	8
Unit -3	**Calculus II:** Limit, Continuity, Derivatives and partial derivatives, Gradient, Curl and divergence, Directional derivatives, Total derivative, Tangent plane and normal line, Maxima, minima and saddle points, Method of Lagrange's multipliers.	8
Unit -4	**Calculus III:** Definite Integrals, Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volume of revolutions.	10
Unit -5	**Sequences and Series:** Introduction to sequence and series, Convergence of sequences and series, Tests for convergence, Power series, Taylor's series, Series for exponential, trigonometric and logarithmic functions, Fourier series for arbitrary interval, Fourier series for even and odd function, Half range sine and cosine series.	8
	Total Hours	45

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
C. B. Gupta, S. R. Singh and Mukesh Kumar	Engineering Mathematics for Semesters I and II	1st	McGraw Hill Education	2015
G.B. Thomas and R.L. Finney	Calculus and Analytic geometry	9th	Pearson	2002
Erwin Kreyszig	Advanced Engineering Mathematics	9th	John Wiley & Sons	2014
B.V. Ramana	Higher Engineering Mathematics	11th	Tata McGraw-Hill, New Delhi	2010
N.P. Bali and Manish Goyal	A textbook of Engineering Mathematics	9th	Laxmi Publications	2016

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
T. Veerarajan	Engineering Mathematics (for First Year)	5th	Tata McGraw-Hill, New Delhi, 2008	2008
Reena Garg and Chandrika Prasad	Advanced Engineering Mathematics	1st	Khanna Book Publishing Company	2022
D. Poole	Linear Algebra: A Modern Introduction	2nd	Brooks/Cole	2005
B. S. Grewal	Higher Engineering Mathematics	36th	Khanna Publications	2010

Department of Electrical Engineering							
Program: - Bachelor of Technology (Common to all the Programs)							
Semester	I/II	*Course Title*	**Basic Electrical Engineering**			*Code*	TEE 101/201
Course Components		*Credits*		*Contact Hours*	*L*	*T*	*P*
DSC		02			02	00	00
Examination Duration (Hrs)		*Theory*	*Practical*	*WEIGHTAGE: EVALUATION*	*CWA*	*MSE*	*ESE*
		03	00		25	25	50
Pre-requisite	Basic Knowledge of Physics and Mathematics						
Course Outcomes							
CO1	Recall the concept of voltage, current, resistance and laws related to electricity with reference to the electrical circuits/systems.						
CO2	Understanding of fundamental laws and theorems used in the electrical circuits.						
CO3	Application of network theorems/laws in electrical circuit.						
CO4	Understanding of various electrical safety components and electrical wiring.						
CO5	Application of earthing/grounding.						

Unit No.	Content	Contact Hours
Unit -1	**DC Circuit:** Concepts of current, resistance, E.M.F., potential difference, Ohm's law, Simplifications of networks using series and parallel combinations and star-delta conversions, Kirchhoff's law, Superposition, Thevenin, Norton, Maximum Power Transfer theorem and their applications for network solutions.	10
Unit -2	**Single Phase AC:** Introduction of Single-Phase AC, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Single phase AC through R, L, C, and series combination of RLC.	10
Unit -3	**Electrical Installations and Illumination:** Wire and cables for internal wiring, switches, and circuits (Two-way switch, staircase wiring, go down wiring, double pole double throw switch), type of electrical wiring, Switch Fuse Unit (SFU), MCB, MCCB, Earthing concept and methods of earthing.	4
	Total Hours	24

Text Books/Reference Books:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", 4th Ed., Tata McGraw Hill, 2019
2. D.C. Kulshreshtha, "Basic Electrical Engineering", 2nd Ed., McGraw Hill, 2019
3. V. N. Mittle and Arvind Mittle, "Basic Electrical Engineering", 2nd Ed., Tata McGraw-Hill, 2017
4. L.S. Bobrow, "Fundamentals of Electrical Engineering", 12th Ed., Oxford University Press, 2003
5. V.D. Toro, "Electrical Engineering Fundamentals", 2nd Ed., Prentice Hall India, 2015
6. E. Hughes, "Electrical and Electronics Technology", 10th Ed., Pearson, 2010

DEPARTMENT OF ELECTRICAL ENGINEERING							
Course: - Bachelor of Technology							
Semester	First/Second	*Subject Title*		Basic Electrical Engineering Lab	*Code*		PEE 151/251
Course Components		*Credits*		*Contact Hours*	*L*	*T*	*P*
DSC		01			00	00	02
Examination Duration (Hrs)		*Theory*	*Practical*	*WEIGHTAGE: EVALUATION*	*CWA*	*MSE*	*ESE*
		00	03		25	25	50

Course Outcomes

CO1	Understanding of basic electrical concepts i.e. voltage, current, power, energy etc.
CO2	Development of basic electrical circuit model for the verification of networks and theorems.
CO3	Analysis of various AC circuit parameters.
CO4	Understanding of basic concept of house wiring and measurement of electrical energy consumption.

Exp No.	*Name of the Experiment*
1.	To verify the Kirchhoff's Voltage Law (KVL) in DC circuit.
2.	To verify the Kirchhoff's Current Law (KCL) in DC circuit
3.	To verify Superposition theorem in DC circuit.
4.	To verify Thevenin's theorem in DC circuit.
5.	To verify Norton's theorem in DC circuit.
6.	To verify Maximum Power Transfer theorem in DC circuit.
7.	To find out the meter constant of a single-phase energy meter
8.	To wire for a Stair-case arrangement using a two-way switch.
9.	To measure power and power factor in a single-phase ac circuit with resistive load by using wattmeter.
10.	To draw the current versus frequency characteristics in RLC series circuit.
11.	To study various electrical accessories and machines parts (cut set model).

Department of Electrical Engineering								
Program: - Bachelor of Technology (Biotech)								
Semester	I	*Course Title*		**Basic Electrical & Electronics Engineering**		*Code*	EEC 101	
Course Components		*Credits*		*Contact Hours*		*L*	*T*	*P*
DSC		04				03	01	00
Examination Duration (Hrs)		*Theory*	*Practical*	*WEIGHTAGE: EVALUATION*		*CWA*	*MSE*	*ESE*
		03	00			25	25	50
Pre-requisite	Basic Knowledge of Physics and Mathematics							

Course Outcomes	
CO1	Recalling the concepts of basic electric circuits and remembering the theorems to solve DC Circuits
CO2	Summarize the various characteristics of AC Circuits.
CO3	Applying the concepts of magnetic circuits to understand the basic characteristics of single-phase Transformer.
CO4	Analysing the basics of semiconductor devices used for electronic components.
CO5	Evaluating the basic concept of PN junction diode and its applications in rectifier circuits and DC power supply.
CO6	Compiling Bipolar Junction Transistor (BJT) from its basic concepts and various biasing circuits.

Unit No.	*Content*	*Contact Hours*
Unit -1	**D.C. Network Theory:** Circuit theory concepts-KCL, KVL, mesh and node analysis, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Star Delta transformation.	07
Unit -2	**A.C. Circuit Analysis:** Sinusoidal and phasor representation of voltage and current, single phase a.c. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel, power factor, series parallel resonance and quality factor.	07
Unit -3	**Magnetic Circuits:** Introduction, series-parallel magnetic circuits comparison, Eddy currentsand Hysteresis losses. **Single Phase Transformer:** Principle of operation, classification, phasor diagram at no load, efficiency, and all-day efficiency of transformer.	06
Unit -4	**Semiconductor Basics:** Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors and charge densities in semiconductors, Fermi Level, current components in semiconductors, continuity equation. **Junction Diode and Its Applications:** PN Junction diode – characteristic and analysis, Diode Models, Rectifiers, and filter circuit: Half wave, full wave and Bridge rectifier circuits and their analysis, L, C and Pi filters, Zener Diode, Basic	10

	regulator supply using Zener diode, Design of Regulator circuits.	
Unit –5	**TRANSISTORS:** Construction and characteristics of bipolar junction, transistors (BJT's)- Comm. Base, Comm. emitter, Comm. Collector configuration, Transistor biasing and bias stabilization: - the operating point, stability factor, analysis of fixed base bias, collector to base bias, Emitter resistance bias circuit and self-bias circuit.	8
	Total Hours	38

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
D.P. Kothari and I. J. Nagrath	Basic Electrical Engineering	4th	Tata McGraw Hill,	2019
D.C. Kulshreshtha	Basic Electrical Engineering	2nd	McGraw Hill	2019
V. N Mittle and Arvind Mittle	Basic Electrical Engineering	2nd	Tata McGraw-Hill	2017
Jacob Millmann & Halkias	Integrated Electronics	2nd	Tata McGraw-Hill	2010
Boylestad and L. Robert and Nashelsky Louis	Electronics Devices and Circuits Theory	9th	PHI/Pearson Education.	2010

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
L.S. Bobrow	Fundamentals of Electrical Engineering	12th	Oxford University Press	2003
V.D. Toro	Electrical Engineering Fundamentals	2nd	Prentice Hall India	2015
E. Hughes	Electrical and Electronics Technology	10th	Pearson	2010

DEPARTMENT OF ELECTRICAL ENGINEERING							
Course: - Bachelor of Technology							
Semester	First	*Subject Title*	**Basic Electrical & Electronics Engineering Lab**	*Code*		**EEC 151**	
Course Components		*Credits*		*Contact Hours*	*L*	*T*	*P*
DSC		01			00	00	02
Examination Duration (Hrs)		*Theory*	*Practical*	*WEIGHTAGE: EVALUATION*	*CWA*	*MSE*	*ESE*
		00	03		25	25	50

Course Objectives

CO1	**Illustrate** and **Verification** of various laws in DC circuit
CO2	**Illustrate** and **Verification** of various theorems in DC circuit
CO3	**Demonstrate** various types of diodes and their characteristics
CO4	**Analysis** of various types of analog and digital electronic circuits

Exp No.	*Name of the Experiment*
1.	To verify Kirchhoff's voltage law (KVL) in D.C. circuits
2.	To verify Kirchhoff's current law (KCL) in D.C. circuits
3.	To verify Superposition theorem in DC circuits.
4.	To verify Thevenin's theorem in DC circuits
5.	To verify Norton's theorem in DC circuits '
6.	To verify Maximum Power Transfer theorem in DC circuits.
7.	Study of PN junction diode and its characteristics
8.	Study of ZENER junction diode and its characteristics
9.	Study of half wave rectifier with and without capacitive filter
10.	Study of full wave rectifier with and without capacitive filter
11.	Study of BJT in CB /CE configuration
12.	Verification of basic and derived gates.
13.	Realization of basic gates through universal gates.

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I

Name of Department: - Computer Science and Engineering

1. Subject Code: **TCS 101**   Course Title: **Fundamental of computer and Introduction to Programming**

2. Contact Hours: **L:** 3   **T:** 0   **P:** 0

3. Examination Duration (Hrs.): **Theory** 3   **Practical** 0

4. Relative Weight: **CIE** 25   **MSE** 25   **ESE** 50

5. Credits: 3

6. Semester: I

7. Category of Course: DSC

8. Pre-requisite: Basic Knowledge of Mathematics

9.**Course Outcome:**	CO1: Learn the concepts of IT and understand the fundamentals of basic building blocks of computer science.
	CO2: Learn solution to problem by using tools like algorithm and flowcharts.
	CO3: Understand basic concepts and learn syntax of C to solve basic problems.
	CO4: Analyze and select the best possible solution for decision-based problems using decision making skills and develop the aptitude to solve iterative problems using different types of looping statements.
	CO5: Implement complex problems as a collection of sub problems by applying modularization in applications using functions.
	CO6: Apply and implement the concept arrays for providing solution to homogenous collection of data types.

10.   **Details of the Course:**

Sl. No.	Contents	Contact Hours
1	**UNIT- I** Generation of computers, Block Diagram, Computer system memory hierarchy, Input/Output, RAM/ROM, Software & Hardware, understand concept of bit and byte, Operating System-functions and its types, Computer Networks, Internet and its services	8
2	**UNIT- 2** Basics of 'C', Features, High Level, Low Level and Assemble language, compiler, interpreter and assembler, Basic input/output functions. Variables and Data types - Variables, Identifiers, data types and sizes, type conversions, difference between declaration and definition of a variable, Constants, Keywords, qualifiers, Algorithms and Flow-charts Life of a C program (Preprocessing, Compilation, Assembly, Linking, Loading, Execution), Compiling from the command line, Macros, Operators – equality and assignment, Compound assignment operators, Increment and decrement operators, Performance comparison between pre and post increment/decrement operators, bitwise operators, Logical Operators, comma operator, precedence and associativity.	8
3	**UNIT- III** Conditional statements: Flowcharts on conditional statements, if statement, if-else statement, ternary statement or ternary operator, nested if-else statement, switch statement, Difference between performance of if else and switch, Advantages of if else and switch over each other. Loops: Flowcharts on iterative statements 'for' loops, 'while' loops, 'do while' loops, break and continue, nested loops	10

4	**UNIT- IV** Functions: Flowcharts on functions, Function prototype, function return type, signature of a function, function arguments, call by value, Activation Record, Activation record, Function call stack, Recursion v/s Iteration, passing arrays to functions, Storage classes: Automatic, Static, Register, External, Static and Dynamic linking implementation, C program memory (show different areas of C program memory and where different type of variables are stored), scope rules.	9
5	**UNIT- V** **Arrays:** Flowcharts on array, Single-dimensional arrays, initializing arrays, computing address of an element in array, character arrays, segmentation fault, bound checking, Searching and Sorting.	10
	Total	45

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Peter Prinz, Tony Crawford	C in a Nutshell	2nd	O,Reilly Publishers,USA	2015
Peter Norton	Introduction to computers	6th	TMH Publication, India	2009
E.Balagurusamy	Programming in ANSI C	11th	McGraw Hill Education, American	2022

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Steve Oualline	Practical C programming	3rd	O,Reilly Publishers,USA	2011
Brian W Kernighan, Dennis M Ritcie	"The C Programming Language	2nd	Prentice Hall, India	2008
Yashwant Kanetkar	Let Us C	18th	BPB Publication, India	2023

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER II

Name of Department: - Computer Science and Engineering

1. Subject Code: | **TCS201** | Course Title: | **Programming for Problem Solving**

2. Contact Hours: **L:** 3 **T:** 0 **P:** 0

3. Examination Duration (Hrs): **Theory** 3 **Practical** 0

4. Relative Weight: **CIE** 25 **MSE** 25 **ESE** 50

5. Credits: 3

6. Semester: II

7. Category of Course: DSC

8. Pre-requisite: TCS 101 Fundamental of computer and introduction to programming.

9. **Course Outcome:**	After completion of the course the students will be able to**:**
	CO1: Learn and apply concepts of strings and multi-dimensional array for providing solutions to homogenous collection of data.
	CO2: Propose solution to problem by using tools like algorithm and flowcharts.
	CO3: Apply the concept of pointers to optimize memory management by overcoming the limitations of arrays.
	CO4: Analyze and Implement problems based on heterogeneous collection of data using structures.
	CO5: Apply concepts of file handling to implement data storage and retrieval tasks.
	CO6: Learn and implement the basic concept of Python to solve problems.

10. **Details of the Course:**

SI. No.	Contents	Contact Hours
1	**UNIT- I** Multi-Dimensional Arrays- Initializing arrays, row major and column major form of an array, character strings and arrays, Strings – Declaration of strings, Initialization of string, standard library functions of string, strings and function, string and pointers.	7

2	**UNIT- II** Pointers –Basic of pointers and addresses, Pointers and arrays, Pointer arithmetic, passing pointers to functions, call by reference. Accessing string through pointers. Dynamic memory management in C - malloc(), calloc(), realloc(), free(), memory leak, Dangling, Void, Null and Wild pointers	10
3	**UNIT- III** **Structures** - Structures, structure initialization, accessing structure members, array of structures, structure within structure, structure and function, union, typedef, pointer to structure, self-referential structure, Bit field.	8
4	**UNIT- IV** **File Handling** - Opening or creating a file, closing a file, File modes, Reading and writing a text file using getc(), putc(), fprintf() ,fscanf(),fgets(), fputs(), Reading and writing in a binary file, counting lines in a text file, Search in a text file, Random file accessing methods- feof(), fseek(), ftell() and rewind() functions.	10
5	**UNIT- V** **Introduction to Python-** History of Python, Need of Python Programming, Python features, Variables, Reserved words, Lines and indentation, Quotations, Comments, Input output. Data Types, Operators and Expressions: Standard Data Types – Numbers, strings, Boolean, Operators. Control flow – if, if-elif-else, for, while, break, continue, pass, range(), nested loops. Functions, File Handling.	10
	Total	45

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Peter Prinz, Tony Crawford	C in a Nutshell	2nd	O'Reilly,United Kingdom	2015
Yashwant Kanetkar	Let Us C	**18th**	BPB Publication,India	2023

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Steve Oualline	Practical C programming	3rd	O'Reilly,United Kingdom	**2011**
Brian W Kernighan, Dennis M Ritcie	The C Programming Language	2nd	Prentice Hall, American	**2008**
E.Balagurusamy	Programming in ANSI C	11th	McGraw Hill Education, American	**2022**

Department of Mechanical Engineering							
Program: - Bachelor of Technology (Common to all the Programs)							
Semester	I / II	**Course Title**		Design Thinking		**Code**	**HSMC101/201**
Course Components		**Credits**		**Contact Hours**	**L**	**T**	**P**
VAC/ESC		01			00	00	02
Examination Duration (Hrs)		**Theory**	**Practical**	**WEIGHTAGE: EVALUATION**	**CWA**	**MSE**	**ESE**
		00	02		25	25	50
Pre-requisite	NIL						

COURSE OBJECTIVE(S): The objective of this Course is to provide the new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.

Course Outcomes	
CO1	Analyze emotional experience and inspect emotional expressions to better understand users while designing innovative products
CO2	Develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products
CO3	Propose real-time innovative engineering product designs and choose appropriate frameworks, strategies, techniques during prototype development
CO4	Implementing design thinking in the real world and create a better customer experience.

Unit No.	Content	Contact Hours
Unit -1	**Introduction to Design thinking** Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting, Understanding the Memory process, Problems in retention, Memory enhancement techniques Emotions: Experience & Expression	2
Unit -2	**Basics of Design Thinking** Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test	10
Unit -3	**Process of Product Design** Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem-Solving, Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Product design with AI. Assignment – Engineering Product Design	6
Unit -4	**Celebrating the Difference** Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences	2

Unit -5	**Design Thinking & Customer Centricity** Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design.	2
Unit -6	**Project** Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – "Solving Practical Engineering Problem through Innovative Product Design & Creative Solution". **This will be a Group activity and the project will be assigned by mentor.**	8
	Total Hours	30

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
E Balaguruswamy	Developing Thinking Skills (The way to Success)	32nd edition	Khanna Book Publishing Company, India	2022
Bala Ramadurai	Karmic Design Thinking	1st	Self-Published	2020

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).	Solving Problems with Design Thinking Ten Stories of What Works	1st	(Columbia Business School Publishing)	2013
Yousef Haik and Tamer M.Shahin	Engineering Design Process	2nd	Cengage Learning	2011
Karen Gadd	TRIZ For Engineers: Enabling Inventive Problem Solving	1st	John Wiley & Sons	2011

Department of Mechanical Engineering							
Program: - Bachelor of Technology (Common to all the Programs)							
Semester	I / II	**Course Title**	Mechanical Workshop &Manufacturing Practices		**Code** PME 151/251		**ESC**
Course Components		**Credits**		**Contact Hours**	**L**	**T**	**P**
Core Course (CC)		02			00	00	04
Examination Duration (Hrs)		**Theory**	**Practical**	**WEIGHTAGE: EVALUATION**	**CWA**	**MSE**	**ESE**
		00	04		25	25	50

Pre-requisite	NIL

COURSE OBJECTIVE(S): The objective of this Course is to provide new ways of creative thinking and to learn the innovation cycle of Manufacturing processes for developing innovative products, which are useful for

students in preparing for an engineering career.

Course Outcomes	
CO1	Identify various conventional, non-conventional and automated manufacturing techniques.
CO2	Explain various manufacturing practices used for the production of work pieces and different innovative products in shops like Machine, Welding, Casting, Carpentry, Advanced manufacturing methods, e.g. CNC router, 3D Printer, Laser Cutting, Arduino
CO3	Apply the principles of manufacturing in developing different creative products using a CNC router, 3D Printer, Laser Cutting, and Arduino.
CO4	Analyse the different properties of various materials used for making products.

	List of Practicals	**Contact Hours**
	Week 1: Introduction of manufacturing, 3M's of manufacturing: man, machine and material. Types of manufacturing processes, followed by visits to all shops	4
	Week 2: Machine Shop 1. To make a work piece of mild steel using Facing, Turning and Threading operations	4
	Week 3: Foundry Shop 2. To prepare a mould casting using silicone rubber and perform polymer casting using epoxy resin and hardener in a ratio of 2:1.	4
	Week 4: Fitting Shop 3. To prepare a square piece of mild steel of the given dimensions.	4
	Week 5: 3-D printing 4. To 3D print an object using PLA filament by preparing a model, slicing it, and analysing the print quality.	4

	Week 6: Welding Shop 5. To prepare a butt(single –V) joint using electric arc welding	4
	Week 7,8: Carpentry Shop 6. To make a corner Lap joint/Centre Lap joint of soft wood. 7. To prepare a model using the CNC router to cut a wooden block by designing a tool path, setting machine parameters	8
	Week 9,10 : Non-Conventional and Automated Manufacturing Techniques 8. To write and upload an Arduino program that makes an LED blink at regular intervals using the digital output pin of an Arduino UNO board. 9. To interface an ultrasonic sensor (HC-SR04) with a servo motor using Arduino UNO and program the system to rotate the servo based on the measured distance to an object.	8
	Week 11: Laser Machining 10. To understand and perform Laser engraving and cutting operations on MDF (Medium Density Fibreboard) using a laser cutting machine, by designing, setting appropriate parameters(power, speed, frequency).	4
	Week 12: Mini project To submit a project using the above manufacturing techniques	4
	Total Hours	48

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
A.K..Hajra Chaudhary& S.K Hajra Chaudhary	Workshop Technology Vo I & II	15th	Media Publishing House	2020
R C S Mehta, NS Gaira & Y Chaudhary	Manufacturing Science & Technology -I	1st	SPORE	2018
P C Sharma	A Text Book of Production Technology	7th	S.Chand	2019

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
B.L.Juneja	Workshop&Manufacturing Practices	Ist Impression	CENGAGE	2019
Seropo Kalpakjian& Steven R Schimid	Manufacturing Engineering and Technology	7th	PEARSON	2020
R S Raghuwanshi	Workshop Technology	10th	Dhanpat Rai&Sons	2018

Department of Mechanical Engineering							
Program: - Bachelor of Technology (Common to all the Programs)							
Semester	I / II	Course Title		Engineering Graphics and Design	Code		PME 153/253
Course Components	Credits		Contact Hours		L	T	P
SEC	02				00	00	04
Examination Duration (Hrs)	Theory	Practical	WEIGHTAGE: EVALUATION		CWA	MSE	ESE
	00	03			25	25	50
Pre-requisite	NIL						
Course Outcomes							

CO1	Construct Engineering Drawings as per BIS conventions manually and using CAD software to prepare Orthographic Projections of Points and Lines.
CO2	Use the knowledge of Orthographic Projections to represent Engineering concepts of Planes.
CO3	Develop Projections of Solids and Lateral Surfaces of Solids by analysing the given problems.
CO4	Construct Isometric Drawings after analysing the combination of simple solids.

Unit No.	Content	Contact Hours
Unit -1	**Introduction to Computer Aided Sketching:** Introduction, Drawing Instruments and their uses, BIS conventions, lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar, and description of most commonly used tool bars, navigational tools. Coordinate system and reference planes. Definitions of HP, VP, RPP& LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of lines, Coordinate points, axes, poly-lines, square, rectangle, polygons, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line convention, material conventions and lettering. Computer Aided Design(CAD) software: Modelling of parts and Assemblies.	8
Unit -2	**Orthographic projections of Points, Lines and Planes:** Introduction, Definitions - Planes of projection, reference line and conventions employed. First angle and Third angle projection. Projections of Points in all the four quadrants. Projection of Lines (located in first quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems) Projection of Planes: triangle, square, rectangle, pentagon, hexagon, and circle, Planes in different positions by change of position method only (No problems on punched plates and composite plates.)	20
Unit -3	**Projections of Solids:** Projections of right regular Prisms, Pyramids and Cones with axis inclined to both the planes. (Solids resting on HP only)	8

Unit -4	**Development of Lateral Surfaces of Solids:** Sections of right regular prisms, Pyramids, Cylinders and Cones resting with base on HP. Development of lateral surfaces of above solids, their truncations.	8
Unit -5	**Isometric Projections:** Principles of Isometric projection - Isometric Scale, Isometric Views, Conventions, Isometric views of Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice - Versa.	8
Unit -6	**Demonstration of a Simple Team Design Project that Illustrates:** Geometry and topology of Engineered components: creation of Engineering models and their presentation in standard 2D blueprint form and as 3D wireframe and shaded solids; meshed topologies for Engineering analysis and tool-path generation for component manufacture; Geometric Dimensioning and Tolerancing; Use of Solid-Modelling software for creating associative models at the component and assembly levels.	8
	Total Hours	60

CAD Softwares:	1. **AUTOCAD** 2. **CREO**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
K.R. Gopalakrishna	Engineering Graphics	32nd edition	Subash Publishers, Bangalore.	2005
S.Trymbak a Murthy	Computer Aide d Engineering Drawing	3rd revise d edition.	International Publishin g house Pvt. Ltd., New Delhi,	2006

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
N.D. Bhatt and V.M. Panchal	Engineering Drawing	48th edition	Charotar publishin g House, Gujarat.	2005

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Department of Nursing							
Program: - Bachelor of Technology (Common to all the Programs)							
Semester	One/Two	Course Title	Healthy Living and Fitness		Code	THF 101 /201	
Course Components		Credits	Contact Hours		L	T	P
Core Course (CC)		02			02	00	00
Examination Duration (Hrs)		Theory 03	Practical 00	WEIGHTAGE: EVALUATION	CWA -	MSE -	ESE 100
Pre-requisite		NIL					
9.Course Outcome:		After completion of the course the students will be able to: CO1: Explain the importance of balanced food and proper diet in daily life. CO2: Recognize the benefits of healthy lifestyle, lifestyle management, and related diseases. CO3: State the problems related to addiction and benefits of routine exercises. CO4: Describe the significance of mental health and keys to stress management. CO5: Express the benefits of yoga and meditation.					

10.   **Details of the Course:**

Sl. No.	Contents	Contact Hours
1	**Unit 1:** **Human Body:** Awareness of important body organs, their location, and broad functions. **Diet and Health:** Importance of breakfast, fruits, whole grains Knowledge about constituents of diet. Importance of fiber. Harmful effects of junk/processed foods	10
2	**Unit 2:** **Lifestyle Diseases and management:** Dangers of obesity, Diseases ensuing because of lifestyle e.g., Diabetes-Hypertension - Obesity- CHD. **Addictions and treatments:** Chewing/unhealthy harmful products, Drinking, Smoking: lethality's and management	10

| | Unit 3:

Importance of Mental Health: Stress management, Anxiety and depression, Awareness of commonly encountered diseases/ailments.

Yoga and Stress Management: Benefits of yogic exercises and meditation for physical and mental fitness, stress management and relaxation techniques | 10 |
|---|---|---|
| 3 | | |
| | **Total** | **30** |

Textbooks:

Authors Name	Title	Edition	Publisher, Country	Year
Darshan Sohi	A Comprehensive Textbook of Applied Nutrition and Dietetics for BSc Nursing Students	Third	Jaypee, India	2022
Leon Beach	Yoga and Meditation: Alternative Medicine	First	Larsen and Keller Education (21 April 2017)	2017
Tim Spector	Food for Life: The New Science of Eating Well	First	Jonathan Cape	2022

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Mr. Rahul Kushwah, Mr. Shrikant& Mr. Yogendra Kushwah	Fundamental of Yogic Practices (A Complete Guide of Yoga)	First	Khel Sahitya Kendra (1 January 2021)	2021
Anita Jatana	Apollo Clinical Nutrition Handbook	First	Jaypee brothers' medical publishers	2022
N. Shakuntala Manay & M. Shadaksharaswamy	New Age Foods Facts and Principles	Fifth	New age international publishers	2023

Name of Department: Chemistry   Annexure - I

1. **Subject Code**: | TCH 101/201 | **Course Title:** | Engineering Chemistry |

2. **Contact Hours**:   L: | 3 | T: | --- | P: | --- |

3. **Semester**: I / II

4. **Credits:** | 3 |

5. **Pre-requisite**: Basic Knowledge of Chemistry

6. **Course Outcomes**: After completion of the course students will be able to:

   1. acquire knowledge of structure and properties of molecules based on bonding and spectroscopic techniques
   2. understand the chemistry of purification of water and its industrial and domestic application
   3. classify various types of polymers and their applications
   4. Interpret and distinguish between the different types of conventional and non-conventional fuels
   5. apply the basic principles of electrochemistry in different electrochemical cells, corrosion control, fuel cells and industrial applications

6. **Detailed Syllabus**

UNIT	CONTENTS	Contact Hrs
Unit - I	**MOLECULAR STUCTURE AND SPECTROSCOPIC TECHNIQUES** Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules Hydrogen Bonding and its application Metallic Bonding (Band theory) and application to conductors, semiconductors and insulators Nanoscale Materials - Properties and applications Basic Principles of spectroscopy and its applications for molecular structure	10
Unit - II	**WATER TECHNOLOGY** Hardness of water: Causes, Types, Measurement, Boiler troubles: Sludges, Scales and Caustic Embrittlement Softening of water by L-S Process, Zeolite Process and Reverse Osmosis Process, Ion Exchange Process, Calgon Process Numerical Problems based on L-S Process, Zeolite Process and hardness of water. Introduction to the membrane concept for the treatment of microplastics from water	5
Unit -III	**POLYMERS** **Polymers:** Definition, degree of polymerization, functionality of monomer, Classification of polymers with examples, Types of polymerizations – addition and condensation polymerization with examples. Mechanism of addition polymerization. **Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, preparation, properties, and applications of PVC and Bakelite **Fibers:** Characteristics of fibers – preparation, properties and applications of Nylon and Dacron. **Conducting polymers:** Characteristics and Classification of conducting polymers with examples. **Biodegradable polymers:** Concept and advantages – Preparation of Polylactic acid and poly vinyl alcohol and their applications. **Liquid Crystalline Polymers:** Characteristics, classification with examples and their applications.	6
Unit –IV	**FUELS AND RENEWABLE SOURCE OF ENERGY** Fuels Definition, Classification and Characteristics of a good fuel, Calorific value and its determination by Bomb Calorimeter, Numerical problems on Bomb Calorimeter, Composition and uses of Natural gas, CNG, LPG.	10

	Renewable Energy Sources: Solar energy, wind energy, hydroelectric and geothermal. Biofuels as alternative sources of energy (biomass, biogas).	
Unit-V	**ELECTROCHEMISTRY & ITS APPLICATIONS** Electrode potential, standard electrode potential, factors affecting the electrode potential of a cell. Nernst equation: Electrochemical series and its application, Electrochemical cell: Daniel cell, Concentration cells, electrolyte concentration cell Numerical problems based on electrode potential and emf of a cell. Fuel Cells: Introduction, Principles, Classification, and application Corrosion its causes and effects, Theories of corrosion – Chemical & Electrochemical corrosion	**11**
	Total	**42**

Text Books:

1. Sunita Rattan, " Comprehensive Engineering Chemistry", S.K. Kataria & Sons Delhi, India, 2nd
Edition (2009)

2. Shashi Chawala , "Theory and Practical's of Engineering Chemistry", Dhanpat Rai and Company, (Pvt) Ltd 3rd
Edition (2012)

3. Jain & Jain "A text book of Engineering Chemistry," Dhanpat Rai Publishing Company,
15th Edition New Delhi (2008)

Reference Books:

1. J.D. Lee, " Concise Inorganic Chemistry", 5th Edition (1996)

2. K. L. Kapoor "A text book of Physical Chemistry" Vol. 5 , Macmillan India, 1st Edition (2004)

3. Prof. K.N. Jayaveera, Dr.G.V.Subba Reddy and Dr.C. Ramachandraiah, "Chemistry for Engineers" McGraw Hill Higher Education Hyd.,(2009)

4. William Kemp, "Organic Spectroscopy", Palgrave Foundations, (1991).

5. L.E.Foster, "Nanotechnology, Science Innovation & Opportunity", Pearson Education, 2007.

6. Y.R. Sharma "Elementary Organic Spectroscopy: Principles and Chemical Applications", 1st Edition,

7. F.W.Bill, Meyer, A Text book of Polymer Chemistry, 3rd Edition 2009,

8. Thirumala Chary and Laxminarayana, "Engineering Chemistry", Scitech Publishers, Chennai (2016).

1.   **Subject Code**:   PCH 151/251   **Course Title**:   Chemistry Lab

2.   **Contact Hours**:   L: 0   T: 0   P: 2

.   **Semester**: I / II

3.   **Credits:**   2

4.   **Pre-requisite**: Basic Knowledge of Experiments in Chemistry

5.   **Course Outcomes**: After completion of the course students will be able to

1. Analyze the water and oil quality parameter.
2. Understand the concept of viscosity, surface tension and their applications.
3. Analyze the ores and bleaching powder sample
4. Knowledge of pH metric and calorimetry and their application in industry.

Detailed Syllabus: **Students have to perform any twelve experiments:**

UNIT	CONTENTS	CONTACT HRS
EXP- 1	**To determine the alkalinity of the given water sample containing carbonate (CO_3^{2-}) ions and bicarbonate (HCO_3^-) ions by titrating it against standard HCl solution [N/10] using phenolphthalein and methyl orange as indicators.**	**2**
EXP - 2	**To determine the chloride ion (Cl^-) content in the given water sample by Argentometric method (Mohr's method) using N/50 $AgNO_3$ as a standard solution and potassium chromate (K_2CrO_4) as an internal indicator.**	**2**
EXP-3	**To determine the temporary and permanent hardness of given water sample by titrating it against standard solution of M/100 Ethylene Diamine Tetracetic Acid (EDTA) using Eriochrome black-T (EBT) as an internal indicator.**	**2**
EXP-4	**To determine the coefficient of viscosity of the given sample solution by Ostwald's viscometer (Viscosity of water = 0.0101 Poise).**	**2**
EXP-5	**To determine the ferrous ion (Fe^{++}) content in given sample solution of Mohr's salt ($FeSO_4.(NH_4)_2SO_4.6H_2O$) by titrating it against standard N/30 potassium dichromate ($K_2Cr_2O_7$) solution by using potassium ferricyanide $K_3[Fe(CN)_6]$ as an external indicator.**	**2**
EXP - 6	**To determine the surface tension of the given sample solution by drop number method.**	**2**
EXP - 7	**To determine the percentage of available chlorine in the given sample of 1 gram bleaching powder by titrating it against standard solution of N/25 sodium thiosulphate ($Na_2S_2O_3$) using**	**2**

	starch $(C_6H_{10}O_5)_n$ as an internal indicator.	
EXP - 8	To determine the acid value of oil	2
EXP - 9	To determine the strength of unknown HCl solution by titrating it against N/10 NaOH solution with the help of pH meter.	2
EXP - 10	Synthesis of phenol-formaldehyde resin	2
EXP – 11	To determine the alkalinity of the given water sample containing carbonate (CO_3^{2-}) ions and hydroxide (OH^-) ions by titrating it against standard HCl solution [N/10] using phenolphthalein and methyl orange as indicators.	2
EXP – 12	To determine the rate constant of a reaction	2
EXP – 13	To determine the Copper (Cu^{++}) ion content in the given sample of copper ore (blue vitriol) by titrating it against standard N/30 sodium thiosulphate solution using starch as indicator by Iodometric titration.	2
EXP - 14	Determination of adsorption isotherm of acetic acid on activated charcoal	2

Text Books:

- Sunita Rattan, " Comprehensive Engineering Chemistry", S.K. Kataria & Sons Delhi, India, 2nd Edition (2009)
- Shashi Chawala , "Theory and Practicals of Engineering Chemistry", Dhanpat Rai and Company, India 3rd Edition (2012)

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Accredited by NAAC with Grade A
NBA Accredited Program in CSE, ECE & ME
Approved by AICTE, Ministry of HRD, Govt. of India

Name of Department: - Biotechnology

1. **Subject Code:** BTE 201   **Course Title:** Advanced Organic Chemistry

2. **Contact Hours:** Lecture - 3   T: Tutorial -0   Practical- 0

3. **Semester:** II

4. **Credits:** 3

5. **Pre-Requisite:** Basic and Advanced knowledge of Organic Chemistry

6. **Course Outcomes:** After completion of the course, students will be able to:

    1. understand the basic knowledge of different techniques of purification of organic compound
    2. explain the reaction mechanism in organic chemistry.
    3. illustrate concepts and knowledge on nanotechnology and its application
    4. Learn and apply the concepts of analytical chemistry for sample analysis
    5. discuss the knowledge of carbohydrates and their practical application to biotechnology and engineering.

7. **Detailed Syllabus**

UNIT	CONTENTS	Contact Hrs
Unit - I	**PURIFICATION OF ORGANIC COMPOUNDS** Crystallization sublimation, Distillation, Fractional distillation, distillation under reduced pressure, Steam distillation, Extraction with solvent, chromatography	4
Unit - II	**(a) STRUCTURE OF ORGANIC COMPOUNDS** Nature of covalent bond and its orbital representation. Hybridization, bond energy, polarity of bond & dipole moment of molecules, Isomerism	5
	(b) ORGANIC REACTIONS AND THEIR MECHANISM Bond fission, Inductive effect, hyperconjugation, electromeric, resonance effects and their significance; Types of reagents: electrophiles & nucleophiles, Reaction intermediates: carbocation, carbanion, carbenes, and free radicals- generation, properties and stability,	7
	(c) Addition reactions, Substitution reactions, Elimination reactions in organic chemistry. Orientation in aromatic substitution reactions	7

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Approved by AICTE, Ministry of HRD, Govt. of India

Unit - III	**(a) NANOMATERIALS** Introduction, Green nanotechnology, Synthesis of nanoparticles and its applications	3
	(b) GREEN CHEMISTRY Introduction, Twelve Principles of Green Chemistry, Adverse effects of chemicals, Practice of Green Chemistry	3
Unit - IV	**Analytical Chemistry: Basics and its applications** a. Definition of Qualitative and quantitative analysis, volumetric and gravimetric analysis. b. Principle of volumetric analysis. Concept of pH, buffer solution and Henderson equation. Concept of strength and concentration of solution, Normality, Molarity, Molality and interconversion of strength, c. Types of volumetric analysis: Acid-base, Complexometric, redox and precipitation titration (Principle and examples). d. Principle and applications of the following methods: **Chromatography:** Introduction, principle & application of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration. **Thermoanalytical methods:** Thermogravimetric Analysis, Thermometric Titrations **Electroanalytical techniques:** Electrogravimetry, Polarography and Voltametric Methods. **Atomic Spectroscopy:** Principle and application of atomic absorption spectroscopy and flame photometry.	8
Unit - V	**CARBOHYDRATES** Definition, Classification, General Properties. Preparation of Glucose, its physical and chemical properties, Killiani Fischer synthesis, Ruff degradation	5
	Total	42

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NBA Accredited Program in CSE, ECE & ME
Approved by AICTE, Ministry of HRD, Govt. of India

Textbooks:

1. Morrison & Boyd "Organic Chemistry",6th edition ,Pearson education
2. I.L.Finar, Organic Chemistry (Vol. I & II) 5th Edition 2009, Pearson Publication
3. Bahl and Bahl, "Advanced Organic Chemistry" by S. Chand & Company Ltd.

Reference Books:

1. F.W.Bill Meyer, "Text book of Polymer Chemistry, 3rd Edition 2009, W.J.Wiley India
2. Advanced Organic Chemistry by Bernard Mille
3. Organic Structural Spectroscopy by Joseph Lambert, Scott Gronert, Herbert Shurvell, David Lightner and Robert Graham Cooks
4. L.E.Foster, "Nanotechnology, Science Innovation & Opportunity", Pearson Education, 2007.

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I/II

Sr. No.	Department of Electronics and Communication Engineering						
1.	Subject Code	TEC 101/201		Course Title		Basic Electronics Engineering	
2.	Contact Hours	L	2	T	0	P	0
3.	Examination Duration	Theory		3	Practical		0
4.	Relative Weight	CIE	25	MSE	25	ESE	50
6.	Credit	02					
6.	Semester	First/Second					
7.	Category of Course	DSC/ESC					
8.	Pre-requisite	Physics					

9.	Course Outcomes	After completion of the course the students will be able to: **CO1: Remember** operations on number systems and understand concepts of digital circuits. **CO2: Understand** the basics of semiconductor materials and devices like, PN junction diode as well as Bipolar Junction Transistor (BJT). **CO3: Apply** and **Analyze** the basics of PN junction diode in rectifier circuits and BJT in Amplifier. **CO4: Design** and **develop** various basic electronic circuits.

10. Details of the Course

Sl. No.	Contents	Contact Hours
1.	**Unit 1: Number Systems & Boolean Algebra**: *Number systems and their conversion, Logic gates, Boolean algebra, Implementation of basic gates using universal gates, Implementation of logic functions using basic gates & universal gates, SOP & POS form of logic expression, Canonical form, Conversion from SOP & POS form to canonical form, Simplification of Boolean function: Algebraic method, Karnaugh map method (two, three & four variable K-map with don't care condition).*	10

2.	**Unit 2: Basics of Semiconductor Devices: P-N junction diode and BJT** *Energy band theory: Classification of solids based on energy band diagram, Semiconductors; Intrinsic semiconductors, Extrinsic semiconductors– P-type and N-type, Mobility and conductivity, Mass action law, Charge densities in semiconductors, P-N Junction; Formation*	10
	of depletion region, V-I characteristics of P-N junction diode, and Zener diode. *Construction of bipolar junction transistors (BJT), NPN and PNP type* *transistor, Characteristics; Common base and Common emitter configuration.*	
3.	**Unit 3: AC to DC Conversion and Introduction of Operational amplifier:** *Introduction to DC power supply, Rectifiers circuit: Half wave, Center tapped full wave and Bridge rectifier circuits. Rectifier performance* *parameter analysis (with and without capacitor filter).* *Introduction of Operational Amplifier: Inverting and non-Inverting Op- amp, Summing amplifier, Difference amplifier.*	10
	Total	**30**

11. Suggested Books

Sr. No.	Name of Authors/Books/Publishers	Edition	Year of Publication / Reprint
	Textbooks		
1.	Jacob Millmann & Halkias, "**Integrated Electronics**", TMH.	2nd	2009
2.	M. Morris Mano, Michael D. Ciletti, "**Digital Design**", Pearson Education.	5th	2012
	Reference Books		
1.	Boylestad and L. Robert and Nashelsky Louis, "**Electronics Devices and Circuits Theory**", Pearson Education,	10th	2009
2.	S. Salivahanan and S. Arivazhagan, "**Digital Circuits and Design**", Oxford University Press,	5th	2008
12.	**Mode of Evaluation**	Test / Quiz / Assignment / Mid Term Exam / End Term Exam	

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I / II

Sr. No.	Department of Electronics and Communication Engineering						
1.	Subject Code	PEC151/251		Course Title		Basic Electronics Engineering Lab	
2.	Contact Hours	L	0	T	0	P	2
3.	Examination Duration	Theory		0	Practical		3
4.	Relative Weight	CIE	25	MSE	25	ESE	50
6.	Credit	01					
6.	Semester	First/Second					
7.	Category of Course	DSC/LC					
8.	Pre-requisite	Physics					

9.	Course Outcomes	After completion of the course the students will be able to: CO1: **Identify** and **understand** active & passive components along with various measuring instruments. CO2: **Verify** truth table of logic gates. CO3: **Analyse** the characteristics of diodes and transistors. CO4: **Implement** different electronics circuits using operational amplifier and logic gates

10. Details of the Course

Sr. No.	List of problems for which student should develop program and execute in the Laboratory	Contact Hours
1.	Familiarization of electronics measuring instrument and components.	2
2.	Measure the voltage and frequency using a DSO.	2
3.	Study and verification of the truth table for logic gates.	2
4.	To design and verify the truth table for logic gates using NOR gate.	2
5.	To design and verify the truth table for logic gates using NAND gate.	2
6.	Study V-I characteristics of PN junction diode and determine the static and dynamic resistance from the characteristic curve.	2
7.	Study of a Half wave rectifier circuit with and without capacitor filter.	2
8.	Study of a Centre tapped full wave rectifier circuit with and without capacitor filter.	2

Department of Environmental Science

Program: B.Tech. (Common to all)							
Semester	First/ Second		**Subject Title**	Environmental Science	**Code**	TEV 101 /TEV 201	
Course Components			**Credits**		**Contact Hours**		
MNG			02		**L**	**T**	**P**
					2	0	0
Examination Duration	Theory	Practical	**Weightage Evaluation**		Qualified / Non Qualified		
	03	00					

Course Objectives	
CO1	To create environmental awareness and knowledge
CO2	To encourage participation in environmental conservation practices
CO3	To develop critical thinking and apply those to the analysis of a problem or question related to the environment
CO4	To evaluate impact of various human induced activities on the environment
CO5	To design possible solutions to the real environmental problems.
CO6	To create interest in research and innovation related with different aspects of environmental science.

Unit No.	**Contents**	**Hours**
1.	**Environmental Science and Ecosystem** **a**. Definition of Environmental Science, Multidisciplinary nature, Objective, Scope and Importance. **b**. Concept of an ecosystem, structure and function, energy flow, ecological succession, food chains, food webs, ecological pyramids. **c**. Introduction, types, characteristic features, structure and function of the following ecosystem: • Forest ecosystem • Grassland ecosystem • Desert ecosystem • Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	

.	**Natural Resources and Biodiversity** **a**. Renewable and non- renewable resources. **b**. Natural resources and associated problems: • Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people. • **Water Resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems, water conservation, rainwater harvesting, watershed management. • **Mineral Resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies. • **Food Resources:** World food problems, Changes in landuse by agriculture and grazing, Effects of modern agriculture, Fertilizer/ pesticide problems, Water logging and salinity • **Energy Resources:** Increasing energy needs, Renewable/ non- renewable, Use of Alternate energy sources, urban problems related to energy, Case studies • **Land resources:** Land as a resource, land degradation, man-induced land-slides, soil erosion and desertification, wasteland reclamation **c**. Role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles. **d**. Definition of biodiversity, levels of biodiversity, value of biodiversity, threats to biodiversity (habitat loss, poaching of wildlife, man-wildlife conflicts). **e**. Biodiversity at global, national and local levels, India as a biodiversity nation, biogeographical classification of India, hotspots of biodiversity. **f** . Endangered and endemic species of India. **g**. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	

3.	**Environmental Pollution**
	    a. Definition, causes, effects and control measures of Air Pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards.
	    b. Solid waste Management: causes, effects and control measures of urban and industrial wastes.
	    c. Role of an individual in prevention of pollution, pollution case studies, pollution case studies.	

4.	**Important Environmental and Social Issues, Management and Legislation**
	    a. Climate change, global warming, acid rain, Ozone layer depletion, nuclear accidents and holocaust, Case studies.
	    b. Sustainable development, Resettlement and rehabilitation of people (its problems and concerns, case studies), Environmental ethics (issues and possible solutions), consumerism and waste products.
	    c. Disaster management: floods, earthquake, cyclone and landslides.
	    d. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.
	    e. Issues involved in enforcement of environmental legislation, Public Awareness
	    f. Population growth (variation among nation), Population explosion (family welfare programme), Environment and human health, human rights, value education, HIV/ AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, case studies.	

Text Books:
1. G. M. Wagh, Environmental Studies, Savera Publishing House, 2022.

2. Deswal, S. & Deswal A.: A Basic Course In Environmental Studies; Dhanpat Rai & Co., 2018

References:
1. Bharucha, Erach for University Grants Commission – Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi, 2004.
2. Kaushi, Anubha and Kaushik, C.P. – Perspectives in Environmental Studies, 2nd Edition, New Age International (P) Ltd, 2004.

DEPARTMENT OF BIOTECHNOLOGY (2024-25)							
Program: - Bachelor of Technology (Biotechnology)							
Semester	I	*Course Title:*	**Fundamentals of Medical Biotechnology**		*Code*	**TBT101**	
Course Components		*Credits:3*	*Contact Hours*		*L*	*T*	*P*
SEC/BSC		03			02	01	00
Examination Duration (Hrs)		*Theory*	*Practical*	*WEIGHTAGE: EVALUATION*	*CIE*	*MSE*	*ESE*
		03	00		25	25	50
Course Outcomes							
CO1	Learn about human microflora and understand basic mechanism ofaction of various medically important bacterial microbes						
CO2	Understand basic mechanism of action of various medically important fungaland Viral infections and their diagnostic procedures.						
CO3	Understanding the concept of immune system and their correlation withMicrobes.						
CO4	Utilize biotechnology tools in medical therapeutic and summarize thediagnostic techniques for common human diseases.						
CO5	Understanding of good laboratory practices followed in medicalbiotechnology laboratory.						
Pre-requisite							
Unit No.	*Content*						*Contact Hours*
Unit -1	**Commensal & Pathogenic Bacteria** **Normal microflora of human body**: Skin, Respiratory system and Genitourinary tracts. Source of infection, mode of spread and portals of entry. **Common pathogenic bacteria**: Introduction of morphology,characterization, pathogenicity, lab diagnosis, prophylaxis of *Staphylococcus, Streptococcus, Neisseria, Corynebacterium, Bacillus*, *Clostridium, Mycobacteria, Hemophilus, Escherichia coli, Pseudomonas*,						8
Unit -2	**Introduction to Pathogenic Fungi & Viruses** **Fungi**: Introduction to morphology, symptoms, lab diagnosis and prevention of Mycoses. **Viruses:** Morphology, Pathogenicity, prophylaxis, Diagnosis of viruses: Pox viruses, Herpes, viruses, Orthomyxxovirus, Polio viruses, Hepatitis viruses; Rabies viruses, Human immunodeficiency viruses, COVID - 19 viruses.						8
Unit -3	**Immunology** **Components of Immune system:** Types of Immunity, barriers of natural immunity, cells and organs of Immune system, properties of antigen and antibody , interaction of antigens with various immune cells and organs, Types of antibodies and their significance in host-pathogen interaction.						9
Unit -4	**Management and Quality Control of Medical Biotechnology** **Laboratory Specimen Collection**: Collection of clinical specimens from patients, clinics, hospitals, for diagnosis and processing, training of medical biotechnologist to handle epidemics. **Quality Control**: Selective cultural media, identification by special tests,						10

	biochemical reactions and sero-typing of pathogenic bacteria. Antibiotic susceptibility testing, its interpretation and reporting. **Hospital infection control**: Quality control in diagnostic microbiology, National programmer for control of infectious diseases.	
Unit -5	**Applications of Medical Biotechnology** **Tools and techniques**: Hybridoma technology, biopharming-subunit vaccines, DNA vaccines, recombinant vaccines, therapeutic enzymes, basic biomedical tools in diagnosis, treatment, prevention of diabetes (Insulin production), cancer (Detection of cancer antigens), transplantation.	10
	Total Hours	45

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
R.Khandpur	Biomedical instrumentation, Technology and applications	**1st**	McGraw Hill Professional	**2004**
GK Suraishkumar	Biology for Engineers.	**1st**	Oxford HigherEducation, Oxford University Press.	2019
Thomas J.Kindt, Barbara A.Osborne, Richard Goldsby.	Kuby Immunology	**8th**	W. H. Freeman	2018

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Prescott, L.M.; Harley, J.P. andKlein, D.A.	Microbiology	**10th**	McGraw-Hill Education; USA.	**2017**

DEPARTMENT OF PROFESSIONAL COMMUNICATION							
Program: - Bachelor of Technology (I year)							
Semester	I	*Course Title*	*Professional Communication*		*Code*		
Course Components	*Credits*		*Contact Hours*		*L*	*T*	*P*
Ability Enhancement Course	02				02	00	00
Examination Duration (Hrs)	*Theory* 02	*Practical* 00	*WEIGHTAGE: EVALUATION*		*CIE* 25	*MSE* 25	*ESE* 50
Course Outcomes							
CO1	Comprehend grammatical rules so that it is easier to converse and write in correct English.						
CO2	Enhance the speaking skills and develop an understanding of effective verbal and nonverbal expressions to instil the confidence of a good speaker in the students.						
CO3	Employ the skills and knowledge of communication in the professional life and in career building exercise						
Pre-requisite	Functional Grammar, Basic writing skills						
Unit No.	Content						Contact Hours
Unit -1	**FUNCTIONAL GRAMMAR:** Sentence correction based on Nouns, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Modals, Tenses and Subject-Verb Agreement						10
Unit -2	**EFFECTIVE COMMUNICATION:** Introduction to effective communication, Evolution, Principles, Barriers, Communication based on Formality, Media and Party. Oral and Written Communication, Non-verbal communication Characteristics, Components: Paralanguage, Kinesics and Proxemics						10
Unit -3	**CORPORATE COMMUNICATION:** Memo writing, Notice and Email writing, Agenda and Minutes of the meeting						10
	Total Hours						**30**

Textbooks:

Authors Name	Title	Edition	Publisher, Country	Year
Wren & Martin

Revised by: Dr. N.D.V Prasad Rao | English Grammar and Composition | 6th | S. Chand, India | 2023 |
| Kumar S. and Lata P. | Communication Skills | 2nd, (13th Impression) | Oxford University Press, India | 2022 |

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Singh C.	English is Easy	4th	BSC Publishing Co. Pvt. Ltd., India	2020
Raman M. and Sharma S.	Technical Communication	4th	Oxford University Press	2022

DEPARTMENT OF PROFESSIONAL COMMUNICATION							
Program: - Bachelor of Technology (I year)							
Semester	II	*Course Title*	*Advanced Professional Communication*		*Code*		
Course Components		*Credits*	*Contact Hours*		*L*	*T*	*P*
Ability Enhancement Course		02			02	00	00
Examination Duration (Hrs)		*Theory*	*Practical*	*WEIGHTAGE: EVALUATION*	*CIE*	*MSE*	*ESE*
		02	00		25	25	50
Course Outcomes							
CO1	Understand the significance of impressive and word limited writing and to apply the writing skills into writing for employment and for corporate communication.						
CO2	Evaluate and assess the speaking patterns of self and others to excel in interviews and extemporaneous speaking and to analyse the impact of interpersonal skills in communication.						
CO3	Create a distinctive idea of listening and negotiating by applying the oral and verbal communication skills.						
Pre-requisite	Basic communication skills						
Unit No.	*Content*						*Contact Hours*
Unit -1	**WRITING SKILLS:** Transitive/linking words, Précis writing: Do's and don'ts, Paragraph Writing –Descriptive, Imaginative, Analytical and informative (150 words), CV/Resume, Job Application Letter, E-mails,						10
Unit -2	**SOFT SKILLS-I:** Interviews- definition, purpose, preparation, types, dos and don'ts. Extempore speaking, JAM delivery. Group discussion: definition, purpose, dos and don'ts, qualities judged, types of topics. Presentation skills: process, components, principles, effective skills, methods of speaking, audience analysis.						10
Unit -3	**SOFT SKILLS-II**: Listening Skills: Importance, barriers to effective listening, approaches, being better listeners. Negotiation Skills: Importance, approaches, preparations, role plays (Laboratory component)						10
	Total Hours						**30**

Textbooks:

Authors Name	Title	Edition	Publisher, Country	Year
Raman M. and Sharma S.	Technical Communication	4th	Oxford University Press	2022
Kumar S. and Lata P.	Communication Skills	2nd, (13th Impression)	Oxford University Press, India	2022

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Richards J.C., Hull J. and Proctor S.	Interchange	5th	Cambridge University Press, India	2022
Agarwal M.	Technical Communication	2nd	Krishna Prakashan Media (P)m Ltd., India	2019

Department of Mathematics							
Program: B. Tech. (AI)							
Semester	I	**Course Title**		**Engineering Mathematics for Artificial Intelligence - I**		**Code**	TMA 102
Course Components		**Credits**		**Contact Hours**	**L**	**T**	**P**
Discipline Specific Course (DSC)		03			02	01	00
Examination Duration (Hrs)		**Theory**	**Practical**	**Weightage Evaluation**	**CWA**	**MSE**	**ESE**
		03	00		25	25	50
Pre-requisite	Basic Knowledge of Mathematics						
Course Outcomes							
CO1	Analyze the concept of matrices and its application.						
CO2	Discriminate valid and invalid arguments using Mathematical logics.						
CO3	Implement the concepts of differential calculus in various problems related to AI.						
CO4	Evaluate maxima / minima of function of several variables.						
CO5	Determine area and volume of different curves and shapes using multiple integrals.						

Unit No.	Content	Contact Hours
Unit -1	**Matrices:** Scalars, Vectors, Matrices, Tensors: Notations and operations. Matrix multiplication and its role in neural networks. Linear dependency and independency of vectors, Inverse of a matrix, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian and orthogonal matrices, Characteristic equation, Cayley-Hamilton theorem, Eigenvalues and eigenvectors, Orthogonal transformation, Diagonalization of matrices, Single value decomposition (SVD) and its use in compression.	11
Unit -2	**Mathematical Reasoning:** Fundamentals of Logical reasoning in AI: Propositions, Truth tables, Logical connectives. Proof strategies and Inference: Inductive and deductive reasoning. Set theory and Symbolic abstraction: Sets, Subsets, Notation for tokens, Latent representations. Functions, Relations and Mappings: Functions as mappings in neural networks, Relations, equivalence and ordering in embedding spaces	8
Unit -3	**Calculus-I:** Limit and continuity, Derivatives and gradients in multiple dimensions, Partial derivatives and gradient vectors, Chain rule and backpropagation, Indeterminate forms and L'Hospital's rule, Linear approximation, Successive differentiation, Leibnitz's theorem.	8
Unit -4	**Calculus-II:** Extreme value of functions, Saddle point, Jacobian, Gradient fields, Hessians, Application in Artificial Intelligence.	8
Unit -5	**Calculus III:** Evaluation of definite and improper integrals, Beta and Gamma functions with their properties, Double integrals (Cartesian coordinates), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: area and volume, Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds.	10
	Total Hours	45

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year

N.P. Bali and Manish Goyal	A text book of Engineering Mathematics	9th	Laxmi Publications, Reprint, 2008	2016
Gorakh Prasad and Chandrika Prasad	Textbook of differential calculus	11th	Pothishala Pvt. Ltd, Allahabad	1968
R. K. Jain and S. R. K. Iyengar	Advanced Engineering Mathematics	5th	Narosa Publication	2019
Erwin Kreyszig	Advanced Engineering Mathematics	9th	Wiley Publications	2014
G. B. Thomas and R. L. Finney	Calculus and Analytic geometry	9th	Addison-Wesley Publishing Company	2010
B. V. Ramana	Higher Engineering Mathematics	6th	Tata McGraw Hill publications	2006
T. Veerarajan	Discrete Mathematics with Graph Theory and Combinatorics	1st	McGraw Hill Education	2017

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
B. S. Grewal	Higher Engineering Mathematics	44th	Khanna Publications, India	2022
Tom M. Apostol	Calculus-Volume 2	2nd	Wiley Publications	2022
Reena Garg	Advanced Engineering Mathematics	1st	Khanna Book Publishing Company 2021	2022
T. Veerarajan	Engineering Mathematics (for First Year)	5th	Tata McGraw-Hill, New Delhi	2008
Thomas Koshy	Discrete Mathematics with Applications	1st	Elsevier	2008

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I

Name of Department: - Computer Science and Engineering

1. Subject Code: | **TCS 102** | Course Title: | **Introduction to Python Programming** |

2. Contact Hours: **L:** 3 **T:** 0 **P:** 0

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weight: **CIE** 25 **MSE** 25 **ESE** 50

5. Credits: 3

6. Semester: I

7. Category of Course: DSC

8. Pre-requisite: Basic Knowledge of Mathematics

9.**Course Outcome:**	CO1: Learn the concepts of IT and understand the fundamentals of basic building blocks of computer science.
	CO2: Learn solution to problem by using tools like algorithm and flowcharts.
	CO3: Understand basic concepts and learn syntax of python to solve basic problems.
	CO4: Analyze and select the best possible solution for decision-based problems using decision making skills and develop the aptitude to solve iterative problems using different types of looping statements.
	CO5: Implement complex problems as a collection of sub problems by applying modularization in applications using functions.
	CO6: Apply and implement the concept arrays for providing solution to homogenous collection of data types.

Sl. No.	Contents	Contact Hours
1	**Unit 1: Fundamentals of Computer** Generation of computers, Block Diagram, Computer system memory hierarchy, Input/ Output, RAM/ ROM, Software & Hardware, understanding concept of bit and bytes, Operating System- functions and its types, Computer Networks, Internet and its services.	8
2	**Unit 2**: **Python Basics and Functions** Syntax and Semantic Basics: Identifiers, Keywords, Data types: strings and string handling, integers, floats, Variable assignments and expressions, operators, Basic input/output operations, control statements, match-case Defining and calling functions: Function parameters and return values, Lambda functions, Using built-in modules, Creating and using custom modules, recursive functions, Exception handling basics	10
3	**Unit 3: Data Handling** Lists: creation, indexing, slicing, and methods Tuples: usage and when to use Dictionaries: creating, accessing, and manipulating, sets Regular Expressions: usage and applications Reading from and writing to files: text and binary files	8
4	**Unit 4: Basics of Object-Oriented Programming** Introduction to classes and objects, Attributes and methods, Inheritance: extending classes Polymorphism: using a unified interface Encapsulation: private and public members Abstraction: why to use abstraction	10
5	**Unit 5: Libraries for AI and ML** NumPy: arrays, array operations, statistical operation, Linear algebra operation, slicing, indexing, reshaping Pandas: DataFrame operations, indexing, merging, grouping Matplotlib and Seaborn: basic plotting, figures, and axes, outliers, statistical data visualization, histograms, scatter plots, box plots. Data cleaning techniques and Exploratory data analysis (EDA), correlation	10
	Total	**46**

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I

Name of Department: - Computer Science and Engineering

1. Course Code: **TCS102**   Course Title: **Introduction to Python Programming**

2. Contact Hours: **L:** 3   **T:** 0   **P:** 0

3. Examination Duration (Hrs):   **Theory** 3   **Practical** 0

4. Relative Weight: **CIE** 25   **MSE** 25   **ESE** 50

5. Credits: 3

6. Semester: I

7. Category of Course: DSC

8. Pre-requisite: Basic knowledge of Computer.

9. **Course Outcome:**	After completion of the course the students will be able to**:**
	CO1: Learn the concepts of IT and understand the fundamentals of basic building blocks of computer science.
	CO2: Identify and describe the fundamental data types and basic operators used in Python programming.
	CO3: Explain the purpose and usage of functions in Python, including parameters, return values, and modules.
	CO4: Apply data structures like lists, tuples, and dictionaries to organize and manipulate data for engineering problems.
	CO5: Analyse the differences between object-oriented programming concepts like inheritance, polymorphism, and encapsulation, and their impact on program design.
	CO6: Evaluate and apply libraries like NumPy, Pandas, Matplotlib, and Seaborn to design Python programs for numerical computing, data analysis, cleaning, and visualization in basic engineering problems.

10. **Details of the Course:**

Sl. No.	Contents	Contact Hours
1	**Unit 1: Fundamentals of Computer** Generation of computers, Block Diagram, Computer system memory hierarchy, Input/ Output, RAM/ ROM, Software & Hardware, understanding concept of bit and bytes, Operating System- functions and its types, Computer Networks, Internet and its services.	08
2	**Unit 2: Python Basics and Functions** Syntax and Semantic Basics: Identifiers, Keywords, Data types: strings and string handling, integers, floats, Variable assignments and expressions, operators, Basic input/output operations, control statements, match-case Defining and calling functions: Function parameters and return values, Lambda functions, Using built-in modules, Creating and using custom modules, recursive functions, Exception handling basics	10
3	**Unit 3: Data Handling** Lists: creation, indexing, slicing, and methods Tuples: usage and when to use Dictionaries: creating, accessing, and manipulating, sets Regular Expressions: usage and applications Reading from and writing to files: text and binary files	08
4	**Unit 4: Basics of Object-Oriented Programming** Introduction to classes and objects, Attributes and methods, Inheritance: extending classes Polymorphism: using a unified interface	10

	Encapsulation: private and public members Abstraction: why to use abstraction	
5	**Unit 5: Libraries for AI and ML** NumPy: arrays, array operations, statistical operation, Linear algebra operation, slicing, indexing, reshaping Pandas: DataFrame operations, indexing, merging, grouping Matplotlib and Seaborn: basic plotting, figures, and axes, outliers, statistical data visualization, histograms, scatter plots, box plots. Data cleaning techniques and Exploratory data analysis (EDA), correlation.	10
	Total	**46**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Yahwant Kanetkar	Let Us Python	5th Edition	BPB, India	2023
Eric Matthes	Python Crash Course: A Hands-On, Project-Based Introduction to Programming	3rd Edition	No Starch Press, USA	2023
Mark Lutz	Learning Python	5th Edition	O'Reilly Media, USA	2013
Wes McKinney	Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython	2nd Edition	O'Reilly Media, USA	2017

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Charles H. Roth Jr., Larry L. Kinney	Fundamentals of Logic Design	7th Edition	CL Engineering, India	2015
John P Hayes	Computer Architecture and Organization	3rd Edition	McGraw Hill	2017

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER II

Name of Department: - Computer Science and Engineering

1. Course Code: **TCS202**   Course Title: **Programming in C**

2. Contact Hours: **L:** 3   **T:** 0   **P:** 0

3. Examination Duration (Hrs): **Theory** 3 **Practical** 0

4. Relative Weight: **CIE** 25   **MSE** 25   **ESE** 50

5. Credits: 3

6. Semester: II

7. Category of Course: DSC

8. Pre-requisite: Basics of Computer.

9. **Course Outcome:**	After completion of the course the students will be able to**:**
	CO1: Learn basic syntax of sequential and decision-making programming.
	CO2: Propose solution to problem by using tools like algorithm and flowcharts and select the best possible solution.
	CO3: Develop the aptitude to solve iterative problems and providing solution to homogenous collection of data types using arrays.
	CO4: Apply concepts of strings and multidimensional array through functions implementing the concept of modularization.
	CO5: Implement the concept of pointers and structures to optimize memory and solve problems based on heterogeneous data respectively.
	CO6: Implement the concepts of file handling to develop applications on real life problems.

10.   **Details of the Course:**

Sl. No.	Contents	Contact Hours
1	**Unit 1:** Algorithms and Flow-charts. Fundamental of 'C'**:** Basic input/output functions, Tokens and operators. Life of a C program.	7

	Conditional statements: if statement, if-else statement, nested if, else-if ladder, switch statement. **Loops:** 'for' loops, 'while' loops, 'do while' loops, break and continue, nested loops.		
2	**Unit 2**: **Function:** Function declaration, definition and calling, call by value, actual and formal parameters, Activation Record, Function call stack, Recursion v/s Iteration, Storage classes: Automatic, Static, Register, External.	8	
3	**Unit 3:** **Arrays:** One-dimensional arrays, declaration, compile time and run time initialization, computing address of an element in array, Searching and Sorting, passing arrays to functions. Multi-Dimensional Arrays- row major and column major form of an array. **Strings** – Declaration of strings, Initialization of string, standard library functions of string, strings and function.	12	
4	**Unit 4:** **Pointers** –Basic of pointers and addresses, Types of pointers, , Pointer arithmetic, call by reference, arrays and strings using pointers, Dynamic memory management in C - malloc(), calloc(), realloc(), free(), memory leak. **Structures** - Structure initialization, accessing structure members, array of structures, structure within structure, structure and function, union, typedef, pointer to structure, self-referential structure, Bit field.	10	
5	**Unit 5:** **File Handling** - Opening or creating a file, closing a file, file modes, Reading and writing files using different file handling functions. Random file access functions: fseek(), ftell() and rewind().	8	
	Total	**45**	

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Peter Prinz, Tony Crawford	C in a Nutshell	2nd Edition	O'Reilly Publishers, USA	2015
Yashwant Kanetkar	Let Us C	18th Edition	BPB Publication, India	2023

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Steve Oualline	Practical C Programming	3rd Edition	O'Reilly Publishers, USA	2011
Brian W Kernighan, Dennis M Ritcie	The C Programming Language	2nd Edition	Prentice Hall, India	2008
E. Balagurusamy	Programming in ANSI C	11th Edition	McGraw Hill Education, American	2022

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER II

Name of Department: - Computer Science and Engineering

1. Course Code: **TCS203**   Course Title: **Fundamentals of AI and ML**

2. Contact Hours: **L:** 3   **T:** 0   **P:** 0

3. Examination Duration (Hrs): **Theory** 3   **Practical** 0

4. Relative Weight: **CIE** 25   **MSE** 25   **ESE** 50

5. Credits: 3

6. Semester: II

7. Category of Course: DSC

8. Pre-requisite: Introduction to Python Programming (TCS102)

9. **Course Outcome:**	After completion of the course the students will be able to**:**
	CO1: Define Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning, and differentiate between them.
	CO2: Explain problem-solving frameworks in AI and describe search strategies like breadth-first, depth-first, and A*.
	CO3: Choose appropriate classification techniques like Logistic Regression, KNN, or SVM based on specific data characteristics.
	CO4: Compare and contrast different performance metrics like accuracy, precision, recall, and F1-score for evaluating ML models.
	CO5: Evaluate the strengths and limitations of specific unsupervised learning techniques like K-means and hierarchical clustering for a given task.
	CO6: Design a simple machine learning pipeline involving data pre-processing, model selection, and evaluation for a classification task.

10.   **Details of the Course:**

SI. No.	Contents	Contact Hours

1	**Unit 1:**	9
	Overview of AI and Intelligent Agents: Definition and history of AI, Differences between AI, ML, and deep learning, Applications and impact of AI in various sectors, Agents and environments, Types of agents (simple reflex, model-based, goal-based, utility-based), Agent architecture and environments **Problem Solving:** Problem-solving frameworks, Search strategies: breadth-first, depth-first, A* Heuristics: designing and applying heuristics	
2	**Unit 2**: **Knowledge and Reasoning:** Knowledge-based AI, Logic and Reasoning: propositional and predicate logic, Inference in first-order logic, Building knowledge bases. **Uncertainty Handling:** Probabilities and Bayesian networks, Decision making: Expected utility- Markov decision processes.	9
3	**Unit 3:** **Introduction to ML and Data Preprocessing:** What is Machine Learning? Types of Machine Learning: Supervised, Unsupervised, Reinforcement- ML in practice: Applications and case studies, Importance of data preprocessing, Data cleaning, normalization, and transformation, Feature selection, and dimensionality reduction. **Regression Analysis:** Linear regression, Polynomial regression, Regularization methods: Ridge, Lasso, Bias, Variance, Bias-Variance Trade-off.	10
4	**Unit 4:** **Classification Techniques:** Logistic regression, K-nearest neighbors (KNN), Support vector machines (SVM) **Decision Trees and Random Forests:** Building decision trees, Overfitting and pruning, Ensemble methods: Bagging and boosting.	10

5	**Unit 5:** **Evaluation of ML Models and Clustering and Association:** Training and testing data splits, Performance metrics: accuracy, precision, recall, F1-score, Confusion matrix and ROC curves, K-means clustering, Hierarchical clustering, Apriori algorithm for association rule learning.	10
	Total	**48**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach	4th Edition	Pearson Education Limited, USA	2024
Melanie Mitchell	Introduction to Artificial Intelligence	2nd Edition	McGraw-Hill Education, USA	2024
Tom M. Mitchell,	Machine Learning	1st Edition	Mc Graw Hill Publisher	2017
Manaranjan Pradhan, U Dinesh Kumar	Machine Learning using Python	1st Edition	Wiley, India	2017

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Richard E. Neapolitan and Kevin Goda	Artificial Intelligence: Foundations and Applications	4th Edition	Elsevier Science & Technology, Netherlands	2024
Aurélien Géron	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	2nd Edition	O'Reilly Media Inc., USA	2024
E. Alpaydin	Introduction to Machine Learning	3rd Edition	PHI Publisher	2015

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I

Name of Department: - Computer Science and Engineering

1. Course Code: | **TMA102** | Course Title: | **Mathematics for AI - I**

2. Contact Hours: **L:** 2 **T:** 1 **P:** 0

3. Examination Duration (Hrs): **Theory** 3 **Practical** 0

4. Relative Weight: **CIE** 25 **MSE** 25 **ESE** 50

5. Credits: 3

6. Semester: I

7. Category of Course: DSC

8. Pre-requisite: Basic Knowledge of Mathematics

9. **Course Outcome:**	After completion of the course the students will be able to**:** CO1: Analyze the concept of matrices and its application. CO2: Discriminate valid and invalid arguments using Mathematical logics. CO3: Apply mathematical reasoning to solve problems related to matrices, eigenvalues, eigenvectors, and transformations in AI contexts. CO4: Implement the concepts of differential calculus in various problems related to AI. CO5: Evaluate maxima / minima of function of several variables. CO6: Determine area and volume of different curves and shapes using multiple integrals.

10. **Details of the Course:**

SI. No.	Contents	Contact Hours
1	**Unit 1:** **Matrices:** Scalars, Vectors, Matrices, Tensors: Notations and operations. Matrix multiplication and its role in neural networks. Linear dependency and independency of vectors, Inverse of a matrix, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian and orthogonal	11

	matrices, Characteristic equation, Cayley-Hamilton theorem, Eigenvalues and eigenvectors, Orthogonal transformation, Diagonalization of matrices, Single value decomposition (SVD) and its use in compression.	
2	**Unit 2**: **Mathematical Reasoning:** Fundamentals of Logical reasoning in AI: Propositions, Truth tables, Logical connectives. Proof strategies and Inference: Inductive and deductive reasoning. Set theory and Symbolic abstraction: Sets, Subsets, Notation for tokens, Latent representations. Functions, Relations and Mappings: Functions as mappings in neural networks, Relations, equivalence and ordering in embedding spaces.	8
3	**Unit 3:** **Calculus-I:** Limit and continuity, Derivatives and gradients in multiple dimensions, Partial derivatives and gradient vectors, Chain rule and backpropagation, Indeterminate forms and L'Hospital's rule, Linear approximation, Successive differentiation, Leibnitz's theorem.	8
4	**Unit 4:** **Calculus-II:** Extreme value of functions, Saddle point, Jacobian, Gradient fields, Hessians, Application in Artificial Intelligence.	8
5	**Unit 5:** **Calculus III:** Evaluation of definite and improper integrals, Beta and Gamma functions with their properties, Double integrals (Cartesian coordinates), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: area and volume, Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds.	10
	Total	**45**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
N.P. Bali and Manish Goyal	A text book of Engineering Mathematics	9th Edition	Laxmi Publications, Reprint, 2008	2016

Gorakh Prasad and Chandrika Prasad	Textbook of differential calculus	11th Edition	Pothishala Pvt. Ltd, Allahabad	1968
R. K. Jain and S. R. K. Iyengar	Advanced Engineering Mathematics	5th Edition	Narosa Publication	2019
Erwin Kreyszig	Advanced Engineering Mathematics	9th Edition	Wiley Publications	2014
G. B. Thomas and R. L. Finney	Calculus and Analytic geometry	9th Edition	Addison-Wesley Publishing Company	2010
B. V. Ramana	Higher Engineering Mathematics	6th Edition	Tata McGraw Hill publications	2006
T. Veerarajan	Discrete Mathematics with Graph Theory and Combinatorics	1st Edition	McGraw Hill Education	2017

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
B. S. Grewal	Higher Engineering Mathematics	44th Edition	Khanna Publications, India	2022
Tom M. Apostol	Calculus-Volume 2	2nd Edition	Wiley Publications	2022
Reena Garg	Advanced Engineering Mathematics	1st Edition	Khanna Book Publishing Company 2021	2022
T. Veerarajan	Engineering Mathematics (for First Year)	5th Edition	Tata McGraw-Hill, New Delhi	2008
Thomas Koshy	Discrete Mathematics with Applications	1st Edition	Elsevier	2008

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER II

Name of Department: - Computer Science and Engineering

1. Course Code: **TMA203**   Course Title: **Mathematics for AI - II**

2. Contact Hours: **L:** 2   **T**: 1   **P**: 0

3. Examination Duration (Hrs): **Theory** 3 **Practical** 0

4. Relative Weight: **CIE** 25 **MSE** 25 **ESE** 50

5. Credits: 3

6. Semester: II

7. Category of Course: DSC

8. Pre-requisite: Basic Knowledge of Mathematics

9. **Course Outcome:**	After completion of the course the students will be able to**:**
	CO1: Solve first order ordinary differential equations related to different Engineering problems.
	CO2: Implement the various methods for solving higher order ordinary differential equations.
	CO3: Analyze the first order partial differential equations and its applications.
	CO4: Classify the second order partial differential equations.
	CO5: Identify the significance of vector spaces.
	CO6: Apply concepts of vector spaces, linear transformations, and orthogonalization techniques to solve problems related to partial differential equations.

10. **Details of the Course:**

SI. No.	Contents	Contact Hours

1	**Unit 1:** **Ordinary differential equations I:** Ordinary differential equation of first order: Exact, Equations reducible to exact equations, linear and Bernoulli's equations, Equations of first order but not of first degree:	8
	equations solvable for p, equations solvable for y and equations solvable for x, Clairaut's type.	
2	**Unit 2**: **Ordinary differential equations II:** Linear differential equations of nth order with constant coefficients, Cauchy-Euler differential equation, Second order linear differential equations with variable coefficients, Equation whose one solution of complementary function is known, Normal form, Solution of linear differential equations by changing the independent variables, Method of variation of parameters and applications of ODE in Artificial Intelligence.	10
3	**Unit 3:** **Partial Differential Equations I:** Introduction to PDE, Formation of PDE, solution first order PDE, Lagrange's, Charpit's, Monge's method, standard form of first order PDE.	8
4	**Unit 4:** **Partial Differential Equations II:**Solution of linear partial differential equations with constant coefficients of second order and their classifications: parabolic, Hyperbolic and elliptic, Method of separation of variables for solving partial differential equations.	10
5	**Unit 5:** **Vector Space:** Vector space, basis Dimension, Subspace of vector space, Orthogonality, Projections, Linear transformation, rank and nullity theorem, Inverse of linear transformation, Inner product space, orthogonality, projection, Gram-Schmidt orthogonalization and QR decomposition.	9
	Total	**45**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Erwin Kreyszig	Advanced Engineering Mathematics	9th Edition	Wiley India	2014
B. S. Grewal	Higher Engineering Mathematics	44th Edition	Khanna Publications	2022
S. L. Ross	Differential Equations, Ed.	3rd Edition	Wiley India	1984

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Reena Garg	Advanced Engineering Mathematics	1st Edition	Khanna Book Publishing Company	2022
Tom M. Apostol	'Calculus' Volume 2	2nd Edition	Wiley Publications	2022
T. Veerarajan	Engineering Mathematics for first year	5th Edition	Tata McGraw-Hill, New Delhi, 2008	2008
E. A. Coddington	An Introduction to Ordinary Differential Equations	1st Edition	Prentice Hall India	1995
E. L. Ince	Ordinary Differential Equations	1st Edition	Dover Publications	1958
R. K. Jain and S. R. K. Iyengar	Advanced Engineering Mathematics	5th Edition	Narosa Publication	2009

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I

Name of Department: - Computer Science and Engineering

1. Subject Code: | **PCS151** | Course Title: | **Computer Lab- I** |

2. Contact Hours: **L:** | 0 | **T:** | 0 | **P:** | 4 |

3. Examination Duration (Hrs): **Theory** | 0 | **Practical** | 2 |

4. Relative Weight: **CIE** | 25 | **MSE** | 25 | **ESE** | 50 |

5. Credits: | 2 |

6. Semester: | I |

7. Category of Course: | DSC |

8. Pre-requisite: Basic Knowledge of Computer.

9. **Course Outcome:**	After completion of the course, the students will be able to**:**
	CO1: Learn and apply the simple (IPO based) programs using input/output function and basic syntax of C language.
	CO2: Process different categories of operators combined with decision making statements and to solve multiple choice-based problems.
	CO3: Apply and implement the concept arrays for providing solution to homogenous collection of data types.
	CO4: Propose solution to problem by modularizing it into small units using function.

10. **Details of the Course:**

Sl. No.	List of problems for which students should develop programs and execute in the Laboratory	Contact Hours
1.	Write a Program to print Hello World using C. Sample Output: Hello World!	2
2.	Write a Program to find sum of two numbers without using scanf() function. Sample Output: Sum of 5.000000 and 6.000000 is: 11.000000	2

3.	Write a Program to compute Net salary on the basis of given data.
	 Sample Input:
	    Enter the Basic Salary of Employ:
	    20000
	    Sample Output:
		2

	HRA is: 2000.000000 TA is: 1000.000000 DA is: 3000.000000 Employ Net Salary is 26000.000000	

4.	Write a Program to convert temperature form Fahrenheit to Celsius.
	
	Sample Input:
	   Enter the Temperature in Fahrenheit
	   97
	   Sample Output:
	   Temperature in Celsius is: 36.111111
		2

5.	Write a Program to find roots of quadratic equation.
	
	Sample Input:
	   Enter coefficients a, b and c:
	   4
	   1
	   0
	Sample Output:
	   Roots are real numbers.....
	   Roots are: 0.00 and -0.25
		2

6.	Write a Program to swap two numbers using third variable.
	
	Sample Input:
	   Enter First Number:
	   10
	   Enter second number:
	   20
	Sample Output:
	   Before swapping first number is 10.000000 and second number is 20.000000
	   After swapping first number is 20.000000 and second number is 10.000000
		2

7.	Write a Program to swap two numbers without using third variable
	
	Sample Input:
	   Enter First Number:
	   10
	   Enter second number:
	   20
	Sample Output:
	   Before swapping first number is 10.000000 and second number is 20.000000
	   After swapping first number is 20.000000 and second number is 10.000000
		2

8.	Write a Program to find whether a number is even or odd. Sample Input:	2

	Enter a number5 Sample Output: Number entered is odd	

9.	Write a Program to find largest of three number and display numbers in ascending order
	
	Sample Input:
	
	  Enter the three numbers: 6 4 9
	
	Sample Output:
	   Numbers in Ascending order is
	   4
	   6
	   9
		2

10.	Write a Program to find whether a given character is vowel or consonant.
	
	Sample Input:
	
	   Enter a character: t
	Sample Output:
	   Entered Character is a consonant
		2

11.	Write a Program to calculate SI if principal amount is less than 10000 else CI.
	
	Sample Input:
	   Enter the principal, rate & time
	   1000
	   3
	   4
	Sample Output:
	   Compound Interest Rs10000.000000
		2

12.	Write a Program to input a character and find whether it is number, alphabet or special symbol.
	
	Sample Input:
	
	   Enter a character: A
	
	Sample Output:
	
	   Entered Character is an alphabet
	
	Sample Input:
	   Enter a character:
	Sample Output:
	   Entered Character is a special symbol
		2

13.	Write a Program to find sum and average of ten numbers using for, while and do-while loop.	2

	Sample Input:
	   Enter 1 element:12
	   Enter 1 element:34
	   Enter 1 element:12
	   Enter 1 element:5
	   Enter 1 element:4
	   Enter 1 element:6
	   Enter 1 element:7
	   Enter 1 element:8
	   Enter 1 element:3
	   Enter 1 element:1
	
	Sample Output:
	   Sum of the 10 given elements is= 92.00
	   Average of given 10 elements is= 9.20	

14.	Write a Program to find sum of digits of number.
	
	Sample Input:
	
	   Enter a number:1234
	
	Sample Output:
	   Sum of digits of given number is=10
		2

15.	Write a Program to find whether a given number is prime or not.
	
	Sample Input:
	
	   Enter a number:12
	
	Sample Output:
	
	   The entered number is not prime
		2

16.	Write a Program to print Fibonacci Series upto N Terms.
	
	Sample Input:
	
	   Enter the limit of Fibonacci series5
	Sample Output:
	   0 1 1 2 3 5 8
		2

17.	Write a Program to find whether a number is Armstrong number or not.
	
	Sample Input:
	
	   Enter a number=153
	
	Sample Output:
	   The given number is Armstrong
	Sample Input:
	   Enter a number=567
	Sample Output:
		2

	Not Armstrong	

18.	Write a Program to find whether a number is palindrome number or not.
	
	Sample Input:
	    Enter a number=151
	
	Sample Output:
	    The given number is palindrome
		2

19.	Write a Program to print the given pattern:
	
	1)
	
	    1
	    0 1
	    1 0 1
	    0 1 0 1
	    1 0 1 0 1
	
	2)
	
	    A
	    B C
	    D E F
	    G H I J
	
	Sample Input:
	    Enter value of n to generate pattern
	    3
	Sample Output:
	    Pattern of digit 1 and 0
	    1
	    0 1
	    1 0 1
	    Pattern of alphabet
	    A
	    B C
	    D E F
		2

20.	Write a Program to find the sum of given series:
	
	a) $1^2+2^2+3^2+$.......................... upto n terms
	b) $1^2-2^2+3^2-4^2$ ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯upto n terms
	Sample Input:
	Enter value of 'n' to calculate sum of series upto n terms
	    3
	Sample Output:
	    sum of series upto 3 terms = 14
	Sample Input:
	    Enter value of 'n' to calculate sum of series upto n terms
		2

	4 Sample Output: Sum of series upto 4 terms = -10	

21.	Write a Program to find the sum of two numbers using function.
	
	Sample Input:
	   Enter first number: 3
	   Enter second number: 5
	Sample Output:
	   Sum of the entered numbers: 8
		2

22.	Write a Program to return reverse of a number.
	
	Sample Input:
	
	   Enter the number to reverse:342
	
	Sample Output:
	   Reverse of 342 is = 243
		2

23.	Write a Program to find the X^Y using recursion.
	
	Sample Input:
	   Enter base number:4
	   Enter power number (positive integer):2
	Sample Output:
	   4^2=16
		2

24.	Write a Program to find the sum of natural numbers using function
	
	Sample Input:
	   Enter a positive integer: 5
	Sample Output:
	   Sum=15
		2

25.	Write a Program to find the sum and average of array elements
	
	Sample Input:
	   Enter the numbers of elements: 230
	   Error! number should in range of (1 to 100).
	   Enter the number again:3
	   1. Enter number:2
	   2. Enter number:5
	   3. Enter number:6
	Sample Output:
	   Sum=14.00 Average=4.66
		2

26.	Write a Program to sort an array.
	
	Sample Input:
	   Enter the value of N 5
	   Enter the numbers34
	   -78
	   8
		2

	40
	-6
	Sample Output:
	   The numbers arranged in ascending order are given below
	  -78 -6 8 34 40	

27.	Write a Program to input N integers in an array and pass array for min and max functions which will return min and max values.
	Sample Input:
	   Input the number of elements to be stored in the array :4
	   element – 1:34
	   element – 2:-4
	   element – 3:6
	   element – 4:-34
	Sample Output:
	   Maximum element is : 34
	    Minimum element is :-34
		2

	Total	**54**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Peter Prinz, Tony Crawford	C in a Nutshell	2nd Edition	O,Reilly Publishers, USA	2015
Peter Norton	Introduction to computers	6th Edition	TMH Publication, India	2009
E.Balagurusamy	Programming in ANSI C	11th Edition	McGraw Hill Education, American	2022

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Steve Oualline	Practical C programming	3rd Edition	O,Reilly Publishers, USA	2011
Brian W. Kernighan, Dennis M Ritcie	The C Programming Language	2nd Edition	Prentice Hall, India	2008
Yashwant Kanetkar	Let Us C	18th Edition	BPB Publication, India	2023

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER I

Name of Department: - Computer Science and Engineering

1. Subject Code: **PCS152**   Course Title: **Python Programming Lab**

2. Contact Hours: **L:** 0   **T:** 0   **P:** 4

3. Examination Duration (Hrs): **Theory** 0   **Practical** 2

4. Relative Weight: **CIE** 25   **MSE** 25   **ESE** 50

5. Credits: 2

6. Semester: I

7. Category of Course: DSC

8. Pre-requisite: Basic Knowledge of Computer

9. **Course Outcome:**	After completion of the course, the students will be able to**:** CO1: Apply Python syntax, semantics, functions, exception handling, and modules to solve computational problems, along with data structures, file handling, and regex operations. CO2: Implement object-oriented programming principles (inheritance, polymorphism, encapsulation, abstraction) and develop modular programs using Python. CO3: Utilize Python libraries (NumPy, Pandas) for data manipulation, transformation, statistical analysis, and visualization using Matplotlib/Seaborn. CO4: Integrate Python programming skills to design and implement solutions for real-world applications in domains such as healthcare, finance, and data-driven decision-making.

10. **Details of the Course:**

Sl. No.	List of problems for which students should develop programs and execute in the Laboratory	Contact Hours

1.	Design, Develop and Implement a menu driven Program in Python to perform the following tasks
	
	    a. Read three numbers and print largest of it
	    b. Read a number and print sum of its digit
	    c. Read a number and print reverse a number (without using built in function)
	
	Support the program with appropriate functions for each of the above tasks
		2

2.	A university portal allows students to check their **CGPA**. The system takes total marks and total credits as input. • If the user enters text instead of numbers, the program should handle it. • If credits entered are 0, handle division by zero. Finally, display the CGPA rounded to 2 decimals.	2
3.	Design a **custom Python module named math_utils** that contains the following functions: • is_prime(n): Check if a number is prime. • factorial(n): Compute the factorial of a number using recursion. • convert_to_binary(n): Convert a number into its binary representation. Then, in your **main program**, • Import this module. • Take a number as input from the user. • Use functions from your module to **check if the number is prime**, **find its factorial**, and **display its binary representation**. Also, handle exceptions if the user enters invalid (non-integer or negative) values.	2

4.	A **restaurant billing system** displays a menu with items and prices. Develop a program that should: I. Show food items with prices.	2
	II. Take the user's order (multiple items). III. Calculate the total bill. IV. Apply a 10% discount if the bill is above ₹500. V. Exit option to close billing. • Use **functions** for add_to_order, calculate_total, apply_discount. • Use **match-case** for menu selection. Handle invalid inputs using exceptions.	
5.	Create a **custom module** shopping_utils.py with functions: I. add_item(cart, item, price) → adds item (dictionary: {"item": price}) to the shopping cart (list). II. remove_item(cart, item) → removes item if present, else raise a custom exception. III. unique_items(cart) → returns all **unique items** using a **set**. IV. bill_summary(cart) → returns a **tuple** containing (total_items, total_cost). In the **main program**, import the module and: • Build a shopping cart interactively. Use exception handling when removing unavailable items.	2

6.	Design, Develop and Implement a menu driven Program in Python for the following operations on File
	
	    a. Read
	    b. Write
	    c. Append
	    d. Delete
	    e. Exit
		2

	Support the program with appropriate functions for each of the above errors.	

7.	Design, Develop and Implement a menu driven Program in Python for the following set operations
	
	    a. Union()
	    b. Intersection()
	    c. Difference()
	    d. Symmetric_Difference()
	Support the program with appropriate functions for each of the above operation
		2

8.	Design, Develop and Implement a menu driven Program in Python for the following
	
	    i. Add a new contact (Name, Phone Number, Email).
	
	        a. Store contacts in a **dictionary** ({name: (phone, email)}).
	
	        b. Validate phone number (10 digits) and email using **regex**.
	
	    ii. View all contacts.
	
	    iii. Search contact by name.
	
	    iv. Delete a contact.
	
	    v. Save all contacts to a **text file** (phonebook.txt) and load back when program starts.
	
	    vi. Exit.
	
	Use exception handling for graceful handling of errors.
		2

9.	Develop a Python program to manage student records where each student has: • Roll number, name, and marks in 3 subjects. • Store student data in a **list of dictionaries**.	2

	• Allow the user to:
	
	    a. Add a new student.
	
	    b. Search for a student by roll number.
	
	    c. Display the student with the highest average.
	
	• Save the records into a **text file** and load them back when the program starts.
	
	Use exception handling for invalid inputs.	

10.	You are given a **server log file** that contains lines like: [2025-08-16 10:25] ERROR: Connection failed for user admin [2025-08-16 10:30] INFO: User guest logged in [2025-08-16 10:35] ERROR: Disk full for user root Design a program to: a) Extract all **unique usernames** using **regular expressions**. b) Count how many times each type of log level (INFO, ERROR, WARNING) appears. Store the summary in a new file called log_summary.txt.	2
11.	Design a Book class with attributes title, author, and is_available. Implement methods to issue and return a book. Create objects for at least 3 books and demonstrate their usage.	2
12.	Create a base class Vehicle with attributes brand and model. Extend it into Car (extra attribute: doors) and Bike (extra attribute: engine_capacity). Implement methods to display full details of each.*Design a menu-driven program* that allows the user to choose from a set of string operations (e.g., palindrome check, anagram test, word count), each implemented in a separate function within a custom module.	2

13.	Develop a payment system program to demonstrate **method overloading** and **method overriding**:
	
	    a. Create a base class Payment with a method make_payment(amount).
	
	    b. Implement **method overloading** in the Payment class by allowing make_payment to accept either one argument (amount) or two arguments (amount, currency).
	
	    c. Create two subclasses CreditCardPayment and PayPalPayment that **override** the make_payment(amount) method to provide their own implementations.
	
	Demonstrate both **overloading** (different parameter lists in the same class) and **overriding** (redefining the method in subclasses) by processing payments through different objects.
		2

14.	Create a BankAccount class with private attribute __balance. Implement public methods to deposit(amount), withdraw(amount), and check_balance(). Demonstrate encapsulation by performing valid and invalid operations.	2
15.	Define an abstract base class DeliveryService with abstract methods calculate_charges(weight) and track_package(id). Create two subclasses DHL and FedEx implementing these methods. Demonstrate abstraction by calling methods using base class reference.	2
16.	A fitness app records the daily step counts of a user for 30 days in a NumPy 1D array. a) Calculate the average, minimum, and maximum step count. b) Find the number of days the user achieved more than 10,000 steps.	2
	c) Identify the day (index) with the highest step count.	

17.	You are given a dataset of employees with columns: EmployeeID, Department, Salary, and JoiningDate. Write Pandas code to: a) Find the average salary of employees in each department. b) Display employees who joined after **2020-01-01**. c) Merge this DataFrame with another DataFrame containing EmployeeID and PerformanceScore.	2
18.	A health dataset contains columns: Age, Cholesterol_Level, and Heart_Disease (Yes/No). Plot the following: a) A **histogram** of cholesterol levels. b) A **scatter plot** of Age vs. Cholesterol, with color indicating heart disease presence. c) A **box plot** of cholesterol levels grouped by heart disease.	2
19.	You are working with a customer dataset containing CustomerID, Age, AnnualIncome, and SpendingScore. Some values are missing or duplicated. Write steps to: a) Handle missing values (mean imputation for Age, drop rows with missing CustomerID). b) Remove duplicate rows. c) Perform **correlation analysis** between AnnualIncome and SpendingScore and interpret the result.	2
20.	A retail company provides transaction data with columns: TransactionID, CustomerID, PurchaseAmount, PurchaseDate, PaymentMethod. a) Load the dataset into Pandas and check for null values. b) Using NumPy/Pandas, calculate the **total purchase per customer**. c) Group purchases by PaymentMethod and display the total and average purchase amounts. d) Plot a bar chart showing the **number of transactions**	2

	per payment method. e) Perform EDA to check if there is any correlation between PurchaseAmount and PaymentMethod.	
	Total	**40**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Yahwant Kanetkar	Let Us Python	5th Edition	BPB, India	2023
Eric Matthes	Python Crash Course: A Hands-On, Project-Based Introduction to Programming	3rd Edition	No Starch Press, USA	2023
Mark Lutz	Learning Python	5th Edition	O'Reilly Media, USA	2013
Wes McKinney	Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython	2nd Edition	O'Reilly Media, USA	2017

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Joel Grus	Data Science from Scratch: First Principles with Python	2nd Edition	O'Reilly Media, USA	2019
Al Sweigart	Automate the Boring Stuff with Python: Practical Programming for Total Beginners	2nd Edition	No Starch Press, USA	2019

UNIVERSITY), DEHRADUN

SEMESTER II

Name of Department: - Computer Science and Engineering

1. Subject Code: | **PCS251** | Course Title: | **Computer Lab- II** |

2. Contact Hours: **L:** | **0** | **T**: | **0** | **P**: | **4** |

3. Examination Duration (Hrs): **Theory** | **0** | **Practical** | **2** |

4. Relative Weight: **CIE** | **25** | **MSE** | **25** | **ESE** | **50** |

5. Credits: | **2** |

6. Semester: | **II** |

7. Category of Course: | **DSC** |

8. Pre-requisite: Computer Lab- I (PCS151).

9. **Course Outcome:**	After completion of the course, the students will be able to**:** CO1: Learn and apply concept of strings for providing solution to problems. CO2: Apply the concept of pointers to optimize memory management by DMA overcoming the limitation of array. CO3: Implement structure and file handling for storage, retrieval and manipulation of records. CO4: Apply and implement solutions to complex problems using python language.

10. **Details of the Course:**

Sl. No.	List of problems for which students should develop programs and execute in the Laboratory	Contact Hours
1.	Write a Program to Find Sum & Average of Elements in mxn Matrix. Input: 　　Enter row and column size: 　　3 3 　　Enter matrix elements: 　　a[0][0]=2 　　a[0][1]=4 　　a[0][2]=5 　　a[1][0]=1 　　a[1][1]=3 　　a[1][2]=6 　　a[2][0]=9 　　a[2][1]=7 　　a[2][2]=8 Output:	2

	Sum=45.000000 Average=5.000000	

2.	Write a Program input square matrix and print its transpose.
	
	Input:
	    Enter the size of the square matrix:3
	    Enter elements of the matrix:
	    1 2 3
	    4 5 6
	    7 8 9
	Output:
	    Transpose of the matrix:
	    1 4 7
	    2 5 8
	    3 6 9
		2

3.	Write a Program to input mxn matrix and print that it is lower triangular matrix or not.
	
	Input:
	    Enter the Number of Rows:3
	    Enter the Number of Columns:3
	    Enter the Elements in the Matrix:
	    1 2 3
	    0 4 5
	    0 0 6
	Output:
	    Not the Lower Triangular Matrix
		2

4.	Write a Program to two 2D array and find their sum.
	
	Input:
	    Enter elements of 1st matrix:
	    1 2
	    3 4
	    Enter elements of 2nd matrix:
	    5 6
	    7 8
	    Output:
	
	    Sum of the matrices:
	
	    6 8
	
	    10 12
		2

5.	Write a Program to show the use of different string library functions.
	
	Input
	    Enter first string:
	    Hello
	    Enter second string:
	    World
	Output:
		2

	Concatenated String: HelloWorld Length: 10 Comparison Result: -15	

6.	Write a Program to calculate the length of the string.
	
	Input:
	    Enter a string:
	    Hello
	Output:
	    Length = 5
		2

7.	Write a Program to insert a sub-string in a given main string from a given position.
	
	Input:
	    Enter a string
	    Comer
	    Enter sub string
	    Put
	Output:
	    Enter position for insertion:3
	    String after Insertion is: Computer
		2

8.	Write a Program to delete n characters from the string from a given position.
	
	Input:
	    Enter a string=Jayapal
	    Enter position for deletion=4
	    Enter number of characters to be deleted=2
	Output:
	    String after Deletion is: Jayal
		2

9.	Write a Program to count the number of lines, words and characters in a given text.
	
	Input:
	    Ramu is a good boy.
	
	Output:
	    Number of lines =1
	    Number of words =5
	    Number of characters =18
		2

10.	Write a Program to find the length of the string using Pointer.
	
	Input:
	    Enter any String: Pritesh
	Output:
	    The Length of the given string Pritesh is: 7
		2

11.	Write a Program to Display array elements using calloc( ) function.	2

	Input:
	    Number of elements to be entered:3
	    Enter 3 numbers:
	    2
	    5
	    14
	Output:
	    The sum: 21	

12.	Write a Program to swap two numbers using call by reference.
	
	Input:
	    10
	    20
	Output:
	    Before swapping: x = 10, y = 20
	    After swapping: x = 20, y = 10
		2

13.	Write a Program to find maximum element of an array using pointer.
	
	Input:
	    Enter n: 5
	    Enter 5 elements:
	    15 22 9 31 5
	Output:
	    The maximum element in the array is: 31
		2

14.	Write a Program to Calculate Total and Percentage marks of a student using structure.
	
	Input:
	    Enter RollNo., Name and three sub marks
	    12 Rama 30 40 50
	Output:
	    Rollno.=12
	    Name=Rama
	    m1=30
	    m2=40
	    m3=50
	    total=120
	    per=40.000000
		2

15.	Write a Program that uses functions to perform the different operation on complex numbers using structure
	
	Sample Input/Output:
	    …….
	    Menu for Complex Number Operations
	    ……
	    1. Addition
	    2. Subtraction
	    3. Multiplication
	    4. Division
	    5. Exit
		2

	Enter your choice: 1 Enter first complex number: Enter real part of complex number: 4 Enter imaginary part of complex number: 3 Enter second complex number: Enter real part of complex number: 2 Enter imaginary part of complex number: 5 Result: 6.00 + i8.00 …… Menu for Complex Number Operations …… 1. Addition 2. Subtraction 3. Multiplication 4. Division 5. Exit Enter your choice: 5 Exiting program...	

16.	Write a Program to display contents of a file.
	
	Input:
	    Enter the file name: sample.txt
	Output:
	    this is my first program
		2

17.	Write a Program to copy the contents of one file to another.
	
	Input:
	    a.txt
	    An array is a collection of elements of similar datatypes
	Output:
	    57 bytes copied from 'a.txt' to 'b.txt'
	    2 files closed
		2

18.	Write a Program to merge two files into a third file
	
	Input:
	    Program to merge two files.
	    Enter first file name: file1.txt
	    Enter second file name: file2.txt
	    Enter destination file name: merged.txt
	Output:
	    File merging successful.
	    Hello, this is file one.
	    This is file two.
		2

19.	Write a Program to perform different Arithmetic Operations on numbers in Python.
	
	Input:
	    15
	    4
	Output:
		2

	x + y = 19 x - y = 11 x * y = 60 x / y = 3.75 x // y = 3 x ** y = 50625	

20.	Write a Program to perform to calculate simple interest in Python
	
	Input:
	    Enter the principal amount: 1000
	    Enter the rate of interest: 5
	    Enter the time (in years): 2
	Output:
	    Simple Interest is: 100.0
		2

21.	Write a Program to find largest of three numbers in Python
	
	Input:
	    Enter first number: 45
	    Enter second number: 67
	    Enter third number: 23
	Output:
	    The largest number is: 67.0
		2

22.	Write a Program to print numbers from 0-9 in Python
	
	Output
	    <class 'range'>
	    range(0, 10)
	    0
	    1
	    2
	    3
	    4
	    5
	    6
	    7
	    8
	    9
		2

23.	Write a Program to check the number is palindrome or not in Python
	
	Input:
	    Enter a number: 121
	Output:
	    The number is a palindrome.
		2

24.	Write a Program to swap two numbers in Python
	
	Input:
	    10
	    20
	Output:
		2

	Before swapping: x = 10 , y = 20 After swapping: x = 20 , y = 10	
25.	Write a Program to copy contents of one file into another file in Python. Input: 　　Enter the name of the source file: source.txt 　　Enter the name of the destination file: copy.txt Output: 　　File copied successfully!	2
	Total	**50**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Peter Prinz, Tony Crawford	C in a Nutshell	2nd Edition	O,Reilly Publishers,USA	2015
Peter Norton	Introduction to computers	6th Edition	TMH Publication, India	2009
E. Balagurusamy	Programming in ANSI C	11th Edition	McGraw Hill Education, American	2022

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Steve Oualline	Practical C programming	3rd Edition	O,Reilly Publishers,USA	2011
Brian W Kernighan, Dennis M Ritcie	The C Programming Language	2nd Edition	Prentice Hall, India	2008
Yashwant Kanetkar	Let Us C	18th Edition	BPB Publication, India	2023

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER II

Name of Department: - Computer Science and Engineering

1.　Subject Code:　**PCS253**　Course Title:　**AI and ML Lab using Python**

2.　Contact Hours:　**L:** 0　**T:** 0　**P:** 2

3.　Examination Duration (Hrs): **Theory** 0 **Practical** 2

4.　Relative Weight:　**CIE** 25　**MSE** 25　**ESE** 50

5.　Credits:　1

6.　Semester:　II

7.　Category of Course:　DSC

8.　Pre-requisite: Python Programming Lab (PCS152).

9. **Course Outcome:**	After completion of the course, the students will be able to**:** CO1: Design and develop graph search algorithms such as BFS, DFS, and A* using heuristics. CO2: Design and develop reasoning models using propositional logic, Bayesian inference, and networks. CO3: Design and develop Machine Learning models (Linear Regression, Logistic Regression, KNN, Decision Tree). CO4: Analyze and evaluate machine learning models using metrics (Confusion Matrix, F1 Score), clustering, and association rule mining.

10.　**Details of the Course:**

Sl. No.	List of problems for which students should develop programs and execute in the Laboratory	Contact Hours
1.	**AI Overview and Search:** a) Write a Program to implement Breadth-First Search algorithm for graph traversal. b) Write a program to implement Depth-First Search algorithm for graph traversal. c) Write a Program to implement A* search algorithm using heuristics.	8
2.	**Knowledge and Reasoning:**	8

	d) Write a Program to implement propositional logic inference using truth tables. e) Write a Program to implement simple Bayesian inference. f) Write a Program to implement Bayesian Network for simple medical diagnosis.	
3.	**Machine Learning and Preprocessing:** g) Write a Program to implement Linear Regression on a dataset (predict marks vs study hours). h) Write a Program to implement Polynomial Regression (fit nonlinear data). i) Write a Program to implement data preprocessing - Missing values, normalization, feature scaling.	8
4.	**Classification:** j) Write a Program to implement Logistic Regression for binary classification. k) Write a Program to implement K-Nearest Neighbours (KNN) on given dataset. l) Write a Program to implement Decision Tree Classifier with pruning.	8
5.	**Evaluation and Clustering:** m) Write a Program to evaluate models using Confusion Matrix and F1 Score. n) Write a Program to implement K-Means Clustering on synthetic dataset. o) Write a Program to implement Apriori Algorithm for Association Rule Mining.	8
	Total	**40**

Text Books:

Authors Name	Title	Edition	Publisher, Country	Year
Stuart Russell, Peter Norvig	Artificial Intelligence: A Modern Approach	4th Edition	Pearson, USA	2021
Ethem Alpaydin	Introduction to Machine Learning	4th Edition	MIT Press, USA	2020
Aurélien Géron	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	3rd Edition	O'Reilly Media, USA	2022

Reference Books:

Authors Name	Title	Edition	Publisher, Country	Year
Tom M. Mitchell	Machine Learning	1st Edition	McGraw-Hill, USA	1997