Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur

(An Autonomous Institute)

Course Curriculum Structure

First Year B.Tech (All Branches)

(with effect from Academic Year 2026-2027)



Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405
Ph: 02563 259 802, Web: www.rcpit.ac.in

Semester-I (w.e.f. Academic Year 2026-2027) Computer Engineering														
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26CBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26CBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26CBS102	Biology for Computing	3	–	–	25	30	30	15	60	100	3
4	ES	RCP26CES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
5	ES	RCP26CES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
6	ES	RCP26CES102	Engineering Graphics #	2	–	–	25	30	30	15	60	100	2
7	ES	RCP26CES102L	Engineering Graphics Laboratory	–	–	2	25	–	–	–	–	25	1
8	ES	RCP26CES103	Basic Electrical Engineering and Digital Electronics	2	–	–	25	30	30	15	60	100	2
9	ES	RCP26CES103L	Basic Electrical Engineering and Digital Electronics Tutorial & Laboratory	–	1	2	50	–	–	–	–	50	2
10	SC	RCP26CSC101L	Workshop Practices	–	–	2	25	–	–	–	–	25	1
11	LL	RCP26CLL101T	Health and Wellness	–	2	–	50	–	–	–	–	50	2
12	SC	RCP26CSC149	Foundations of Artificial Intelligence*	1	–	–	40	-	-	-	–	40	1
			Total	**13**	**04**	**08**	365	–	–	75	325	765	**21**

BS: Basic Science, **ES:** Engineering Science, **LL:** Liberal Learning, **PC:** Program Core, **SC:** Skill Enhancement, **HM:** Humanities, **TA:** Teachers Assessment, **TT1:** Term Test-1, **TT2:** Term Test-2

* Online Course to be completed on Coursera, # Computer based assessment in the college premises only.

Prof. S. K. Patil
Prepared by

Dr. J. S. Shaikh
Checked by

Dr. S. V. Desale
Head

Prof. S. P. Shukla
C.O.E.

Prof. Dr. P. J. Deore
Dy. Director

Prof. Dr. J. B. Patil
Director

Semester-I (w.e.f. Academic Year 2026-2027) Information Technology													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26IBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26IBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26IBS102	Biology for Computing	3	–	–	25	30	30	15	60	100	3
4	ES	RCP26IES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
5	ES	RCP26IES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
6	ES	RCP26IES102	Engineering Graphics #	2	–	–	25	30	30	15	60	100	2
7	ES	RCP26IES102L	Engineering Graphics Laboratory	–	–	2	25	–	–	–	–	25	1
8	ES	RCP26IES103	Basic Electrical Engineering and Digital Electronics	2	–	–	25	30	30	15	60	100	2
9	ES	RCP26IES103L	Basic Electrical Engineering and Digital Electronics Tutorial & Laboratory	–	1	2	50	–	–	–	–	50	2
10	SC	RCP26ISC101L	Workshop Practices	–	–	2	25	–	–	–	–	25	1
11	LL	RCP26ILL101T	Health and Wellness	–	2	–	50	–	–	–	–	50	2
12	SC	RCP26ISC149	Fundamentals of Artificial Intelligence*	1	–	–	40	-	-	-	–	40	1
			Total	**13**	**04**	**08**	365	–	–	75	325	765	**21**

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Semester-I (w.e.f. Academic Year 2026-27) Electronics & Telecommunication Engineering													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26EBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26EBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26EBS102	Engineering Chemistry for Semiconductor and Electronic Applications	2	–	–	25	30	30	15	60	100	2
4	BS	RCP26EBS102L	Engineering Chemistry for Semiconductor and Electronic Applications Laboratory	–	–	2	25	–	–	–	–	25	1
5	ES	RCP26EES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
6	ES	RCP26EES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
7	ES	RCP26EES102	Engineering Graphics #	2	–	–	25	30	30	15	60	100	2
8	ES	RCP26EES102L	Engineering Graphics Laboratory	–	–	2	25	–	–	–	–	25	1
9	ES	RCP26EES103	Basic Electrical Engineering and Digital Electronics	2	–	–	25	30	30	15	60	100	2
10	ES	RCP26EES103L	Basic Electrical Engineering and Digital Electronics Tutorial & Laboratory	–	1	2	50	–	–	–	–	50	2
11	SC	RCP26ESC101L	Workshop Practices	–	–	2	25	–	–	–	–	25	1
12	LL	RCP26ELL101T	Health and Wellness	–	2	–	50	–	–	–	–	50	2
13	SC	RCP26ESC149	Artificial Intelligence Foundations*	1	–	–	40	-	-	-	–	40	1
			Total	**12**	**04**	**10**	390	–	–	75	325	790	**21**

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Prepared by	Checked by	Head	C.O.E.	Dy. Director	Director

Semester-I (w.e.f. Academic Year 2026-27) Electrical Engineering													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26LBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26LBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26LBS102	Chemistry in Electrical Engineering	2	–	–	25	30	30	15	60	100	2
4	BS	RCP26LBS102L	Chemistry in Electrical Engineering Laboratory	–	–	2	25	–	–	–	–	25	1
5	ES	RCP26LES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
6	ES	RCP26LES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
7	ES	RCP26LES102	Engineering Graphics #	2	–	–	25	30	30	15	60	100	2
8	ES	RCP26LES102L	Engineering Graphics Laboratory	–	–	2	25	–	–	–	–	25	1
9	ES	RCP26LES103	Basic Electrical Engineering and Digital Electronics	2	–	–	25	30	30	15	60	100	2
10	ES	RCP26LES103L	Basic Electrical Engineering and Digital Electronics Tutorial & Laboratory	–	1	2	50	–	–	–	–	50	2
11	SC	RCP26LSC101L	Workshop Practices	–	–	2	25	–	–	–	–	25	1
12	LL	RCP26LLL101T	Health and Wellness	–	2	–	50	–	–	–	–	50	2
13	SC	RCP26LSC149	Electrical Foundations*	1	–	–	40	-	-	-	–	40	1
			Total	**12**	**04**	**10**	390	–	–	75	325	790	**21**

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Semester-I (w.e.f. Academic Year 2026-2027) Artificial Intelligence & Machine Learning													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26ABS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26ABS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26ABS102	Quantum Physics	2	–	–	25	30	30	15	60	100	2
4	BS	RCP26ABS102L	Quantum Physics Laboratory	–	–	2	25	–	–	–	–	25	1
5	ES	RCP26AES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
6	ES	RCP26AES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
7	ES	RCP26AES102	Applied Mechanics and Robotics	2	–	–	25	30	30	15	60	100	2
8	ES	RCP26AES102L	Applied Mechanics and Robotics Laboratory	–	–	2	25	–	–	–	–	25	1
9	HS	RCP26AHS101	Engineering Communication and Lean Thinking	1	–	–	25	30	30	15	–	40	1
10	HS	RCP26AHS101L	Engineering Communication and Lean Thinking Laboratory	–	–	2	50	–	–	–	–	50	1
11	HS	RCP26AHS102T	Indian Knowledge Systems	–	2	–	50	–	–	–	–	50	2
12	LL	RCP26ALL101T	Health and Wellness	–	2	–	50	–	–	–	–	50	2
13	SC	RCP26ASC149	AI Essentials for Freshers*	1	–	–	40	-	-	-	–	40	1
			Total	**11**	**05**	**08**	415	–	–	75	265	755	**20**

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Semester-I (w.e.f. Academic Year 2026-27) Artificial Intelligence & Data Science														
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26SBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26SBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26SBS102	Quantum Physics	2	–	–	25	30	30	15	60	100	2
4	BS	RCP26SBS102L	Quantum Physics Laboratory	–	–	2	25	–	–	–	–	25	1
5	ES	RCP26SES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
6	ES	RCP26SES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
7	ES	RCP26SES102	Applied Mechanics and Robotics	2	–	–	25	30	30	15	60	100	2
8	ES	RCP26SES102L	Applied Mechanics and Robotics Laboratory	–	–	2	25	–	–	–	–	25	1
9	HS	RCP26SHS101	Engineering Communication and Lean Thinking	1	–	–	25	30	30	15	–	40	1
10	HS	RCP26SHS101L	Engineering Communication and Lean Thinking Laboratory	–	–	2	50	–	–	–	–	50	1
11	HS	RCP26SHS102T	Indian Knowledge Systems	–	2	–	50	–	–	–	–	50	2
12	LL	RCP26SLL101T	Health and Wellness	–	2	–	50	–	–	–	–	50	2
13	SC	RCP26SSC149	Version Control Fundamentals*	1	–	–	40	-	-	-	–	40	1
			Total	**11**	**05**	**08**	415	–	–	75	265	755	**20**

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Prepared by	Checked by	Head	C.O.E.	Dy. Director	Director

Semester-I (w.e.f. Academic Year 2026-27) Computer Science & Engineering (Data Science)													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26DBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26DBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26DBS102	Quantum Physics	2	–	–	25	30	30	15	60	100	2
4	BS	RCP26DBS102L	Quantum Physics Laboratory	–	–	2	25	–	–	–	–	25	1
5	ES	RCP26DES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
6	ES	RCP26DES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
7	ES	RCP26DES102	Applied Mechanics and Robotics	2	–	–	25	30	30	15	60	100	2
8	ES	RCP26DES102L	Applied Mechanics and Robotics Laboratory	–	–	2	25	–	–	–	–	25	1
9	HS	RCP26DHS101	Engineering Communication and Lean Thinking	1	–	–	25	30	30	15	–	40	1
10	HS	RCP26DHS101L	Engineering Communication and Lean Thinking Laboratory	–	–	2	50	–	–	–	–	50	1
11	HS	RCP26DHS102T	Indian Knowledge Systems	–	2	–	50	–	–	–	–	50	2
12	LL	RCP26DLL101T	Health and Wellness	–	2	–	50	–	–	–	–	50	2
13	SC	RCP26DSC149	Fundamentals of Artificial Intelligence*	1	–	–	40	-	-	-	–	40	1
			Total	**11**	**05**	**08**	415	–	–	75	265	755	**20**

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Semester-I (w.e.f. Academic Year 2026-27) Mechanical Engineering													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26MBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26MBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26MBS102	Engineering Physics	2	–	–	25	30	30	15	60	100	2
4	BS	RCP26MBS102L	Engineering Physics Laboratory	–	–	2	25	–	–	–	–	25	1
5	ES	RCP26MES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
6	ES	RCP26MES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
7	ES	RCP26MES102	Engineering Mechanics	2	–	–	25	30	30	15	60	100	2
8	ES	RCP26MES102L	Engineering Mechanics Laboratory	–	–	2	25	–	–	–	–	25	1
9	HS	RCP26MHS101	Engineering Communication and Lean Thinking	1	–	–	25	30	30	15	–	40	1
10	HS	RCP26MHS101L	Engineering Communication and Lean Thinking Laboratory	–	–	2	50	–	–	–	–	50	1
11	ES	RCP26MES103	Engineering Graphics I	1	–	–	25	30	30	15	60	100	1
12	ES	RCP26MES103L	Engineering Graphics I Laboratory	–	–	2	25	–	–	–	–	25	1
13	HS	RCP26MHS102T	Indian Knowledge Systems	–	2	–	50	–	–	–	–	50	2
14	SC	RCP26MSC149	Introduction to AI for Mechanical Engineers*	1	–	–	40	-	-	-	–	40	1
			Total	**12**	**03**	**10**	415	–	–	90	325	830	**20**

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Semester-I (w.e.f. Academic Year 2026-27) Civil Engineering													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
							TA	TT1	TT2	Average			
				L	T	P	A			B	C	A+B+C	
1	BS	RCP26VBS101	Engineering Mathematics	3	–	–	25	30	30	15	60	100	3
2	BS	RCP26VBS101T	Engineering Mathematics Tutorial	–	1	–	25	–	–	–	–	25	1
3	BS	RCP26VBS102	Engineering Physics	2	–	–	25	30	30	15	60	100	2
4	BS	RCP26VBS102L	Engineering Physics Laboratory	–	–	2	25	–	–	–	–	25	1
5	ES	RCP26VES101	Structured Programming using C	2	–	–	25	30	30	15	60	100	2
6	ES	RCP26VES101L	Structured Programming using C Laboratory	–	–	2	25	–	–	–	25	50	1
7	ES	RCP26VES102	Engineering Mechanics	2	–	–	25	30	30	15	60	100	2
8	ES	RCP26VES102L	Engineering Mechanics Laboratory	–	–	2	25	–	–	–	–	25	1
9	HS	RCP26VHS101	Engineering Communication and Lean Thinking	1	–	–	25	30	30	15	–	40	1
10	HS	RCP26VHS101L	Engineering Communication and Lean Thinking Laboratory	–	–	2	50	–	–	–	–	50	1
11	ES	RCP26VES103	Engineering Graphics I	1	–	–	25	30	30	15	60	100	1
12	ES	RCP26VES103L	Engineering Graphics I Laboratory	–	–	2	25	–	–	–	–	25	1
13	HS	RCP26VHS102T	Indian Knowledge Systems	–	2	–	50	–	–	–	–	50	2
14	SC	RCP26VSC149	Introduction to Engineering Mechanics*	1	–	–	40	-	-	-	–	40	1
			Total	**12**	**03**	**10**	415	–	–	90	325	830	**20**

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Program: All	F. Y. B.Tech	Semester: I
Engineering Mathematics (RCP26CBS101 / RCP26DBS101 / RCP26ABS101 / RCP26IBS101 / RCP26MBS101 / RCP26EBS101 / RCP26SBS101 / RCP26LBS101 / RCP26VBS101)		
Engineering Mathematics Tutorial (RCP26CBS101T/ RCP26DBS101T/RCP26ABS101T/ RCP26IBS101T/ RCP26MBS101T/ RCP26EBS101T/ RCP26SBS101T /RCP26LBS101T/RCP26VBS101T)		

Prerequisite: Knowledge of

1. Inverse of a matrix, addition, multiplication and transpose of a matrix.
2. Algebra of Complex Numbers. Geometric representation of complex numbers. Cartesian, polar and exponential form of complex numbers. Complex conjugate.
3. Basics of Differential Calculus.

Course Objective(s):

1. To develop the fundamental mathematical skills required for understanding and solving engineering problems.
2. To strengthen analytical thinking and logical reasoning through the application of mathematical concepts.
3. To provide a foundation in mathematical methods that support advanced studies in various branches of engineering and technology.
4. To enable students to formulate and solve real-life engineering problems using appropriate mathematical techniques.
5. To enhance the ability to represent and interpret mathematical concepts through graphical and visual approaches.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply matrix operations to determine rank and echelon forms of matrices and solve systems of Simultaneous linear equations.	L3	Apply
CO2	Apply the concepts of complex numbers to solve problems involving hyperbolic functions and Logarithmic functions.	L3	Apply
CO3	Expand functions using appropriate mathematical techniques and evaluate their applicability in engineering problems.	L3	Apply
CO4	Apply the principles of partial differentiation to determine maxima, minima, and Jacobians of multivariable functions.	L3	Apply
CO5	Apply numerical methods to solve algebraic, transcendental, and linear systems of equations, and perform curve fitting for given data sets.	L3	Apply

Engineering Mathematics
Course Contents

Unit-I Matrices 08 Hrs.

Types of Matrices: Symmetric, Skew- Symmetric, Hermitian, Skew-Hermitian, Unitary, Orthogonal Matrices. Rank of a matrix using Echelon form, System of homogeneous and non–homogeneous equations, their consistency and solutions, Linear dependent and independent vectors.

Unit-II Complex Numbers, Hyperbolic function and Logarithm of Complex Numbers 12 Hrs.

Review statement of D'Moivre's Theorem, Application of D'Moivre's Theorem: Find expansion of $\sin^n\theta$, $\cos^n\theta$ in terms of sines and cosines of multiples of θ, expansion of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ and to find sum of the trigonometric series. Roots of complex numbers. Circular functions of complex numbers and Hyperbolic functions. Inverse Circular and Inverse Hyperbolic functions. Separation of real and imaginary parts of all types of functions. Logarithmic functions, Separation of real and Imaginary parts of Logarithmic functions..

Unit-III Expansion of Function 04 Hrs.

Taylor's Theorem (Statement only), Taylor's series and Maclaurin's series (Statement only). Expansion of standard functions.

Unit-IV Partial Differentiation 14 Hrs.

Function of several variables, Partial derivatives of first and higher order, Differentiation of composite function, Total differentials and Implicit functions. Euler's Theorem on Homogeneous functions with two and three independent variables (with proof). Deductions from Euler's theorem.

Applications of Partial Differentiation: Maxima and Minima of a function of two independent variables. Jacobian's of two and three independent variables.

Unit-V Numerical Solutions of Transcendental Equations, System of Linear Algebraic Equations, Curve fitting 04 Hrs.

Solution of Algebraic and Transcendental Equations by: Newton Raphson Method. Solution of system of linear algebraic equations by Gauss Seidal Iteration Method. Curve fitting: Fitting a straight line, Quadratic curve.

Engineering Mathematics Tutorial

List of Tutorial

1. Matrices.
2. Complex Numbers.
3. Hyperbolic and Logarithm of complex numbers.
4. Taylors Series.
5. Maclaurin's series.
6. Partial Differentiation.
7. Application of Partial Differentiation.
8. Solution of Transcendental Equations by Newton Raphson Method.
9. Solution of system of linear algebraic equations by Gauss Seidal Iteration Method.
10. Curve Fitting.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.
2. Dennis G. Zill, Warren S. Wright, Advanced Engineering Mathematics.
3. Andrie de Vries and Joris Meys, R Programming for Dummies, 2nd Edition, Wiley.

Reference Books:

1. S. Ponnusamy, Foundations of Complex Analysis, Narosa Publications.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Limited, 9th Ed.
3. H. K. Dass, Advanced Engineering Mathematics, 28th edition, S. Chand 2010.
4. S.S. Sastry, Introductory Methods of Numerical Analysis, Eastern Economy Edition.
5. M. K. Jain, R. K. Jain, S. R. K. Iyengar, Numerical Methods, New Age International Publishers.
6. Shanti Narayan, Matrices, S. Chand publication.

7. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.

8. Howard Anton and Christ Rorres, Elementary Linear Algebra with Application, 6th edition, John Wiley and Sons, INC.

9. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, 2nd Edition, Addison-Wesley Data and Analytics Series.

Web References:

1. Engineering Mathematics - I:
https://onlinecourses.nptel.ac.in/elearning/preview/noc26_ma133

2. Advanced Calculus for Engineers:
https://onlinecourses.nptel.ac.in/elearning/preview/noc26_ma130

3. Calculus of One Real Variable:
https://onlinecourses.nptel.ac.in/elearning/preview/noc26_ma91

4. Calculus of Several Real Variables:
https://onlinecourses.nptel.ac.in/elearning/preview/noc26_ma92

Program: All	F. Y. B.Tech	Semester: I
Structured Programming using C (RCP26CES101/ RCP26AES101/ RCP26EES101/ RCP26MES101/ RCP26IES101/ RCP26SES101/ RCP26DES101/ RCP26VES101/ RCP26LES101)		
Structured Programming using C Laboratory (RCP26CES101L/ RCP26AES101L/ RCP26EES101L/ RCP26MES101L/ RCP26IES101L/ RCP26SES101L/ RCP26DES101L/ RCP26VES101L/ RCP26LES101L)		

Course Objective(s):

1. To familiarize with the logic of Computer Programming.
2. To provide exposure in developing algorithm, flowchart and thereby writing efficient codes for user defined problem.

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Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Implement the programs in C.	L3	Apply
CO2	Debug the C programs.	L3	Apply

Structured Programming using C
Course Contents

Unit-I Basics of C Programming 04 Hrs.

Introduction to programming paradigms, Structure of C program, Algorithm Flowchart, Compilation process: Syntax and semantic errors, Character Set, Identifiers and keywords, Data types, Constants, Variables, Operators-Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, and other operators,precedence and associativity, Library Functions, Preprocessor, Data Input and Output – getchar (), putchar (), scanf (), printf (), fgets (), puts ().

Unit-II Control Structures 05 Hrs.

Decision making with Branching - If statement, If-else Statement, Switch case statement, Looping – while, do-while, for, Nested control structure, Continue statement, Break Statement, goto statement.

Unit-III Functions and Parameter 04 Hrs.

Function -Introduction of Function, defining a Function, accessing a Function, Function Prototype, Passing Arguments to a Function, Designing Recursive function, Storage Classes –Auto, Extern, Static, Register.

Unit-IV Arrays and its applications 07 Hrs.

Array-Concepts, Declaration, Definition, accessing array element, One- dimensional and Multidimensional array, Passing Arrays to Function, Sorting algorithms: Bubble sort, Insertion sort, Selection sort, radix sort Searching algorithms: Linear search, Binary search, String- Basics of String, Functions in string. h, user defined function for string handling.

Unit-V Structures and Unions 04 Hrs.

Declaration, Initialization, structure within structure, Operation on structures, Array of Structure, Structure padding, Union, comparison of Structures and Union.

Unit-VI Pointers and File Handling 04 Hrs.

Introduction to Pointers, Pointer Declaration, Call by Value, Call by Reference, Opening and closing files, reading and writing to files, operations on files.

Structured Programming using C Laboratory

Suggested experiments:

1. Write a program to swap two variables values with and without using third variables. Write algorithm and draw flowchart for the same.
2. Write a program to check odd or even number: (a) using modulus operator (b) using conditional operator.
3. Design and develop a C program to read a year as an input and find whether it is leap year or not. Also consider the end of the centuries. Write algorithm and draw flowchart for the same.
4. Write a C program to find the sum of individual digits of a 3-digit number.
5. Design and develop a flowchart or an algorithm that takes three coefficients (a, b, and c) of a Quadratic equation ($ax^2 + bx + c = 0$) as input and compute all possible roots. Implement a C program for the developed flowchart/algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.
6. Write a program to count the number of digits in a given integer.
7. Write a menu driven program to perform simple arithmetic operations based on the user's choice. The user will indicate the operation to be performed using the signs e.g. + for addition, etc. Write an algorithm and draw flowchart for same.
8. Write a program to read a number of more than one digit, reverse the number and display the sum of digits of numbers. Write algorithm and draw flowchart for the same.
9. Write programs to display each of the following patterns.

A)

```
1
2 1
3 2 1
4 3 2 1
5 4 3 2 1
```

B)

```
A
ABA
ABCBA
ABCDCBA
ABCDEDCBA
```

10. Write a C program to find maximum and minimum between two numbers using functions. Write algorithm and draw flowchart for the same.
11. Write C program to find GCD of two integers by using recursive function.

12. Write a C program to find both the largest and smallest number in a list of integers. Write algorithm and draw flowchart for the same.

13. Develop, implement and execute a C program that reads two matrices A (m x n) and B (p x q) and Compute product of matrices A and B. Read matrix A and matrix B in row major order and in column major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only.

14. Write a Program for deletion of an element from the specified location from Array.

15. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort

16. Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: i) Linear search ii) Binary search

17. Write a C program using user defined functions to determine whether the given string is palindrome or not.

18. Create a structure named "Employee" to store employee details such as employee ID, name, and salary. Write a program to input data for three employees, find the highest salary employee, and display their information.

19. Demonstrate Union for displaying student record.

20. Demonstrate the concept of Call by Value and Call by Reference in C programming by passing variables to functions and observing the effect of modifications on the original variables.

21. Read any text file (e.g. info.txt) and write its content to a new file (no_vowels.txt), excluding all lowercase and uppercase vowels (A, E, I, O, U, a, e, i, o, u).

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. K.R.Venugopal, Sudeep R.Prasad, MASTERING C, Tata McGraw-Hill Publications.
2. Behrouz Forouzan, A Computer Science –Structure Programming Approaches using C ,Cengage Learning.
3. Byron S. Gottfried, Schaum's outlines "Programming with C, Tata McGraw-Hill Publications.

Reference Books:

1. BehrouzForouzan, Basics of Computer Science, Cengage Learning.
2. M. G. Venkateshmurthy, Programming Techniques through C, Pearson Publication.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill Education.
4. Pradeep Day,Manas Gosh, Programming in C, Oxford University Press.
5. Yashwant Kanetkar, Let Us C, BPB Publication.

Web References:

1. Problem Solving Through Programming In C
   https://onlinecourses.nptel.ac.in/e learning/preview/noc26_cs53

Program: Civil Engineering	F. Y. B.Tech	Semester: I
Engineering Physics (RCP26VBS102)		
Engineering Physics Laboratory (RCP26VBS102L)		

Pre-requisite: Knowledge of

Foundations of physics and mathematics till H.S.C. or equivalent is necessary to comprehend engineering physics curriculum effectively.

Course Objective(s):

1. Identify and understand the fundamental physical principles underlying engineering technologies a prerequisite to become successful engineer.
2. To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture into the research field.
3. To introduce the fundamental principles of acoustics, ultrasonic, crystal structure and nanomaterial's along with their applications in simple physical systems and material characterization.
4. To develop an understanding of engineering sensors, laser with emphasis on their principles, working and technological applications.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the core principles of architectural acoustics and characteristics of ultrasonic waves with applications.	L1,L2	Remember, Understand
CO2	Apply the concepts of crystallography and X-ray diffraction (XRD) techniques to analyze crystal structures and understand the properties of engineering materials used in mechanical systems.	L3	Apply
CO3	Assimilate the wide scope of Nanotechnology in modern developments and its role in emerging innovative applications.	L2,L3	Understand, Apply
CO4	Explain the principles, properties, and operating mechanisms of lasers and working of different types of lasers.	L2	Understand
CO5	Explore basic sensing and measurement techniques used for physical parameter monitoring and modern instrumentation in mechanical engineering applications.	L2 ,L4	Understand, Analyze

Engineering Physics
Course Contents

Unit-I Acoustics and Ultrasonic 07 Hrs.

Acoustics: Introduction, Echo, Reverberation, Reverberation time, Sabine's formula (without derivation), Coefficient of absorption, Loudness, Decibel. Acoustic Intensity. Intensity Level (With Formula), Limits of Audibility, Factors affecting the architectural acoustics of building their remedy. **Ultrasonic:** Ultrasonic wave, Production of ultrasonic waves (Piezoelectric and Magnetostriction oscillator) its properties and applications.

Unit-II Crystal Structure 06 Hrs.

Miller indices crystallographic planes directions, Interplanar spacing and its relation with Miller indices, X-ray diffraction and Bragg's law, Determination of Crystal structure using Bragg's diffractometer, Frenkel and Schottky crystal defects.

Unit-III Nanoscience Nanotechnology 05 Hrs.

Introduction Dimensional classification of Nanomaterials Properties of Nanomaterials Synthesis of Nanomaterials Properties of carbon allotropes (CNT, Fullerenes, Graphene) Applications of Nanotechnology Characterization techniques: Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Atomic Force Microscope (AFM), Scanning Tunnelling Microscope (STM) .

Unit-IV Laser 05 Hrs.

Introduction and properties of Laser, Absorption, Spontaneous emission and Stimulated emission of radiation, Einstein's relations for absorption and emission coefficients, Population inversion, pumping, types of pumping, metastable state, active medium, resonant cavity, three four level laser system, Helium Neon laser; Nd:YAG laser.

Unit-V Physics of Sensors 05 Hrs.

Pressure Sensor: Concept of pressure sensing, Capacitive and piezo-resistive pressure sensors, **Temperature Sensor:** (Principle, working & Applications), **Light sensors:** (Photodiode, LDR). **Hall sensor:** (Principle of Hall effect, Applications), **IR sensor:** (Principle Applications). .

Engineering Physics Laboratory

Minimum six experiments and mini lab projects (working model/ simulation/ research paper presentation) as laboratory work from the above suggested list or any other experiment based on syllabus will be conducted batch wise to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies.

Experiment Title:

1. Determination of Planck's constant using LED.
2. Study of Miller Indices, Plane and direction.
3. Study of Diamond crystal structure.
4. To study the reverse bias characteristic of Photo-diode.
5. Simulation experiments on sensors.
6. Determination of wavelength of LASER using single slit diffraction
7. Study of divergence of laser beam.
8. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
9. Study of ZnS, NaCl crystal structure.
10. Study of PT100 calibration.
11. Study of velocity of sound in liquid using Ultrasonic Interferometer
    Performance-Based Experiments (Hands-on and Simulation Tools)
12. Simulation of de Broglie wavelength of an electron with varying accelerating voltage.
13. Simulation of Miller indices for crystallographic planes and directions.
14. Simulation of capacitive pressure sensor: variation of capacitance with pressure.
15. Simulation of resistance versus temperature curve for a superconductor.
    Mini Lab Project
16. Mini lab project (working model/ simulation/ research paper presentation

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. T. V. S. Arun Murthy, M. N. Avadhanulu and P. G. Kshirsagar, A Textbook of Engineering Physics, S. Chand Publishing, New Delhi, 2026.
2. M. N. Avadhanulu and P. G. Kshirsagar, Problems in Engineering Physics, S. Chand Publishing, New Delhi, 2012.
3. S. O. Pillai and Sivakami Pillai, A Textbook of Engineering Physics, New Age International Publishers, New Delhi, 2012.
4. Ajoy Ghatak and S. Lokanathan, Quantum Mechanics: Theory and Applications, Springer, Dordrecht, 2004.
5. A. S. Vasudeva, Modern Engineering Physics, S. Chand Publishing, New Delhi, 1999.
6. Wiley Editorial, Engineering Physics: As per AICTE, Wiley India Pvt. Ltd., New Delhi, 2020.
7. R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Publications, New Delhi, 2012.
8. Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson India Education Services Pvt. Ltd., Chennai, 2018.
9. D. K. Bhattacharya and Poonam Tandon, Engineering Physics, Oxford University Press, New Delhi, 2015.
10. V. Rajendran, Engineering Physics, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2010.
11. H. S. Kalsi, Electronic Instrumentation and Measurements, McGraw Hill Education, New Delhi, 2019.
12. R. K. Puri and V. K. Babbar, Solid State Physics, S. Chand Publishing, New Delhi, 2010.
13. Nano: The essentials, understanding Nanoscience and Nanotechnology, T. Pradeep, Tata Mc Graw Hill, 2007

Reference Books:

1. David J. Griffiths and Darrell F. Schroeter, Introduction to Quantum Mechanics, Cambridge University Press, Cambridge, 2018.
2. Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill Education, New Delhi, 2003.
3. Albert D. Helfrick and William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice-Hall of India Pvt. Ltd., New Delhi, 1992.
4. Jacob Fraden, Handbook of Modern Sensors: Physics, Designs, and Applications, Springer International Publishing, Cham, 2016.Albert D. Helfrick and William David Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI Learning Pvt. Ltd., New Delhi, 2014.

Web References:

1. Quantum Mechanics I, https://onlinecourses.nptel.ac.in/noc26_ph08/preview
2. Quantum Mechanics – An Introduction, https://nptel.ac.in/courses/115106066
3. X-ray Crystallography and Diffraction, https://onlinecourses.nptel.ac.in/noc22_mm39/preview
4. Design of Mechatronic Systems, https://nptel.ac.in/courses/112101304
5. The Science of Light Amplification: An Extensive Laser Course, https://onlinecourses.nptel.ac.in/noc25_ph26/preview
6. Laser: Fundamentals and Applications, https://nptel.ac.in/courses/104104085
7. A Brief Course on Superconductivity,https://onlinecourses.nptel.ac.in/noc26_ph11/preview

Program: Mechanical Engineering	F. Y. B.Tech	Semester: I
Engineering Physics (RCP26MBS102)		
Engineering Physics Laboratory (RCP26MBS102L)		

Pre-requisite: Knowledge of

Foundations of physics and mathematics till H.S.C. or equivalent is necessary to comprehend engineering physics curriculum effectively.

Course Objective(s):

1. Identify and understand the fundamental physical principles underlying engineering technologies a prerequisite to become successful engineer.
2. To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture into the research field.
3. To introduce the fundamental principles of quantum mechanics and crystal structure, along with their applications in simple physical systems and material characterization.
4. To develop an understanding of engineering sensors, lasers and superconductors with emphasis on their principles, working and technological applications.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Relate to the scope and foundation of quantum mechanics in the development of modern technology	L1,L2	Remember, Understand
CO2	Apply the concepts of crystallography and X-ray diffraction (XRD) techniques to analyze crystal structures and understand the properties of engineering materials used in mechanical systems.	L3	Apply
CO3	Assimilate the concepts of Electrodynamics in modern developments for signal communications, Antenna Theory etc	L2	Understand
CO4	Apply the principles of LASER and superconducting materials in modern mechanical engineering fields such as manufacturing and advanced industrial technologies.	L3	Apply
CO5	Describe the fundamental properties, types, theories and applications of superconductors and Explore basic sensing and measurement techniques used for physical parameter monitoring and modern instrumentation.	L1 ,L3	Remember, Analyze

Engineering Physics
Course Contents

Unit-I Quantum Mechanics 07 Hrs.

Matter waves, De Broglie hypothesis, Concept of Phase velocity, group velocity and relation with particle velocity, Concept of wave packet, Heisenberg Uncertainty Principle, Wave function; Physical interpretation of wave function, Schrodinger's time dependent wave equation and time independent wave equation. Application of Schrodinger equation: Particle trapped in a one-dimensional infinite potential well.

Unit-II Engineering Crystallography 06 Hrs.

Miller indices crystallographic planes directions, Interplanar spacing and its relation with Miller indices, X-ray diffraction and Bragg's law, Determination of Crystal structure using Bragg's diffractometer, Crystal defects and applications.

Unit-III Electromagnetic Field Theory 05 Hrs.

Scalar and Vector fields, Physical significance of gradient, divergence, and curl in Cartesian coordinate system. Divergence theorem, Stokes theorem.

Maxwell's equations integral and differential form Significance.

Unit-IV Laser 05 Hrs.

Introduction and properties of Laser, Absorption, Spontaneous emission and Stimulated emission of radiation, Einstein's relations for absorption and emission coefficients, Population inversion, pumping, types of pumping, metastable state, active medium, resonant cavity, three four level laser system, Helium Neon laser; Nd:YAG laser, CO2 laser.

Unit-V Sensors Technology and Superconductivity 05 Hrs.

Pressure Sensor: Concept of pressure sensing, Capacitive and piezo-resistive pressure sensors, **Ultrasonic sensors:** Concept of piezoelectricity and inverse piezoelectricity, use of piezoelectric transducer as ultrasonic generator and application of ultrasonic transducer for distance measurement, **Temperature Sensor:** (Principle, working Applications), **Velocity Sensor:** (Principle, working Applications), **IR sensor:** (Principle, working Applications) **Superconductivity:** Critical temperature, Critical magnetic field, Meissner's effect, Type I and Type II and high Tc superconductors, Concept of cooper pair, BCS theory. Applications for superconducting materials.

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Engineering Physics Laboratory

Minimum six experiments and mini lab project (working model/ simulation/ research paper presentation) as laboratory work from the above suggested list or any other experiment based on syllabus will be conducted batch wise to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies.

Experiment Title:

1. Determination of Planck's constant using LED.
2. Study of Miller Indices, Plane and direction.
3. Study of Diamond crystal structure.
4. To study the reverse bias characteristic of Photo-diode.
5. Simulation experiments on sensors.
6. Determination of wavelength of LASER using single slit diffraction
7. Study of divergence of laser beam.
8. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
9. Study of ZnS, NaCl crystal structure.
10. Study of PT100 calibration.
11. Study of velocity of sound in liquid using Ultrasonic Interferometer

    Performance-Based Experiments (Hands-on and Simulation Tools)
12. Simulation of de Broglie wavelength of an electron with varying accelerating voltage.
13. Simulation of Miller indices for crystallographic planes and directions.
14. Simulation of capacitive pressure sensor: variation of capacitance with pressure.
15. Simulation of resistance versus temperature curve for a superconductor.

    Mini Lab Project
16. Mini lab project (working model/ simulation/ research paper presentation)

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. T. V. S. Arun Murthy, M. N. Avadhanulu and P. G. Kshirsagar, A Textbook of Engineering Physics, S. Chand Publishing, New Delhi, 2026.
2. M. N. Avadhanulu and P. G. Kshirsagar, Problems in Engineering Physics, S. Chand Publishing, New Delhi, 2012.
3. S. O. Pillai and Sivakami Pillai, A Textbook of Engineering Physics, New Age International Publishers, New Delhi, 2012.
4. Ajoy Ghatak and S. Lokanathan, Quantum Mechanics: Theory and Applications, Springer, Dordrecht, 2004.
5. A. S. Vasudeva, Modern Engineering Physics, S. Chand Publishing, New Delhi, 1999.
6. Wiley Editorial, Engineering Physics: As per AICTE, Wiley India Pvt. Ltd., New Delhi, 2020.
7. R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Publications, New Delhi, 2012.
8. Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson India Education Services Pvt. Ltd., Chennai, 2018.
9. D. K. Bhattacharya and Poonam Tandon, Engineering Physics, Oxford University Press, New Delhi, 2015.
10. V. Rajendran, Engineering Physics, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2010.
11. H. S. Kalsi, Electronic Instrumentation and Measurements, McGraw Hill Education, New Delhi, 2019.
12. R. K. Puri and V. K. Babbar, Solid State Physics, S. Chand Publishing, New Delhi, 2010.

Reference Books:

1. David J. Griffiths and Darrell F. Schroeter, Introduction to Quantum Mechanics, Cambridge University Press, Cambridge, 2018.
2. Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill Education, New Delhi, 2003.
3. Albert D. Helfrick and William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice-Hall of India Pvt. Ltd., New Delhi, 1992.
4. Jacob Fraden, Handbook of Modern Sensors: Physics, Designs, and Applications, Springer International Publishing, Cham, 2016.Albert D. Helfrick and William David Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI Learning Pvt. Ltd., New Delhi, 2014.

Web References:

1. Quantum Mechanics I, https://onlinecourses.nptel.ac.in/noc26_ph08/preview
2. Quantum Mechanics – An Introduction, https://nptel.ac.in/courses/115106066
3. X-ray Crystallography and Diffraction, https://onlinecourses.nptel.ac.in/noc22_mm39/preview
4. Design of Mechatronic Systems, https://nptel.ac.in/courses/112101304
5. The Science of Light Amplification: An Extensive Laser Course, https://onlinecourses.nptel.ac.in/noc25_ph26/preview
6. Laser: Fundamentals and Applications, https://nptel.ac.in/courses/104104085
7. A Brief Course on Superconductivity,https://onlinecourses.nptel.ac.in/noc26_ph11/preview

Program: Artificial Intelligence and Machine Learning / Artificial Intelligence (AI) and Data Science / Computer Science and Engineering (Data Science)	F. Y. B.Tech	Semester: I
Quantum Physics (RCP26ABS102/ RCP26SBS102/RCP26DBS102)		
Quantum Physics Laboratory (RCP26ABS102L/RCP26SBS102L/RCP26DBS102L)		

Pre-requisite: Knowledge of

Foundations of physics and mathematics till H.S.C. or equivalent is necessary to comprehend engineering physics curriculum effectively.

Course Objective(s):

1. Identify and understand the fundamental physical principles underlying engineering technologies a prerequisite to become successful engineer.
2. To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture into the research field.
3. To equip students with the basic principles of quantum mechanics needed to analyse microscopic phenomena and understand their significance in contemporary scientific and engineering fields.
4. To provide awareness of contemporary technologies derived from quantum physics and their role in addressing modern engineering challenges.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the fundamental concepts of quantum mechanics and wave particle duality.	L2	Understand
CO2	Apply Schrödinger's equations and quantum operators to simple quantum systems.	L3	Apply
CO3	Analyse quantum models and phenomena including confinement, tunnelling, spin and harmonic oscillator.	L4	Analyse
CO4	Explain the principles and characteristics of lasers and optical fibre communication.	L2	Understand
CO5	Evaluate basic quantum technologies and their applications in computing, tunneling and superconducting devices.	L5	Evaluate

Quantum Physics
Course Contents

Unit-I Physical fundamentals of Quantum Mechanics 05 Hrs.

Matter waves its properties, De Broglie hypothesis, Concept of Phase velocity and group velocity and relation with particle velocity, Wave Packet, Heisenberg's Uncertainty Principle, Wave function; Conditions for well-behaved wave-functions, Physical interpretation of wave function, Normalization of wave functions.

Unit-II Schrodinger Wave Mechanics 06 Hrs.

Schrodinger's time dependent wave equation Significance, Schrodinger's time independent wave equation Significance, Comparison of TDSE TISE, Properties of Schrodinger's equations, Quantum Mechanical Operators its properties, Types of operators: Space coordinate, Energy, Momentum, Hamiltonian Eigen functions, Eigenvalues, Expectation value of dynamical variables, Ehrenfest Theorem.

Unit-III Quantum Physical Models 06 Hrs.

Free particle, Particle trapped in a 1D potential well and its extension in 3D (Energy, Wave functions Probability density), Probability Current Density, Equation of Continuity in Quantum Mechanics, Potential Step (Both cases: E¿V0. E¡V0), Quantum Tunneling, Barrier Penetration (Rectangular Potential), Quantum Harmonic Oscillator (Qualitative Treatment).

Unit-IV Physical Fundamentals of Quantum Photonics 06 Hrs.

Absorption, Spontaneous emission and Stimulated emission; Einstein's coefficients, Metastable state, Resonant cavity, Population inversion, Laser beam characteristics.

Numerical aperture, acceptance angle, Optical fibre specifications, Single mode Multimode, Step index and Graded index optical fibres, Modes of optical signal propagation, Dispersion of signal, Attenuation of signal, V number, Optical fibre transmission.

Unit-V Quantum systems & Applications 05 Hrs.

Introduction to Quantum Computing: Difference between classical computing and quantum computing, Physical Concept of Qubits, Concept of Quantum Superposition theorem and Quantum Entanglement (Spooky action at a distance).

Quantum Tunneling Devices: Tunnel Field effect Transistors (TFETs), Tunnel Diode, Tunneling Magneto resistance Sensors (TMRs), Scanning Tunneling Microscope (STM), Concept of BCS cooper pairs and DC-AC Josephson junctions, Superconducting Quantum Interference Devices (SQUIDs).

Quantum Physics Laboratory

Experiment Title:

1. Determination of Planck's constant using LED.
2. Determination of wavelength of LASER using single slit diffraction
3. Determination of Planck's constant using Photodiode.
4. Study of divergence of LASER beam
5. Determination of Numerical Aperture of an optical fiber.
6. Study of Zener diode as a Voltage regulator.
7. Characterization study of Diffraction Optics.
8. Characterization study of Polarization Optics
9. To study the reverse IV characteristics of Photodiode.
10. Determination of grating element or wavelength using Diffraction grating (Laser source).
11. Study of Optical fibre specifications.
12. Characteristic Study of TMR (Tunneling Magneto resistance Sensors).
13. Characteristics study of STM (Scanning Tunneling Microscope)
14. Characteristics study of Tunnel Field effect Transistors (TFETs)
    Performance-Based Experiments (Hands-on and Simulation Tools)
15. Simulation studies on visualization of wave functions
16. Simulations on quantum tunneling demonstration experiments
17. Simulation study of the optical devices.
18. Simulation study of the Quantum Systems

Minimum six/seven experiments will be conducted in this laboratory course from the above suggested list or any other experiment based on syllabus mentioned above will be conducted batch wise to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies. Also one/two experiments from the virtual lab platform for the enhancement of conceptual understanding and visual-observational skills for abstract or microscopic scientific concepts among students.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. M. N. Avadhanulu and P. G. Kshirsagar, Problems in Engineering Physics, S. Chand Publishing, New Delhi, 2012.
2. D. K. Bhattacharya and Poonam Tandon, Engineering Physics, Oxford University Press, New Delhi, 2015.
3. Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson India Education Services Pvt. Ltd., Chennai, 2018.
4. Wiley Editorial, Engineering Physics: As per AICTE, Wiley India Pvt. Ltd., New Delhi, 2020.
5. V. Rajendran, Engineering Physics, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2010.
6. N. Subrahmanyam, Brij Lal and M. N. Avadhanulu, A Textbook of Optics, S. Chand Company Pvt. Ltd., New Delhi, 2012.

Reference Books:

1. Ajoy Ghatak and S. Lokanathan, Quantum Mechanics: Theory and Applications, Springer, Dordrecht, 2004.
2. V. Devanathan, Quantum Mechanics, Narosa Publishing House, New Delhi, 2005.
3. David J. Griffiths and Darrell F. Schroeter, Introduction to Quantum Mechanics, Cambridge University Press, Cambridge, 2018.
4. R. Shankar, Principles of Quantum Mechanics, Springer, New York, 1994.
5. Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.
6. A. S. Vasudeva, Modern Engineering Physics, S. Chand Publishing, New Delhi, 2013.
7. Albert D. Helfrick and William David Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI Learning Pvt. Ltd., New Delhi, 2014.
8. Francis A. Jenkins and Harvey E. White, Fundamentals of Optics, McGraw-Hill Education, New York, 2001.
9. Michael A. Nielsen and Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, Cambridge, 2010.

10. Nouredine Zettili, Quantum Mechanics: Concepts and Applications, Wiley, Hoboken, 2022.

11. Jack D. Hidary, Quantum Computing: An Applied Approach, Springer, Cham, 2021.

12. Ciaran Hughes, Joshua Isaacson, Anastasia Perry, Ranbel F. Sun and Jessica Turner, Quantum Computing for the Quantum Curious, Springer, Cham, 2021.

Web References:

1. Quantum Mechanics – An Introduction — https://nptel.ac.in/courses/115106066

2. NOC: Quantum Mechanics-I — https://nptel.ac.in/courses/115101107

3. NOC: Applied Optics — https://onlinecourses.nptel.ac.in/noc22_ph32/preview

4. NOC: Introduction to LASER — https://onlinecourses.nptel.ac.in/noc21_ph01/preview

5. NOC: Fiber Optics — https://onlinecourses.nptel.ac.in/noc20_ph07/preview

6. NOC: Introduction to Photonics —https://onlinecourses.nptel.ac.in/noc24_ee144/preview

7. Introduction to Quantum Computing — https://nptel.ac.in/courses/106106232

8. Quantum Entanglement: Fundamentals, Measures and Applications — https://onlinecourses.nptel.ac.in/noc26_ph14/preview

9. Physics of Nanoscale Devices —https://onlinecourses.nptel.ac.in/noc25_ee62/preview

10. Introduction to Semiconductor Devices — https://onlinecourses.nptel.ac.in/noc25_ee92/preview

11. Concepts in Magnetism and Superconductivity — https://onlinecourses.nptel.ac.in/noc25_ph49/preview

12. A Brief Course on Superconductivity — https://onlinecourses.nptel.ac.in/noc26_ph11/preview

Program: Electronics and Telecommunication Engineering	F. Y. B.Tech	Semester: I
Engineering Chemistry for Semiconductor and Electronic Applications (RCP26EBS102)		
Engineering Chemistry for Semiconductor and Electronic Applications Laboratory (RCP26EBS102L)		

Pre-requisite: Knowledge of

Basic process of polymerization and its properties and types.

Course Objective(s):

1. To obtain a strong hold on basic concepts of Chemistry that form fundamental principles of technology.
2. To give exposure to recent material development in the field of engineering.
3. To understand chemical processes involved in IC fabrication.
4. To analyse the phase transition parameters of the material.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe new approach of chemical analysis which is convenient to perform.	L2	Understand
CO2	Describe applications based on nano materials and modern polymers in engineering techniques.	L2	Understand
CO3	Illustrate the oxidation and doping mechanism.	L3	Apply
CO4	Recognize the etching process involved in IC fabrication.	L1	Remember
CO5	Recognize properties of materials and alloys with phase transformation.	L1	Remember

Engineering Chemistry for Semiconductor and Electronic Applications

Course Contents

Unit-I Spectroscopic Techniques and Applications 05 Hrs.

Introduction: Electromagnetic spectrum, its origin, properties and applications. Numericals based on energy of photon.

Spectroscopy: Principle, classification and types. Relation between electromagnetic spectrum, spectroscopy types and energy changes.

Flame Photometry: Principle, Instrumentation, working, applications, interferences, advantages and disadvantages. Jablonski diagram, Introduction to florescence and phosphorescence. Applications of fluorescence.

Unit-II Engineering Materials 05 Hrs.

(A) Nanomaterials: Introduction to nanomaterials. Fullerenes: Properties and applications. Carbon nanotubes: Types, Properties, Method of preparation (Laser, CVD), Applications.

(B) Polymers: Photoresists, Effect of heat on polymers (glass transition temperature), Viscoelasticity. Conducting Polymers and applications.

Unit-III IC Fabrication Processes-I 07 Hrs.

(A) Oxidation: Introduction, Growth Mechanism and Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxide Properties

(B) Diffusion and Ion implantation: Models of Diffusion in Solids, Fick's One-Dimensional Diffusion Equations, Atomic Diffusion Mechanisms, High-Energy Implantation, Implantation Equipment, Annealing.

Unit-IV IC Fabrication processes-II 07 Hrs.

Etching: Wet chemical etching- Crystalline Materials, Application to Silicon, Anisotropic Effects, Selective Etches. Dry physical etching- Ion Beam Etching, Sputter Etching. Dry chemical etching- Photoresist Removal, Pattern Delineation. Reactive plasma etching- Plasma Properties, Feature-Size Control and Anisotropic Etch Mechanisms, Reactive Plasma-Etching Techniques and Equipment.

Unit-V Phase Diagrams and Solid Solubility 04 Hrs.

Unitary Diagrams, Binary Diagrams, The Phase Rule, Isomorphous Diagrams, Eutectic Diagrams, Compound Formation.

Engineering Chemistry for Semiconductor and Electronic Applications Laboratory

Experiment Title:

1. To determine pH of different solutions using pH meter.
2. Determination of surface Tension of a given liquid at room temperature using stalgmometer by drop number method.
3. Saponification value of oil.
4. Acid value of oil.
5. Preparation of Phenol formaldehyde resins.
6. Chemical Etching of Copper/Brass Strip.
7. Determination of the Acidity of Solutions for Wet Etching Using a pH Meter.
8. Determination of percentage of Iron (% Fe) in Plain carbon steel.

A listed eight experiments based on the syllabus will be included, which would help the learner to apply the concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. Sorab K. Ghandhi, VLSI Fabrication Principles: Silicon and Gallium Arsenide, Wiley, 1994.
2. S. M. Sze, VLSI Technology, McGraw Hill, 1983.
3. Jain Jain, Engineering Chemistry, DhanpatRai, 2013.
4. S.S. Dara, A textbook of Engineering Chemistry, S. Chand, 1986.
5. Y.R. Sharma, Elementary Organic Spectroscopy, S. Chand, 2013.
6. A.K. Bandyopadhyay, Nanomaterials, New Age International Pvt Ltd / New Age Science, 2010.

Reference Books:

1. Stephen A. Campbell, The Science and Engineering of Microelectronic Fabrication, Oxford University Press, 2001.
2. Engineering Chemistry, Wiley India, (ISBN – 9788126519880), 2011.
3. Shashi Chawla, A Text Book of Engineering Chemistr, DhanpatRai, 2017.
4. B S Bahl, Arun Bahl, G D Tuli, Essentials of Physical Chemistry, S. Chand, 2022.
5. Colin N. Banwell, Fundamentals of molecular spectroscopy, McGraw-Hill Publications, 2017.
6. J. Michael Hollas, Basic Atomic and Molecular Spectroscopy, Royal Society of Chemistry, 2002.
7. Thomas Varghese K.M. Balakrishna, Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials, Atlantic Publishers Distributors (P) Ltd, 2023.

Web References:

1. Fundamentals of Spectroscopy
   https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_cy14
2. Polymers: Concepts, Properties, Uses and Sustainability
   https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ch51
3. Basic Overview of Semiconductor Device Processing and IC Fabrication
   http://www.digimat.in/nptel/courses/video/108104865/L36.html

Program: Electrical Engineering	F. Y. B.Tech	Semester: I
Chemistry in Electrical Engineering (RCP26LBS102)		
Chemistry in Electrical Engineering Laboratory (RCP26LBS102L)		

Pre-requisite: Knowledge of

Foundations of basic chemistry or equivalent is essential to comprehend chemistry in electrical engineering curriculum effectively.

Course Objective(s):

1. To provide students with fundamental knowledge of spectroscopy, materials chemistry, electrochemistry, and energy systems, enabling them to analyse chemical processes and devices effectively.
2. To develop skills in applying concepts of nanomaterials, polymers, corrosion science,e-waste management, and renewable energy technologies for innovative and environmentally responsible solutions

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply spectroscopic principles to analyze energy changes and chemical samples.	L3	Apply
CO2	Explain synthesis methods and applications of nanomaterials and polymers.	L2	Understand
CO3	Analyze electrochemical cells and fuel cells for energy applications.	L4	Analyze
CO4	Explain corrosion mechanisms and propose sustainable e-waste management strategies.	L2	Understand
CO5	Compare the working, characteristics and applications of rechargeable batteries and solar PV cells as sustainable energy solutions.	L2	Understand

Chemistry in Electrical Engineering
Course Contents

Unit-I Spectroscopic Techniques and Applications 05 Hrs.

Introduction, Spectroscopy, Principle, classification, Electromagnetic spectrum, Relation between electromagnetic spectrum, its origin, properties and applications. Numerical based on energy of photon. Flame Photometry: Principle, Instrumentation, working, applications, interferences, advantages and disadvantages. Jablonski diagram, Introduction to florescence and phosphorescence. Applications of fluorescence.

Unit-II Chemistry of Materials 05 Hrs.

(A) Nanomaterials: Introduction, Fullerene, its properties and applications, Method of preparation (Laser, CVD), Applications. Introduction, properties and applications - Nano fibers, Nano photonics and Nano sensors.

(B) Polymers: Introduction, Molecular weight- Number average molecular weight (Mn), Weight average molecular weight (Mw), Polydispersity index (PDI), numericals, Rubber, Synthesis, properties and application of Styrene-Butadine rubber.

Unit-III Electrochemistry 06 Hrs.

Introduction of Electrochemistry, Basic concepts, Electrochemical cells - electrode potentials, construction and working of a galvanic cell, electrochemical series and its applications. Electrodes- Glass electrode, Standard hydrogen electrode. Fuel cells - H2-O2 fuel cell; applications and advantages of fuel cells.

Unit-IV Corrosion Science and E-waste Management 07 Hrs.

(A) Corrosion Science: Introduction, Consequences of corrosion, theories of corrosion - dry corrosion and wet corrosion, types of corrosion- Waterline, pitting, concentration cell corrosion, Corrosion control-Introduction, anodic and cathodic protection, protective coatings-Galvanizing, tinning. Corrosion Rate calculation by Weight-Loss Method (Numerical).

(B) E-waste Management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling.

Unit-V Energy Conversion devices 05 Hrs.

(A) Rechargeable Batteries: Introduction, classification of batteries. Constriction, working, advantages, applications of Lithium ion battery and Sodium ion battery.

(B) Solar Energy: Introduction, importance of solar photo voltaic cell (PV), construction and Working of solar PV cell, advantages and disadvantages.

Text Books:

1. Jain, P. C., Jain, M. A Textbook of Engineering Chemistry. Dhanpat Rai Publications, New Delhi.
2. Dara, S. S., Umare, S. S. A Textbook of Engineering Chemistry. S. Chand Company Ltd., New Delhi.
3. Chawla, S. A Textbook of Engineering Chemistry. Dhanpat Rai Publications, New Delhi.
4. Rattan, S. Textbook of Engineering Chemistry. S. K. Kataria Sons, New Delhi.

Reference Books:

1. Palanna, O. G. Engineering Chemistry. Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. Kulkarni, S. K. Nanotechnology: Principles and Practices. Springer India, 2014.
3. Gowariker, V. R., Viswanathan, N. V., Sreedhar, J. Polymer Science. New Age International Publishers, New Delhi.
4. Poole, C. P., Jr., Owens, F. J. Introduction to Nanotechnology. John Wiley Sons.
5. Engineering Chemistry. Wiley India Pvt. Ltd. (Edition as prescribed by the university).

Chemistry in Electrical Engineering Laboratory

List of Experiment:

1. To determine pH of different solutions using pH meter.
2. Determination of surface Tension of a given liquid at room temperature using stalgmometer by drop number method.
3. Saponification value of oil.
4. Acid value of oil.
5. Preparation of Phenol formaldehyde resins.
6. Chemical Etching of Copper/Brass Strip.
7. Determination of the Acidity of Solutions for Wet Etching Using a pH Meter.
8. Determination of percentage of Iron (% Fe) in Plain carbon steel.

A listed eight experiments based on the syllabus will be included, which would help the learner to apply the concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. Mukkanti, K., et al. Practical Engineering Chemistry. B. S. Publications, Hyderabad, 2011.
2. Sudharani. Lab Manual on Engineering Chemistry. Dhanpat Rai Publications, New Delhi, 2009.

Reference Books:

1. Shuchi Tiwari, Engineering Chemistry Lab Manual, SCITECH Publications, 2010.
2. G. J. Jeffery, J. Bassett, J. Mendham, and R. C. Denney, Vogel's Text Book of Quantitative Chemical Analysis, 6th Edition, Longman Scientific Technical Publications, New York.
3. R. N. Goyal and H. Goel, A Text Book of Engineering Chemistry, Ane Books (P) Ltd., 2009.

4. S. S. Dara, A Text Book on Experiments and Calculations in Engineering Chemistry, S. Chand Company Ltd., 2003.

5. Gurdeep R. Chatwal and Sham K. Anand, Instrumental Methods of Chemical Analysis, Latest Edition, Himalaya Publishing House, 2015.

Program: Computer Engineering / Information Technology	F. Y. B.Tech	Semester: I
Biology for Computing (RCP26CBS102 / RCP26IBS102)		

Pre-requisite: Knowledge of

1. Basic Biology Concepts.
2. Fundamentals of Science and Engineering.

Course Objective(s):

1. To provide foundational knowledge of biological systems and healthcare technologies relevant to engineering and interdisciplinary healthcare applications.
2. To introduce the principles of biomedical systems, medical imaging, and genomics for understanding modern healthcare diagnostics and treatment approaches.
3. To develop an understanding of artificial intelligence-enabled healthcare technologies and their applications in intelligent medical systems.
4. To create awareness of ethical, societal and professional aspects associated with emerging healthcare technologies and biomedical innovations.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the fundamental concepts of biology and their relevance to healthcare, biotechnology and computing applications.	L2	Understand
CO2	Analyse various analytical and computational techniques used for biomedical data interpretation and healthcare solution development.	L4	Analyze
CO3	Evaluate ethical, safety, regulatory and societal considerations in the use of biomedical data and healthcare technologies.	L5	Evaluate

Biology for Computing
Course Contents

Unit-I Biomolecules and Bioengineering Foundations 09 Hrs.

Introduction to biology and its importance in engineering and healthcare applications, Biomolecules: carbohydrates, proteins, lipids and nucleic acids, DNA and RNA basics, Central dogma (DNA → RNA → Protein), Introduction to enzymes, Engineering applications of biomolecules: biosensors, biomaterials, bioplastics and healthcare technologies.

Case Study: Applications of biomolecules in healthcare and industry.

Unit-II Cardiovascular System Biomedical Signals 06 Hrs.

Structure and functions of the cardiovascular system, Blood circulation and blood pressure concepts, Introduction to biomedical devices: pacemakers, stents and defibrillators, Wearable healthcare monitoring systems and healthcare sensors.

Case Study: Wearable health monitoring systems.

Unit-III Brain Computer Interface (BCI) 09 Hrs.

Neurons and neural communication: Neuron structure and function, Action potentials, Synapses and neurotransmission, Central and peripheral nervous systems, Brain regions and their functions; History and evolution of BCI, BCI system pipeline: acquisition, processing, decoding, output, Types of BCIs.

Case Study: Brain-Controlled Wheelchair using EEG Signals.

Unit-IV Visual System Medical Imaging 06 Hrs.

Structure and functioning of the human eye, Vision and image perception, Rods and cones, Basics of medical imaging modalities: X-ray, CT, MRI and Ultrasound, Basics of digital imaging and medical image analysis, Introduction to AI-assisted diagnosis and computer vision in healthcare.

Case Study: Medical image interpretation and healthcare imaging applications.

Unit-V Genomics, Data Analysis Precision Healthcare 08 Hrs.

Genes and chromosomes, Gene expression and mutations, Introduction to genomics and DNA sequencing concepts, Introduction to bioinformatics and biological databases, Introduction to biomedical signals: ECG, EEG basics and waveform concepts.

Case Study: Genomics in disease prediction and drug response.

Unit-VI Bioethics & Emerging Trends in Healthcare Engineering 04 Hrs.

Bioethics and Technology, Privacy and security of medical and biological data, Ethical issues in AI-

based healthcare systems, Bias and Fairness in Intelligent Systems, Good Clinical Practice (GCP) basics, Introduction to CRISPR and gene editing, Emerging trends in healthcare technologies: bio-printing, AI in smart healthcare systems.
Case Study: Ethical challenges in AI-driven healthcare systems.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper Understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. Johnson, A.T., Biology for Engineers, McGraw Hill Education LLC, 2nd Edition, 2018.
2. Adam Bohr, Kaveh Memarzadeh (Eds.), Artificial Intelligence in Healthcare, Academic Press (Elsevier), Cambridge, Massachusetts, 2020 (1st Edition).
3. Jonathan R. Wolpaw, Elizabeth Winter Wolpaw (Eds.), Brain–Computer Interfaces: Principles and Practice, Oxford University Press, New York, 2012 (1st Edition).
4. Jerry L. Prince, Jonathan Links, Medical Imaging Signals and Systems, Pearson Education, Boston, 2022 (2nd Edition).
5. Rangaraj M. Rangayyan, Biomedical Signal Analysis, IEEE Press / Wiley-Interscience, New York, 2015 (2nd Edition).
6. John E. Hall, Guyton and Hall Textbook of Medical Physiology, Elsevier, Philadelphia, 2020 (15th Edition).
7. Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter, Molecular Biology of the Cell, Garland Science, New York, 2022 (7th Edition).

Reference Books:

1. John E. Hall, Guyton and Hall Textbook of Medical Physiology, Elsevier, Philadelphia, 2020 (15th Edition).
2. S. Ignacimuthu, Bioinformatics, Narosa Publishing House, New Delhi, 2014 (Revised Edition).
3. R. C. Dubey, Textbook of Biotechnology, S. Chand Company, New Delhi, 2022 (Latest Edition).
4. John D. Enderle, Joseph D. Bronzino, Introduction to Biomedical Engineering, Academic Press, Burlington, Massachusetts, 2012 (3rd Edition).
5. C. C. Chatterjee, Human Physiology, Medical Allied Agency, Kolkata, 2019 (Latest Revised Edition, Two Volumes).

6. B. D. Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, 2018 (4th Revised Edition).

7. Arthur T. Johnson, Biology for Engineers, CRC Press, Boca Raton, Florida, 2011 (1st Edition).

Web Reference:

1. Learn Genetics Utah – Virtual Labs: -https://learn.genetics.utah.edu/content/labs/

2. Amino Labs – Virtual Bioengineer Simulators: - https://amino.bio/pages/vbioengineer.

3. Amrita Virtual Labs – Computer-Aided Drug Design Virtual Lab: https://vlab.amrita.edu/index.php/theme/captcha/?sub=3amp;brch=277.

4. Biology for engineers and other non-biologists: https://onlinecourses.nptel.ac.in/e-learning/preview/noc19_ge31.

5. Introduction to Biomedical Imaging Systems: https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_bt50.

Program: Artificial Intelligence and Machine Learning / Artificial Intelligence (AI) and Data Science / Computer Science and Engineering (Data Science) / Mechanical Engineering / Civil Engineering	F. Y. B.Tech	Semester: I
Engineering Communication and Lean Thinking (RCP26AHS101 / RCP26SHS101 / RCP26DHS101 / RCP26MHS101 / RCP26VHS101)		
Engineering Communication and Lean Thinking Laboratory (RCP26AHS101L / RCP26SHS101L / RCP26DHS101L / RCP26MHS101L / RCP26VHS101L)		

Pre-requisite: Knowledge of

Basic understanding of communication and language skills.

Course Objective(s):

1. Understand the fundamentals and process of effective communication in academic and professional environments.
2. Develop active listening and verbatim note-taking skills for factual understanding and communication.
3. Build observation and awareness abilities using Lean Thinking and Gemba-based approaches.
4. Differentiate between facts, assumptions, and opinions while analyzing observations.
5. Apply structured thinking tools such as 4W1H and Ladder of Abstraction for professional reporting and communication.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the fundamentals and barriers of communication in professional environments.	L2	Understand
CO2	Demonstrate active listening, verbatim note-taking, and observation skills in academic and workplace situations.	L3	Apply
CO3	Apply observation principles and appreciative enquiry for factual analysis and interpretation.	L3	Apply
CO4	Use structured communication and reporting tools for reflection, discussion, and professional interaction.	L3	Apply
CO5	Illustrate basic systems thinking concepts and communicate system relationships using simple system dynamic models.	L2, L3	Understand, Apply

Engineering Communication and Lean Thinking

Course Contents

Unit-I Basics of Communication Skills 03 Hrs.

Fundamentals of communication; Process of communication; Verbal and non-verbal communication; Active listening skills; Verbatim note-taking; Barriers to communication; Professional interaction basics; Introduction to workplace communication; AI assisted communication practices; Communication for value creation and waste elimination.

Unit-II Observation and Awareness Skills 03 Hrs.

Importance of observation in engineering and daily life; seeing vs observing; Attention, approach and analysis; Visible, invisible and unknown observations; Fishbowl concept and Gemba observation; Observation without assumptions; Qualitative vs quantitative observations; Appreciative enquiry; Observation in human behaviour and surroundings.

Unit-III Analytical Thinking and Principles of Observation 02 Hrs.

Six Principles of Observation: Observe the Periphery, See the Unusual, look for Shadows, look for Missing, Identify Symbols, Make Comparisons. Facts vs Opinions, Observation-based analysis and interpretation.

Unit-IV Communication, Reflection and Professional Skills 04 Hrs.

Language of affection vs Language of report; 4W1H methodology; Ladder of Abstraction; Structured thinking and reporting; Reflection writing; Writing symbol words; Communication through factual observations. Introduction to visual communication.

Unit-V Systems Thinking and System Dynamics 02 Hrs.

Concept of systems; Components and interactions; Cause-and-effect relationships; Feedback loops; Introduction to Systems Thinking; Basics of System Dynamics Model Diagram; Simple engineering and daily-life system examples; Presentation skills through system model presentations and team discussions.

Engineering Communication and Lean Thinking Laboratory

List of Laboratory Experiments: (Any Eight)

1. Active listening and verbatim note-taking exercise.
2. Observation activity inside campus/workplace environment.
3. Gemba observation and reporting activity.
4. Facts vs opinions identification exercise.
5. Reflection writing activity.
6. 4W1H analysis activity.
7. Visual communication activity using symbols/images.
8. Team-based system dynamics model presentation.
9. Role play using non-verbal communication.
10. Email writing.
11. Case studies in workplace communication.
12. Comprehension and summarisation writing
13. Public Speaking

A minimum of eight experiments from the above-suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Reference Books:

1. James P. Womack and Daniel T.Jones, Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Revised and Updated. Free Press, New York, 2003
2. Peter M. Senge, The Fifth Discipline: The Art and Practice of The Learning Organization, Crown Currency, United States, 2006

3. Shoji Shiba David Walden, Breakthrough Management: Principles, Skills, and Patterns for Transformational Leadership, Confederation of Indian Industry, New Delhi, 2008

4. Samuel I. Hayakawa, Language in Thought and Action, Harcourt Brace International, India, 1991

5. P. D. Hemphill, D. W. McCormick R. D Hemphill, Business Communication with Writing Improvement Exercises, Pearson, Upper Saddle River, NJ: Prentice Hall, 2001

6. Kitty O. Locker Stephen Kyo Kacmarek, Business Communication: Building Critical Skills, McGraw-Hill, 2019

7. Meenakshi Raman Sangeeta Sharma, Technical Communication: Principles and Practice, New Delhi, Oxford University Press, 2016

8. Asha Kaul, Effective Business Communication, Prentice-Hall of India, 2015

9. M. Ashraf Rizvi Priyadarshi Patnaik, Effective Technical Communication: A guide for scientists and engineers, New Delhi, Tata McGraw Hill, 2010

10. Norman Lewis, Word Power Made Easy, Random House USA, 2014

11. Sanjay Kumar Pushp Lata Communication skills. New Delhi, Oxford University Press, 2018

12. Shirley Mathew, Effective Communication Skills, Nirali Prakashan, 2025

13. Smita Rane Chumki Biswas, Professional Communications and Ethics, Himalaya Publishing House, 2025

14. Jacqueline Farrington, The Non-Obvious Guide to Better Presentations: How to Present Like a Pro (Virtually or in Person), Ideapress Publishing, 2023

15. Aruna Koneru, Professional Communication, McGraw Hill, 2018

Program: Mechanical Engineering/ Civil Engineering	F. Y. B.Tech	Semester: I
Engineering Mechanics (RCP26MES102/ RCP26VES102)		
Engineering Mechanics Laboratory (RCP26MES102L/ RCP26VES102L)		

Pre-requisite: Knowledge of

Fundamentals of Engineering Mathematics, Physics, and basic mechanics concepts related to force, motion, and energy.

Course Objective(s):

1. To understand the fundamental concepts of Engineering Mechanics, including force systems, moments, centroids, and moment of inertia.
2. To analyse coplanar force systems, friction, and equilibrium conditions for solving problems related to beams and engineering structures.
3. To apply kinematics, kinetics, work-energy, and dynamic principles to analyse the motion of particles and rigid bodies.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain force systems, moments, centroids, and centre of gravity.	L2	Understand
CO2	Apply equilibrium principles and free-body diagrams to determine support reactions.	L3	Apply
CO3	Analyse dry-friction problems involving ladders, wedges, and inclined planes.	L4	Analyze
CO4	Apply kinetics principles to solve particle-motion problems.	L3	Apply
CO5	Evaluate rigid-body kinetics in translational and rotational motion.	L5	Evaluate

Engineering Mechanics
Course Contents

Unit-I Force Systems and Center of Gravity 05 Hrs.

Force, Concept of force, composition, resolution and resultant of coplanar forces. Moment of force about a point and Varignon's theorem. Force-couple systems. Center of gravity and centroid of simple geometrical bodies. Center of gravity and centroid of simple geometrical

Unit-II Equilibrium of Rigid Bodies 06 Hrs.

Equilibrium of Rigid Bodies, Conditions of static equilibrium and free body diagrams, Equilibrium of connected bodies, Types of supports and support reactions, Analysis of statically determinate beams under different loading conditions, Determination of support reactions.

Unit-III Friction 04 Hrs.

Static and kinetic friction. Laws of dry friction. Angle of friction, cone of friction, and angle of repose. Equilibrium analysis of block friction, ladder friction, and wedge.

Unit-IV Kinetics of Particles 06 Hrs.

Newton's laws of motion. D'Alembert's principle. Work-energy principle and applications. Impulse-momentum principle and applications to particle systems. Motion in rectilinear and curvilinear coordinates.

Unit-V Kinetics of Rigid Bodies 07 Hrs.

Moment of inertia. Kinetics of rigid bodies under translation and rotation. Equations of motion for rigid bodies. Work-energy principle for rigid bodies (basic applications). Impulse-momentum principle (basic linear form). Rolling motion without slipping (introductory concept only).

Engineering Mechanics Laboratory

List of Laboratory Experiments:

1. Verification of Polygon law of coplanar forces.
2. Verification of law of Moment using Bell crank lever.
3. Determination of Support reaction for beam.
4. Determination of coefficient of friction using Inclined plane
5. Verification of Lami's theorem using Jib crane.
6. Resultant of non-concurrent non-parallel coplanar force system.
7. Determination of coefficient of restitution for Collision of elastic bodies (Law of conservation of momentum).
8. Measurement of linear acceleration using MPU-6050 (3-axis accelerometer/ gyroscope) with ESP32.
9. Measurement of rotational speed (RPM) of a shaft using an IR tachometer / Hall effect sensor with ESP32.
10. Measurement of force and weight using HX711 load cell amplifier with ESP32; calibration and static equilibrium verification.

A minimum of six experiments from the above-suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. A. K. Tayal, Engineering Mechanics, Umesh Publications.
2. S. Ramamrutham, Engineering Mechanics, Dhanpat Rai Publishing Company.

Reference Books:

1. Hibbeler, R. C. Engineering Mechanics, Pearson Education.
2. Beer, F. P., Johnston, E. R. Engineering Mechanics, Tata McGraw-Hill.
3. Bhattacharya, B. Engineering Mechanics, Oxford University Press.
4. Nelson, McLean. Engineering Mechanics, Tata McGraw-Hill.

Program: Artificial Intelligence and Machine Learning / Artificial Intelligence (AI) and Data Science / Computer Science and Engineering (Data Science)	F. Y. B.Tech	Semester: I
Applied Mechanics and Robotics (RCP26AES102 / RCP26SES102 / RCP26DES102)		
Applied Mechanics and Robotics Laboratory (RCP26AES102L / RCP26SES102L / RCP26DES102L)		

Pre-requisite: Knowledge of

1. Fundamentals of Engineering Mathematics and Physics.
2. Basic mechanics concepts: force, motion, and energy.

Course Objective(s):

1. To understand and apply the principles of coplanar force systems, equilibrium, and support reactions in engineering structures.
2. To understand the structure, components, and kinematics of planar and spatial robotic systems using coordinate transformations and the D-H convention.
3. To analyse the velocity and acceleration of robotic end effectors using Jacobian matrix formulation.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply force-system principles to determine resultants and equivalent force-couple systems.	L3	Apply
CO2	Apply equilibrium conditions to determine support reactions of beams under various loading conditions.	L3	Apply
CO3	Explain the structure, types, and functions of components of planar and spatial robotic systems.	L2	Understand
CO4	Apply homogeneous transformation matrices and D-H convention to determine robot forward kinematics.	L3	Apply
CO5	Analyse robot end-effector velocity and acceleration using the Jacobian matrix.	L4	Analyze

Applied Mechanics and Robotics
Course Contents

Unit-I Resultant of Coplanar Force Systems 06 Hrs.

Resultant of concurrent, parallel, and non-concurrent non-parallel force systems, moment of a force about a point, Varignon's Theorem, couples, force-couple system, distributed forces on a plane.

Unit-II Equilibrium of Coplanar Force Systems 06 Hrs.

Conditions of equilibrium for concurrent, parallel, and general (non-concurrent non parallel), force systems; free body diagrams; types of supports and loads on beams, determination of support reactions for simply supported, overhanging, and cantilever beams under concentrated, uniformly distributed, and uniformly varying loads (excluding internal hinges).

Unit-III Fundamentals of Robotics: Structure, Types, and Components 06 Hrs.

Introduction to robots and their applications. Types of robots: planar and spatial robots. Basic structure of robots including links, joints, and Degrees of Freedom (DOF). Components of robotic systems: sensors (proximity, ultrasonic, and camera basics), actuators (DC motors and servo motors), controllers (basic concept of microcontrollers and Arduino), and end effectors (grippers/tools).

Unit-IV Robot Kinematics and Coordinate Transformations 06 Hrs.

Coordinate systems and robot positioning. Concept of orientation and movement of robotic arms. Homogeneous transformation matrices. D-H convention for robot configuration. Introduction to forward kinematics without derivation. Simple applications of forward kinematics for planar robot motion.

Unit-V Velocity and Acceleration of Robotic Manipulators 04 Hrs.

Basic concept of velocity and acceleration in robotic systems. Velocity and acceleration of end effector using matrix form for planar robot motion (Jacobian).

Applied Mechanics and Robotics Laboratory

List of Laboratory Experiments:

1. Verification of Polygon law of coplanar forces.
2. Verification of law of Momentum using Bell crank lever.
3. Determination of Support reaction for beam.
4. Determination of coefficient of friction using Inclined plane.
5. Verification of Lami's theorem using Jib crane.
6. Resultant of non-concurrent non-parallel coplanar force system.
7. Determination of coefficient of restitution for Collision of elastic bodies (Law of conservation of momentum).
8. Programming exercises on determination of Resultant of Coplanar Force System.
9. Programming exercises on determination of Support Reaction.
10. Programming exercises on Friction.

A minimum of eight experiments from the above-suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. A. K. Tayal, Engineering Mechanics, Umesh Publications.
2. S. Ramamrutham, Engineering Mechanics, Dhanpat Rai Publishing Company.

Reference Books:

1. Hibbeler, R. C. Engineering Mechanics, Pearson Education.
2. Beer, F. P., Johnston, E. R. Engineering Mechanics, Tata McGraw-Hill.
3. Bhattacharya, B. Engineering Mechanics, Oxford University Press.
4. Nelson, McLean. Engineering Mechanics, Tata McGraw-Hill.
5. M.P. Groover, M. Weiss, R.N. Nagel, and N.G. Odrey, Industrial Robotics: Technology, Programming and Applications, Tata McGraw Hill.

Program: Mechanical Engineering/ Civil Engineering	F. Y. B.Tech	Semester: I
Engineering Graphics I (RCP26MES103 / RCP26VES103)		
Engineering Graphics I Laboratory (RCP26MES103L / RCP26VES103L)		

Pre-requisite: Knowledge of

Basics of geometrical constructions.

Course Objective(s):

1. To introduce the fundamentals of engineering drawing, drawing standards, dimensioning practices, and projection systems used in engineering communication.
2. To develop the ability to visualize and represent three-dimensional objects through orthographic projections and multi-view drawings.
3. To impart knowledge of isometric drawing techniques for effective pictorial representation of engineering components and objects.
4. To enhance spatial visualization skills required for interpreting and constructing missing views from given engineering drawings.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply engineering drawing conventions, dimensioning standards, and projection principles in technical drawings.	L3	Apply
CO2	Construct orthographic projections and multi-view drawings of simple solids and machine components using the First Angle Projection method as per BIS standards.	L6	Create
CO3	Develop isometric views and convert orthographic drawings into isometric representations of engineering objects and components.	L6	Create
CO4	Interpret engineering drawings and generate missing views of objects using visualization and projection principles.	L4	Analyze

Engineering Graphics I
Course Contents

Unit-I Introduction to Engineering Drawing 01 Hrs.

Types of Lines, Dimensioning Systems as per IS conventions, Types of Projections.

Unit-II Orthographic projections 05 Hrs.

Principles of Orthographic Projection; Projection planes and reference line (XY); Methods of Projection: First Angle Projection and Third Angle Projection; Selection and arrangement of Front View, Top View, and Side View.; Orthographic Views of Simple Solids: Cube, Prism, Cylinder, and Cone.; Generation of multi view drawings from pictorial representations; Drawing different views of simple machine parts as per the First Angle Projection Method recommended by Bureau of Indian Standards (BIS/IS).

Unit-III Isometric Views 04 Hrs.

Introduction to Isometric Drawing and Isometric Projection; Difference between Isometric View and Isometric Projection; Isometric Axes and Isometric Scale; Principles and conventions used in isometric representation; Construction of Isometric Views of simple geometrical shapes; Isometric Views of simple solids: Cube, Prism, Pyramid, Cylinder, and Cone; Conversion of Orthographic Views into Isometric Views; Drawing Isometric Views of simple machine components and engineering objects (plain and cylindrical, excluding spheres); Visualization and interpretation of three-dimensional objects using isometric drawings.

Unit-IV Missing Views 04 Hrs.

Interpretation of orthographic drawings and construction of the missing front, top, or side view from the given views of simple engineering objects and machine components using principles of visualization and projection.

Engineering Graphics I Laboratory

List of Laboratory Experiments:

1. Familiarization with drawing instruments, line types, lettering, and dimensioning practices as per BIS standards.
2. Drawing examples demonstrating first-angle and third-angle projection methods. Drawing front, top, and side views of simple geometrical objects.
3. Generation of orthographic views of prism, cylinder, cube and cone in different orientations.
4. Generation of orthographic views from given pictorial or isometric sketches.
5. Generation of orthographic views from given pictorial or isometric sketches.
6. Generation of orthographic views from given pictorial or isometric sketches.
7. Drawing isometric views of cube, prism, cylinder, cone, and combinations of solids.
8. Development of isometric drawings from given orthographic projections.
9. Development of isometric drawings from given orthographic projections.
10. Preparation of isometric views of engineering objects and machine parts.
11. Determination and construction of missing front, top, or side views from given orthographic drawings.
12. Determination and construction of missing front, top, or side views from given orthographic drawings.

Minimum eight exercises from the above suggested list covering all the topics or any other exercise based on syllabus will be included, which would help the learner to apply the concept learnt.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House.
2. M. B. Shah, B. C. Rana, Engineering Drawing, Pearson Education.
3. Basant Agrawal, C M Agrawal, Engineering Drawing, Third Edition, Tata McGraw Hill Education Private Limited.

Reference Books:

1. K. Venugopal (2007), Engineering Drawing and Graphics + AutoCAD, New Age International Publishers.
2. M. L. Dabhade (2008), Engineering Drawing, Vision Publications.

3. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to AutoCAD, Tata McGraw Hill Education Private Limited.

Web Reference:

1. Swayam Course: https://onlinecourses.nptel.ac.in/e-learning/course/noc26_me175

Program: Computer Engineering /Electronics and Telecommunication Engineering/ Information Technology /Electrical Engineering	F. Y. B.Tech	Semester: I
Engineering Graphics (RCP26CES102 / RCP26EES102 / RCP26IES102/ RCP26LES102)		
Engineering Graphics Laboratory (RCP26CES102L / RCP26EES102L /RCP26IES102L /RCP26LES102L)		

Pre-requisite: Knowledge of

Basics of geometrical constructions.

Course Objective(s):

1. Students should be able to visualize the objects.
2. They should be able to understand and read drawing.
3. To impart and inculcate proper understanding of the theory of projection.
4. They should be able to present the same.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Recognize the value of engineering graphics, as a language of engineers.	L2	Understand
CO2	Construct orthographic views of basic shapes of solids.	L3	Apply
CO3	Interpret and sketch orthographic and sectional orthographic views of various machine components.	L4	Analyze
CO4	Visualize objects, and draw isometric views.	L3	Apply
CO5	Build 2D sketches using Auto CAD.	L6	Create

Engineering Graphics
Course Contents

Unit-I Introduction to Engineering Drawing 03 Hrs.

Types of Lines, Dimensioning Systems as per IS conventions, Types of Projections.

**Introduction to Auto CAD: - Basic Drawing and Editing Commands. Knowledge of setting up layers Dimensioning, Hatching, plotting and Printing.

Unit-II Orthographic projections 05 Hrs.

Different views of simple machine parts as per the first angle projection method recommended by I.S.

**Drawing of orthographic projections using Auto CAD.

Unit-III Sectional Orthographic projections 06 Hrs.

Concept of sectioning and drawing section lines, need for drawing sectional views, Section of simple geometrical solids-cases involving different types of cutting planes.

**Drawing of Sectional orthographic projections using Auto CAD.

Unit-IV Isometric Views 06 Hrs.

Isometric Views/Drawings of blocks (plain and cylindrical, excluding spheres).

**Drawing of Isometric Views using Auto CAD.

Unit-IV Projection of Solids 08 Hrs.

Projection of Solids: - (Prism, Pyramid, Cylinder Cone only)

Projections of Solids with the axis inclined to HP and VP. (Exclude Spheres, Composite, Hollow solids and frustum).

Use change of position or Auxiliary plane method.

**Drawing of Projection of Solid using Auto CAD.

** Should be covered during Auto CAD Practical.

Engineering Graphics Laboratory

List of Laboratory Experiments:

1. Orthographic Projections model 1 Using Auto CAD.
2. Orthographic Projections model 2 Using Auto CAD.
3. Sectional Orthographic Projections model 1 Using Auto CAD.
4. Sectional Orthographic Projections model 2 Using Auto CAD.
5. Sectional Orthographic Projections model 3 Using Auto CAD.
6. Isometric Views model 1 Using Auto CAD.
7. Isometric Views model 2 Using Auto CAD.
8. Isometric Views model 3 Using Auto CAD.
9. Projection of solids (Prism and Pyramid only) model 1 Using Auto CAD.
10. Projection of solids (Prism and Pyramid only) model 2 Using Auto CAD.
11. Layout Planning using AutoCAD for PCB.
12. Layout Planning using AutoCAD for Motherboard.

Minimum eight exercises from the above suggested list covering all the topics or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House.
2. M. B. Shah, B. C. Rana, Engineering Drawing, Pearson Education.
3. Basant Agrawal, C M Agrawal, Engineering Drawing, Third Edition, Tata McGraw Hill Education Private Limited.

Reference Books:

1. K. Venugopal (2007), Engineering Drawing and Graphics + AutoCAD, New Age International Publishers.
2. M. L. Dabhade (2008), Engineering Drawing, Vision Publications.
3. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to AutoCAD, Tata McGraw Hill Education Private Limited.

Web Reference:

1. Autodesk, AutoCAD Learning Videos – 2D objects, layers, dimensions, layouts and plotting https://www.autodesk.com/solutions/aec/autocad-tutorials.
2. Swayam Course: https://onlinecourses.nptel.ac.in/e-learning/course/noc26_me175
3. Autodesk, AutoCAD Learning Videos https://www.youtube.com/@autocad/videos.

Program: Computer Engineering / Information Technology/ Electronics and Telecommunication Engineering / Electrical Engineering	F. Y. B.Tech	Semester: I
Basic Electrical Engineering and Digital Electronics (RCP26CES103 / RCP26EES103 / RCP26IES103 / RCP26LES103)		
Basic Electrical Engineering and Digital Electronics Laboratory and Tutorial (RCP26CES103L / RCP 26EES103L / RCP26IES103L / RCP26LES103L)		

Pre-requisite: Knowledge of

1. Knowledge of basic physics
2. Knowledge of basic mathematics

Course Objective(s):

1. To develop basic understanding of concepts of DC and AC circuits and analyse their operations using various techniques.
2. To get an insight of digital electronics.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the knowledge of theorems/laws to analyse the DC circuits.	L3	Apply
CO2	Analyse single phase AC circuits.	L4	Analyze
CO3	Demonstrate the knowledge of logic gates and sequential circuits.	L3	Apply

Basic Electrical Engineering and Digital Electronics

Course Contents

Unit-I **DC Circuits** **05 Hrs.**

Introduction to ideal and practical voltage and current sources, Kirchhoff's current and voltage laws, Mesh and Nodal analysis, Supernode and Supermesh analysis.

Unit-II **DC Network Theorems** **06 Hrs.**

Star – Delta Transformation, Superposition Theorem, Thevenin's Theorem, Maximum Power Transfer Theorem.

Unit-III **AC Circuits** **10 Hrs.**

Generation and representation of alternating voltage and currents, RMS and Average value, Phasor representation, AC through resistance, inductance and capacitance, R-L-C series, parallel circuits, Calculation of power and power factor.

Unit-IV **Logic Gates** **04 Hrs.**

Basic gates, Universal gates, Boolean algebra, De Morgan's Laws.

Unit-IV **Latches and Flip flops** **03 Hrs.**

Introduction to Latches and Flip-flops, Flip-flops: RS, JK, T, D flip-flops.

Basic Electrical Engineering Digital Electronics Laboratory & Tutorial

Batch wise minimum 8 tutorial sessions are to be conducted on topics which would help the learner to identify/analyse the problem and to apply problem solving techniques learnt

Topics of Tutorial:

1. Mesh analysis.
2. Nodal analysis.
3. Supermesh analysis.
4. Supernode analysis.
5. Star – Delta Transformation.
6. Superposition Theorem.
7. Thevenin's Theorem.
8. Maximum Power Transfer Theorem.
9. RMS and Average value.
10. Phasor representation, Series R-L, Series R-C.
11. Series R-L-C, Parallel R-L-C circuits.
12. Logic Gates.
13. Latches and Flip-flops.

List of Practical's:

1. Study of basic laboratory instruments. (compulsory)
2. Mesh and Nodal analysis.
3. Verification of Superposition Theorem.
4. Verification of Thevenin.
5. Maximum Power Transfer Theorem.
6. R-L-C series resonance circuit.
7. Verification of truth table for gates.
8. Implementing a given logic function using basic gates/SSI ICs.

9. Implementation of basic gates using universal gates.
10. Study of SR Latch using NAND Gates

Batch wise laboratory work of minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Text Books:

1. Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill India, 2022.
2. B. R. Patil, Basic Electrical Engineering, Oxford Higher Education, 2016.
3. R. R. Singh, Network Analysis and Synthesis, McGraw Hill, 2019.
4. R. S. Sedha, A textbook of Electronic Devices and Circuits, S. Chand, 2002.
5. R. P. Jain, Modern Digital Electronics, McGraw Hill, 2011.

Reference Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
4. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
5. M. Morris Mano, "Digital design", Prentice Hall India.

Web Reference:

1. Basic Electrical Circuits - https://nptel.ac.in/courses/108106172
2. Fundamentals of Electrical - Engineering https://nptel.ac.in/courses/108105112

Program: Computer Engineering / Information Technology / Electronics and Telecommunication Engineering / Electrical Engineering	F. Y. B.Tech	Semester: I
Workshop Practice (RCP26CSC101L/ RCP26ISC101L/ RCP26ESC101L/ RCP26LSC101L)		

Pre-requisite: Knowledge of

Basic Sciences

Course Objective(s):

1. To explain the concepts of industrial safety and important of working safely.
2. To identify tools, work material and measuring instruments useful for fitting, welding, carpentry, sheet metal, plumbing, PCB and house wiring practice.
3. To understand various fabrication processes and machine protocols.
4. To handle tools and instruments and use them to prepare joints/jobs of specific shape and size.
5. To understand the basic concept and structure of computer hardware and networking
6. To understand the basic work tools of house wiring and house wiring connection etc.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the fundamentals of manufacturing to identify manufacturing process for given job drawing	L3	Apply
CO2	Select proper job material, tools, equipment's and machines required for operations according to the job drawing with safety measures	L4	Analyze
CO3	Plan the sequence of operations required for manufacturing /fabrication of the job as per drawing	L3	Apply
CO4	Acquire hands-on experience and complete job as per job drawing within allotted time adhering to safety norms and set procedures	L5	Create
CO5	Inspect the job dimensions as per job drawing	L4	Analyze

Workshop Practice
Course Contents

Group A

Unit-I Fabrication Processes 12 Hrs.

Use of setting of fitting tools for chipping, cutting, filing, making, center punching, drilling, tapping and finishing. Edge preparation for welding jobs, Arc welding for different job like, Lap welding of two plates, butt welding of plates with simple cover, are welding to join plates at right angles.

Unit-II PCB 12 Hrs.

Design, Layout drawing, Positive and negative film making, PCB etching and drilling, Tinning and soldering technique, Component mounting and circuit testing.

Unit-III House Wiring 12 Hrs.

Electrical safety in the workplace and safe work practices, Protection equipment, measures and tools. Introduction to house wiring, different types of cables, types of power supply, distribution of power supply, electrical wiring symbols. Wiring for two lamps (bulbs) with independent switch controls with or without looping, wiring for staircase lamp.

Unit-IV Computer Hardware and Networking 12 Hrs.

Dismantling of a Personal computer (PC), Identification of components of a PC such as power supply, motherboard, processors, hard disk, memory (RAM, ROM), CMOS battery, CD Drive, monitor, keyboard, mouse, printers, disk drives etc. Assembling of PC, Installation of Operating System (any one), and Device drives, Boot-up sequence, Installation of Application software (at least one). Basic trouble shooting and maintenance. Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables. Basic networking and crimping.

Group B

Unit-V Sheet Metal 08 Hrs.

Introduction to primary technology processes involving bending, punching and drawing, various sheet metal joints, development of joints.

Unit-VI Pipe Fitting 08 Hrs.

Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic

line involving fixing of a water tap and use of coupling, elbow, tee and union etc.

Unit-VII CNC Machines 08 Hrs.

Introduction of CNC Machine tools, working principle, classification, constructional features of CNC Machines, CNC controller, types of motion controls in CNC Machines, application of CNC Machines. Manual part programing for turning and milling.

Unit-VIII 3D Printing 08 Hrs.

Introduction to Additive Manufacturing Technologies for engineering applications, 3D printing of a simple custom object using FDM, SLA and SLS technologies.

Unit-IX Drone 08 Hrs.

Introduction to drone and its applications, Fabrication and testing of mini drone.

Workshop Practice

List of Laboratory Experiments: (Any Eight)

1. To study various types of fitting tools and make a Square joint, V joint, T joint, half round joint, dovetail joint from the given two MS pieces (Any one joint)
2. To study various welding techniques and make a V-butt joint or Lap-joint, using the given mild steel pieces by are welding.
3. To make printed circuit board as per the given circuit drawing.
4. To make connection to two lights control by one switch in series or one light control by two-way switches.
5. To study computer hardware and operating system.
6. To study various types of sheet metal tools and make square or rectangular tray.
7. To study various types of plumbing tools and make one job containing various pipe fitting.
8. To study various operations of a CNC machining center and make one simple job on CNC turning.
9. To study various 3D printing techniques and make a simple object using any of these technique.
10. To study, fabricate and test mini drones.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation scheme:

Term work shall consist of minimum one main job and two group jobs The distribution of marks for term work shall be follows: Laboratory work (Performance of experiments) : 25 Marks

1. Anyone Job from Group A (Main Job)
2. Any two Jobs from Group B (Group Job)

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Text Books:

1. P.F. Ostwald, Manufacturing Process and Systems, 9th Edition, John Wiley and Sons INC. UK 2008.

2. R.P. Singh, Electrical Workshop: Safety, Commissioning, maintenance and testing of electrical equipment, 3rd Edition, IK International Publishing House Pvt. Ltd. 2012.

Reference Books:

1. K.C. John , Mechanical Workshop Practice, 2nd Edition, PHI Learning Pvt. Ltd. 2014

2. P. N. Rao, Manufacturing Technology- Vol 1, 4th Edition, Tata McGraw Hill, 2014.

3. R. S. Khandpur, Printed Circuit Boards: Design, fabrication, assembly and testing, 1st Edition, , Tata McGraw Hill 2005.

Program: Computer Engineering / Computer Science & Engineering (Data Science) / Electronics & Telecommunication Engineering / Artificial Intelligence and Machine Learning / Artificial Intelligence & Data Science / Information Technology / Electrical Engineering	F. Y. B.Tech	Semester: I
Health and Wellness (RCP26ALL101T / RCP26SLL101T / RCP26CLL101T/ RCP26DLL101T/ RCP26ELL101T/ RCP26ILL101T / RCP26LLL101T)		

Course Objective(s):

1. To understand principles of physical, mental, social and spiritual wellness.
2. To understand the significance of digital health.
3. To practice stress management and emotional resilience.
4. To develop healthy lifestyle habits for good health.
5. To impart strategies to solve community or campus health challenges.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the multidimensional nature of health and its role in engineering careers.	L2	Understand
CO2	Use digital wellness and fitness platforms effectively.	L3	Apply
CO3	Employ personal development (both physical & emotional) strategies for better living.	L3	Apply
CO4	Create a plan for good health through a positive mindset.	L6	Create
CO5	Design simple digital solutions (posters) to address community or campus health challenges.	L6	Create

Health and Wellness
Course Contents

Unit-I Foundations of Health & Wellness 04 Hrs.

WHO definition — dimensions of health; Physical, mental, social spiritual wellness; Health vs. disease continuum; Role of lifestyle in engineering careers.

Unit-II Digital Health and Wellness 06 Hrs.

Introduction to digital health; Telemedicine and e-health systems; Wearable health devices; Fitness trackers and smart watches.

Unit-III Mental Health and Stress Management 06 Hrs.

Stress, anxiety, and burnout; Time management for students; Yoga for mind and body (Mindfulness and Meditation); Building resilience; Emotional Intelligence.

Unit-IV Nutrition and Healthy Lifestyle 06 Hrs.

Balanced diet and nutrition basics; Food habits and metabolism; Exercise and fitness principles; Sedentary lifestyle risks for students; Ergonomics posture at workstations; Hydration sleep hygiene; Substance abuse awareness.

Unit-V Community Environmental Health 04 Hrs.

Environmental pollution health impacts; Sustainable living green habits; Campus health resources; Social responsibility in public health.

Health and Wellness Tutorial

Batch wise minimum 8 tutorial sessions are to be conducted on topics which would help the learner to identify/analyse the problem and to apply problem solving techniques learnt

List of Topics:

1. Fundamentals of Good Health.
2. Create a Personalized Health Goal Plan.
3. Lifestyle choice (Healthy or Unhealthy) to explore.
4. Skit on Health and Disease Prevention.
5. Role-play techniques to promote awareness regarding Digital health and disease prevention.
6. Yoga Activity for Mind and Body-Mindfulness Meditation.
7. Stress Management-Group Discussion 8 Real-world nutrition design task.
8. Real-world nutrition design task.
9. Emotional Intelligence and Mind Management (Case Study).
10. Create a digital awareness poster.
11. Nutrition and Healthy Lifestyle.
12. Digital journaling for mood tracking.

Mini Project – Community Health and Wellness Initiative:

1. **Research and Assess Community Needs:**
   (a) Conduct surveys or interviews to assess the health and wellness needs of your community.
   (b) Identify specific areas where improvements can be made, such as physical fitness, mental health, social connections, or access to healthcare resources.
2. **Fitness and Recreation Events:**
   (a) Arrange fitness events, such as community walks or runs, group exercise classes, yoga sessions, or sports tournaments.
3. **Health Education Campaigns:**
   (a) Launch health education campaigns to raise awareness about specific health issues relevant to your community
   (b) This could include distributing informational pamphlets, organizing educational talks, etc.

(c) Creating Social Media Campaigns to share important health messages. Develop a plan to sustain the project beyond its initial phase.

4. **Health and Wellness Advocacy:**

   (a) Choose a health issue you are passionate about and design a health and wellness advocacy project.

   (b) Students can create a Persuasive Video, Infographic or Social Media Campaign to raise awareness and mobilize support for their chosen cause.

A minimum of eight assignments a mini-Project from the above-suggested list or any other assignment based on the syllabus will be included, which would help the learner to apply the concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Reference Books:

1. C. Bouchard, S. N. Blair, and W. L. Haskell, Eds., Physical Activity and Health. Champaign, IL, USA: Human Kinetics, 2012.
2. E. Attached and M. Fernandez, Mental Health Workbook, 2021.
3. N. Lorick, Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Well-Being, 2022.
4. C. Nyambichu and J. Lumiri, Lifestyle Diseases: Lifestyle Disease Management, 2018.
5. A. Clow and S. Edmunds, Physical Activity and Mental Health. Champaign, IL, USA: Human Kinetics, 2013.
6. B. K. S. Iyengar, Yoga for Beginners: A Practical Guide. London, U.K.: Dorling Kindersley, 2006.
7. D. Goleman, Emotional Intelligence: Why It Can Matter More Than IQ. New York, NY, USA: Bantam Books, 2006.
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Web Reference:

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2. Thomas Jefferson University — 8 Dimensions of Wellness — https://www.jefferson.edu/life-at-jefferson/health-wellness/fitness/8-dimensions-wellness.html

3. Open Medscience — Wearable Devices and Apps in Healthcare (role in telemedicine) https://openmedscience.com/wearable-devices-and-apps-a-growing-partnership/

4. Meegle — Wearable Tech for Telemedicine — https://www.meegle.com/en_us/topics/wearable-technology/wearable-tech-for-telemedicine

5. Mindful.org — How to Manage Stress with Mindfulness and Meditation — https://www.mindful.org/how-to-manage-stress-with-mindfulness-and-meditation/

6. PMC/NIH — Mindfulness-Based Approaches for Stress, Anxiety & Depression in Health Students - https://pmc.ncbi.nlm.nih.gov/articles/PMC8435111/

7. College Ave — Effective Time Management for Students — https://www.collegeave.com/articles/effective-time-management-for-students/

8. Harvard T.H. Chan School of Public Health — Healthy Eating Plate — https://nutritionsource.hsph.harvard.edu/healthy-eating-plate/

9. Health Discovery — Ergonomics & Nutrition (posture, workstation health) — https://healthdiscovery.org/nutrition/ergonomics-nutrition-combo/

10. PMC/NIH — Diet and Sleep Behaviors in Student-Athletes (sleep hygiene study) —

11. PAHO/WHO — Environmental Determinants of Health — https://www.paho.org/en/topics/environmental-determinants-health

12. PMC/NIH — Environmental and Health Impacts of Air Pollution: A Review — https://pmc.ncbi.nlm.nih.gov/articles/PMC7044178/

13. Frontiers in Public Health — Greening Public Health (embedding sustainability in practice) — https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2026.1888689/full

Program: Artificial Intelligence and Machine Learning / Artificial Intelligence & Data Science / Computer Science & Engineering (Data Science) / Mechanical Engineering / Civil Engineering	F. Y. B.Tech	Semester: I
Indian Knowledge Systems (RCP26AHS102T / RCP26SHS102T / RCP26DHS102T/ RCP26MHS102T / RCP26VHS102T)		

Course Objective(s):

1. To impart knowledge about basic principles of thought process, reasoning, and inferencing.
2. To make students aware of Indian Traditional knowledge Systems connecting society and nature.
3. To acquaint students with the holistic lifestyle of yogic science and wisdom in modern society with rapid technological advancements and societal disruptions.
4. Develop ethical values, critical thinking, and holistic perspectives through Indian traditions.
5. Explore Indian Knowledge Systems and their contributions to society and civilization.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the history of Indian education system.	L2	Understand
CO2	Learn about Indian Scientists and their inventions.	L1	Remember
CO3	Understand and appreciate the various art forms and architecture in India.	L2	Understand
CO4	Illustrate the classic literature written in Indian languages.	L3	Apply
CO5	Know the various religions followed in India and their philosophies.	L1	Remember

Indian Knowledge System
Course Contents

Unit-I **Indian Education System** **04 Hrs.**

Gurukul system; Ancient Universities (Nalanda, Takshashila, Vikramshila, Vallabhi, Nagarjuna, etc.)

Unit-II **Indian Scientists and Their inventions** **06 Hrs.**

Patanjali, Aryabhatta, Bhaskaracharya, Charaka, Brahmagupta, Varahmitra, Sushruta, Kanada, Baudhyana, etc.

Unit-III **Indian art and architecture** **08 Hrs.**

Mughal Paintings, Tanjore Paintings, Madhubani Paintings, Warli Paintings, etc; Harrappa and Mohenjo-Daro Civilization; Temples and other religious places; Buddhist stupas; Forts and monuments.

Unit-IV **Indian Classic Literature** **06 Hrs.**

Puranas; Epics (Ramayana, Mahabharata, Shakuntala, Meghdoota, Arthashastra,Sangam Literature, Malavikagnimitram etc.).

Unit-V **Religion and Philosophy** **04 Hrs.**

Vedas; Buddhism; Jainism and other religions.

Indian Knowledge Systems Tutorial

List of Tutorials:

1. **Indian Education System::**
   (a) Group discussions/debates on various education systems.
2. **Indian Scientists and Their inventions:**
   (a) Group presentations on various Indian scientists.
   (b) An assignment on different inventions by Indians and their impact on world.
3. **Indian art and architecture:**
   (a) Group Poster project on different painting forms and Harappa and Mohenjo-Daro civilization.
   (b) Group presentation on different archaeological structures in India.
4. **Indian Classic Literature:**
   (a) An assignment on review of any one of the Indian classic literatures.
   (b) Group discussion/Debate on the importance of the Indian classic literature in spreading the awareness about the importance of Indian culture and traditions.
   OR
   (c) Dramatic Adaptations
      i. Ask students to adapt a scene or act from Indian classical literature into a dramatic performance.
      ii. They can write scripts, create props and costumes, and rehearse their adaptations.
      iii. Encourage creativity while staying true to the essence of the original work.
      iv. Students can perform their adaptations for the class or in a larger setting.
5. **Religion and Philosophy:**
   (a) A group discussion/debate on the various religions and their philosophies

A minimum of eight experiments from the above-suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept.

Self-Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Reference Books:

1. B. Mahadevan, V. R. Bhat, Nagendra Pavana, 'Introduction to Indian Knowledge Systems: Concepts and Applications', PHI Learning Publications, Delhi, 2022.

2. Satishchandra Chaterjee, Dheerendramohan Datta, An Introduction to Indian Philosophy, Motilal Banarsidass Publishing House, New Delhi, 2016.

3. V.Sivaramakrishnan (Ed.), 'Cultural Heritage of India-course materia'l, Bharatiya Vidya Bhavan, Mumbai. 5th Edition,2014.

Program: Artificial Intelligence and Data Science Engineering	F. Y. B.Tech	Semester: I
Version Control Fundamentals (RCP26SSC149)		

Pre-requisite: Knowledge of

Basic knowledge of operating systems and file management.

Course Objective(s):

1. To understand the fundamentals and importance of Version Control Systems.
2. To learn and apply Git for tracking and managing code changes.
3. To develop skills in branching, merging, and resolving conflicts in collaborative development.
4. To use GitHub for remote repository management and team collaboration.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the role and working of Version Control Systems,Git.	L2	Understand
CO2	Perform basic Git operations such as repository creation, commit, clone, push, and pull.	L3	Apply
CO3	Apply branching and merging techniques to manage software development effectively	L3	Apply
CO4	Create and manage remote repositories on GitHub for collaboration and portfolio development.	L6	Create

Version Control Fundamentals
Course Contents

Unit-I Introduction to Version Control and Git 05 Hrs.

Introduction to Version Control Systems (VCS), Keeping Historical Copies, Diffing Files, Applying Changes using diff and patch, Practical applications of diff and patch, Version Control and Automation, Introduction to Git, Installing and Configuring Git, First Steps with Git, Tracking Files, Basic Git Workflow, Anatomy of a Commit Message.

Practical Components: Git installation and setup, creating repositories, tracking and committing files, using diff and patch tools, and performing basic Git operations.

Unit-II Using Git Locally and Branch Management 05 Hrs.

Skipping the Staging Area, Viewing and Analyzing Changes, Deleting and Renaming Files, Undoing Changes Before Commit, Amending Commits, Rollbacks and Commit History, Identifying Commits, Introduction to Branches, Creating and Working with Branches, Merging Branches, Handling Merge Conflicts.

Practical Components: Managing local repositories, undoing and restoring changes, creating and merging branches, resolving merge conflicts, tracking commit history.

Unit-III Working with Remote Repositories and GitHub 05 Hrs.

Introduction to GitHub, Remote Repositories and their Importance, Basic Interaction with GitHub, Working with Remotes, Fetching and Updating Changes, Pull-Merge-Push Workflow, Pushing Remote Branches, Rebasing Changes, Conflict Resolution during Collaboration, Best Practices for Team Collaboration using Git.

Practical Components: Creating and managing remote repositories, synchronizing local and remote repositories, pushing and pulling changes, rebasing commits, resolving remote conflicts, and collaborative workflows using GitHub.

Unit-IV Collaboration and Code Review using GitHub 05 Hrs.

Introduction to Collaborative Development, Pull Requests on GitHub, Pull Request Workflow, Updating Existing Pull Requests, Squashing Commits, Code Reviews and Review Workflow, Using Code Reviews in GitHub, Managing Team Collaboration, Tracking Issues, and Introduction to Continuous Integration (CI).

Practical Components: Creating and reviewing pull requests, updating collaborative projects, performing code reviews, managing issues, and integrating collaborative workflows using GitHub.

Online Course:

1. https://www.coursera.org/learn/introduction-git-github

Useful Courses:

1. Getting Started with Git and GitHub - https://www.coursera.org/learn/getting-started-with-git-and-github.
2. Learn GitHub within GitHub - https://learn.github.com/skills.
3. Learn Git & GitHub - https://www.codecademy.com/learn/learn-git.

Program: Artificial Intelligence and Machine Learning	F. Y. B.Tech	Semester: I
AI Essentials for Fresher's (RCP26ASC149)		

Pre-requisite: Knowledge of

Fundamentals of Computers.

Course Objective(s):

1. Differentiate Core AI Paradigms
2. Understand Generative AI Technologies
3. Design Effective AI Prompts
4. Apply Prompt Engineering Techniques
5. Execute AI-Driven Academic Workflows

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Differentiate Core AI Paradigms (Narrow, General, Generative)	L2	Understand
CO2	Design Structured Prompts using frameworks (Role, Context, Task, Constraints)	L3	Apply
CO3	Execute AI-Driven Academic Workflows ethically	L3	Apply

AI Essentials for Fresher's
Course Contents

Unit-I **Demystifying AI & the Digital Mind** **05 Hrs.**

Introduction, The terminology of AI, what makes an AI company, What machine learning can and cannot do, Non-technical explanation of deep learning, Introduction to Prompts, Intuition Behind Prompts, Programming with Prompts, Prompt Size Limitations.

Unit-II **The Art of Prompt Engineering** **05 Hrs.**

Prompt Patterns, The Persona Pattern, Introducing New Information to the Large Language Model, Question Refinement Pattern, Cognitive Verifier Pattern, Audience Persona Pattern, Flipped Interaction Pattern, Game Play Pattern, Template Pattern, Meta Language Creation Pattern, Recipe Pattern, Alternative Approaches Pattern, Ask for Input Pattern, Combining Patterns, Outline Expansion Pattern, Menu Actions Pattern, Fact Check List Pattern, Tail Generation Pattern, Semantic Filter Pattern.

Unit-III **AI for Productivity Research** **05 Hrs.**

Introduction, Decision Making with AI, Communicating a Difficult Decision, Easy AI-Enhanced SOPs and Knowledge Management, Introduction to NotebookLM, NotebookLM Vs ChatGPT.

Unit-IV **Vibe Coding Logic** **05 Hrs.**

Introduction, Cursor's AI chat panel, Build an app with Cursor's AI agent, Debugging and Iteration with AI, Building New Features and Starting New Chats Ask vs Agent Mode Context Tools, Build a Quote Generator, Build a Quote Generator, Cursor Rules.

Online Course:

1. Vibe Coding with Cursor AI: https://www.coursera.org/learn/vibe-coding-with-cursor-ai
2. AI for Leaders: Master ChatGPT, Google NotebookLM Growth: https://www.coursera.org/learn/packt-ai-for-leaders-master-chatgpt-google-notebooklm-andgrowth-oy3ek
3. Prompt Engineering for ChatGPT: https://www.coursera.org/learn/prompt-engineering
4. AI for Everyone: https://www.coursera.org/learn/ai-for-everyone

Useful Courses:

1. Generative AI for Everyone – https://www.coursera.org/learn/generative-ai-for-everyone
2. ChatGPT Prompt Engineering for Developers – https://www.coursera.org/projects/chatgptprompt-engineering-for-developers-project

Program: Computer Engineering	F. Y. B.Tech	Semester: I
Foundations of Artificial Intelligence (RCP26CSC149)		

Pre-requisite: Knowledge of

Fundamentals of Computers.

Course Objective(s):

1. To introduce the foundations, history, algorithms, data practices, and ethical-regulatory aspects of Artificial Intelligence.
2. To build understanding of machine learning, deep learning, generative AI, and the future trajectory from Narrow AI to AGI and Super AI.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the origins, evolution, and core algorithmic foundations of AI, and describe the role of data, bias mitigation, and the AI regulatory landscape.	L2	Understand
CO2	Apply key machine learning paradigms (classification, regression, clustering) and assess model performance while avoiding pitfalls such as overfitting and underfitting	L3	Apply
CO3	Analyze deep learning and generative AI architectures (CNN, RNN, GAN) and their applications across creative, business, and industrial domains, considering data and computational requirements.	L4	Analyze
CO4	Evaluate the technological, economic, ethical, and societal implications of Narrow AI, AGI, and Super AI, including AI safety, governance, and the control problem..	L5	Evaluate

Foundations of Artificial Intelligence
Course Contents

Unit-I History and Overview of Artificial Intelligence 05 Hrs.

Introduction to Artificial Intelligence, The Impact of the Gies Community, The Intelligence Spectrum, Origins of AI, Development of Modern AI, Anatomy of an Algorithm, Gallery of Algorithms, Introduction to Neural Networks, What Is Data?, Data Preprocessing and Transformation, Finding Data, Ethical Concerns of AI, Techniques to Mitigate Bias in AI, Cultural Issues With AI, How Can AI Be Regulated?, The AI Regulatory Landscape, New Regulatory Opportunities with AI.

Unit-II Machine Learning Basics 05 Hrs.

What is Classification, Classification Applications, Key Classification Algorithms, What is Regression, Regression Applications, Key Regression Algorithms, What is Clustering, Clustering Applications, Key Clustering Algorithms, Metrics for Performance Evaluation, Pitfalls to Avoid (Overfitting and Underfitting), Cross-Validation and Retraining, The Data- Model-Application Process, Transition From ML to AI, Newer AI Models.

Unit-III Deep Learning and Generative AI 04 Hrs.

Understanding Neural Networks, Convolutional Neural Networks, Recurrent Neural Networks, Natural Language Processing, Computer Vision, Predictive Analysis, Overview of Generative Models, Generative Adversarial Networks, AI in Creative Industries, AI in Marketing & Communications, AI in Human Resources, AI in Manufacturing & Sales, Data Requirements for AI, Computational Costs of AI, Model Interpretability.

Unit-IV The Future of AI and Artificial General Intelligence 07 Hrs.

Narrow AI, AGI, and Super AI, Testing for AGI, Milestones and Potential Timelines for Achieving AGI, Economic Impacts of Narrow AI, AGI, and Super AI, Societal Challenges With Narrow AI, AGI, and Super AI, Ethical Considerations of Narrow AI, AGI, and Super AI, Application of Narrow AI, AGI, and Super AI on Front Office, Application of Narrow AI, AGI, and Super AI on Factories, Application of Narrow AI, AGI, and Super AI on Customer Interaction, Policy and Governance With AGI and Super AI, Impact of AGI and Super AI on Education and the Workforce, Societal Impacts of AGI and Super AI, Technological Singularity, Philosophy About Consciousness, AI Safety and Control Problems

Web References:

https://www.coursera.org/programs/nmims-university-faculty-development-program-kjd4b/learn/intro-to-artificial-intelligence?authProvider=nmimssource=search

Program: Computer Science & Engineering (Data Science)	F. Y. B.Tech	Semester: I
Fundamentals of Artificial Intelligence (RCP26DSC149)		

Course Objective(s):

1. To understand the fundamentals of Artificial Intelligence, including its concepts, terminology, history, and major application domains.
2. To explain impact of AI across industries and society, with emphasis on business transformation, career opportunities, and real-world use cases.
3. To develop the understanding of AI project lifecycle and organizational adoption, including strategies for integrating AI into business processes.
4. To Analyse ethical, social, and governance issues associated with AI, promoting responsible and trustworthy AI practices.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the fundamental concepts, terminology, and application areas of Artificial Intelligence and distinguish AI from related technologies.	L2	Understand
CO2	Identify AI-driven solutions across various domains and evaluate their potential impact on business, industry, and society.	L5	Evaluate
CO3	Describe the process of planning and implementing AI projects within organizations, including the roles of technical and non-technical stakeholders.	L2	Understand
CO4	Analyse ethical, legal, and societal implications of AI technologies and recommend responsible AI practices for sustainable deployment.	L4	Analyze

Fundamentals of Artificial Intelligence
Course Contents

Unit-I Introduction to Artificial Intelligence 05 Hrs.

Introduction to Artificial Intelligence (AI) and Augmented Intelligence, Evolution of AI: Traditional AI to Generative AI, AI Concepts, Terminology, and Application Domains, Cognitive Computing and Intelligent Systems, Data and its Importance in AI, Basics of Machine Learning and Deep Learning, Capabilities and Limitations of AI, AI in Everyday Life and Emerging Technologies.

Unit-II Modern AI Technologies 05 Hrs.

Introduction to Generative AI, Generative models and Large Language Models (LLMs), Natural Language Processing (NLP), AI chatbots and virtual assistants, Prompt engineering fundamentals, AI-powered content generation tools, Speech recognition and conversational AI, Applications of Generative AI in education, creativity, and productivity.

Unit-III AI Applications and Business Transformation 05 Hrs.

AI applications in healthcare, finance, education, manufacturing, and transportation, AI agents and intelligent automation, Robotics and autonomous systems, Smart devices and Internet of Things, AI for business transformation and decision making, AI project lifecycle, Working with AI teams, Real-world AI case studies and career opportunities in AI.

Unit-IV Ethical AI and Future Directions 06 Hrs.

Ethical principles of AI, Fairness, transparency, accountability, and explainability in AI systems, Bias and hallucinations in generative AI, Adversarial attacks and misuse of AI technologies, Responsible AI and AI governance frameworks, AI and society, Impact of AI on employment and economy, Future trends in Artificial Intelligence, Mini case study on ethical AI applications

Web References:- https://www.coursera.org/programs/nmims-university-faculty-development-program-kjd4b/learn/introduction-to-ai?authProvider=nmimssource=search

Program: Electrical Engineering	F. Y. B.Tech	Semester: I
Electrical Foundations (RCP26LSC149)		

Pre-requisites:

Basic knowledge of environmental science, electrical concepts, and elementary mathematics

Course Objective(s):

1. To develop an understanding of climate change, global warming, net-zero emissions, ESG principles, and sustainable practices across various sectors.
2. To explore renewable energy sources and develop knowledge of solar photovoltaic (PV) technology, including its systems, components, applications, economic aspects, and ROI analysis.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the fundamentals of climate change, global warming, carbon footprint, COP-26 commitments, ESG principles, sustainability practices, and various renewable energy sources with their applications and challenges.	L2	Understand
CO2	Apply the principles of sustainable energy and solar photovoltaic (PV) systems to assess carbon footprint, environmental impact, system design, economic feasibility, ROI, and practical renewable-energy applications.	L3	Apply

Electrical Foundations
Course Contents

Unit-I Climate Science 05 Hrs.

This module provides a comprehensive understanding of global warming, its effects on climate change, and the importance of achieving net-zero emissions. It covers key strategies for climate resilience, including carbon sequestration, mitigation, and neutrality. The module also highlights the commitments made at the COP-26 Glasgow Conference and their global implications.

Need for Sustainability:

This module explores the principles of Environmental, Social, and Governance (ESG) in sustainability, the role of Industrial Sustainability Reports, and innovative eco-friendly solutions in architecture and transportation, with strong emphasis on sustainable practices for a greener future.

Unit-II Various Forms of Renewable Energy 03 Hrs.

This module covers the concepts, mechanisms and applications of various forms of renewable energy sources such as solar, wind, geothermal, tidal, and biomass energy technologies. It also explores hybrid energy systems and their advantages in sustainable energy solutions.

Unit-III Acknowledgements and Solar Power 03 Hrs.

This module introduces learners to the history of solar power and the nature of photovoltaics (PV).

Unit-IV The Nature of PV 03 Hrs.

This module provides an understanding of the structure and function of different types of PV systems and their components.

Unit-V Solar Power ROI 04 Hrs.

This module provides an understanding of the costs and ROI that can be expected when installing a PV system. PV System Analysis Project: Theory to Practice.

Web References:

1. Introduction to Renewable Energy by L&T EduTech: - `https://www.coursera.org/programs/nmims-university-faculty-development-program-kjd4b/learn/introduction-to-renewable-energy?authProvider=nmims&specialization=renewable-energy-power-evacuation`
2. Solar Energy Systems Overview by University of Buffalo: - `https://www.coursera.org/programs/nmims-university-faculty-development-program-kjd4b/learn/solar-energy-systems?authProvider=nmims&specialization=solar-energy`

Program: Electronics and Telecommunication Engineering	F. Y. B.Tech	Semester: I
Artificial Intelligence Foundations (RCP26ESC149)		

Pre-requisites:

Basic knowledge of Computer Systems

Course Objective(s):

1. To understand fundamental concepts of Artificial Intelligence, Generative AI, and apply Generative AI tools responsibly.
2. To develop core programming fundamentals in Python to solve computational problems.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the fundamental concepts, applications, capabilities, and limitations of Artificial Intelligence, Generative AI, and apply Generative AI tools responsibly for professional and everyday tasks.	L3	Apply
CO2	Develop basic Python programs using variables, expressions, conditional statements, functions, and loops to solve simple computational problems.	L3	Apply

Artificial Intelligence Foundations
Course Contents

Unit-I Introduction to Artificial Intelligence, Generative AI and Responsible AI 05 Hrs.

Introduction to Artificial Intelligence, Generative AI, key AI terminology, Introduction to Generative AI tools such as ChatGPT and Gemini, Fundamentals of prompt engineering, Brainstorming, idea generation, and iterative prompting, AI for everyday productivity: email organization, document summarization, planning, and scheduling, AI as a creativity partner: content generation, storytelling, and creative writing, Introduction to AI image generation and effective image prompting, AI-generated content for personal branding and social media, AI applications for travel planning and everyday activities, Fact-checking and evaluating AI-generated information, Understanding AI hallucinations, accuracy, and reliability, Privacy, sensitive information, plagiarism, and copyright, Understanding bias and responsible use of AI, Developing personal AI toolkits, prompt libraries, and AI workflows, Applying AI to professional and everyday tasks, Building an individual AI learning strategy.

Unit-II Introduction to Programming and Python 05 Hrs.

Why programming; what is a program; computer hardware and software; programming languages; Python as a programming language; basic programming concepts; setting up Python; Python Playground; text editors; running Python programs; programming environment; Python syntax; writing and executing the first Python program; Hello World assignment.

Unit-III Variables, Expressions and Input / Output 04 Hrs.

Elements of Python; constants; reserved words; variables; variable names and assignment; numerical expressions; data types; comments; input-process-output model; basic calculations; user input and output; Welcome Message assignment; Pay Calculator assignment

Unit-IV Conditional Statements and Decision-Making 03 Hrs.

Sequential execution; conditional execution; if statements; decision-making; conditional logic; multiple conditions; developing programs using conditional statements; Overtime Pay Calculator assignment.

Unit-V Functions, Loops and Iteration 05 Hrs.

Introduction to functions; using and defining functions; parameters and arguments; return values; reusable code; loops and iteration; for loops; definite loops; loop patterns; repetitive processing; finding largest and smallest values; Build Functions assignment; Largest and Smallest Numbers assignment.

Web References:

1. Introduction to AI for Beginners by Skills Booster Academy: - https://www.coursera.org/learn/introduction-to-ai-for-beginners

2. Programming for Everybody (Getting Started with Python) by University of Michigan: - https://www.coursera.org/learn/python/

Program: Mechanical Engineering	F. Y. B.Tech	Semester: I
Introduction to AI for Mechanical Engineers (RCP26MSC149)		

Pre-requisites:

Basic understanding of mathematics and computer fundamentals, along with an elementary knowledge of engineering concepts and digital technologies.

Course Objective(s):

1. To understand the fundamentals of digital engineering and modern industrial technologies.
2. To explain basic concepts related to Artificial Intelligence (AI), Machine Learning (ML), and Industry 4.0.
3. To identify the role of digital technologies in mechanical engineering industries.
4. To develop awareness about smart manufacturing, robotics, automation, and intelligent systems.
5. To understand future engineering trends associated with AI-enabled industrial transformation.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the concepts of digital engineering and intelligent industrial systems.	L2	Understand
CO2	Explain the fundamentals of AI, ML, IoT, and Industry 4.0 technologies.	L2	Understand
CO3	Identify applications of AI and automation in mechanical engineering industries.	L3	Apply
CO4	Interpret the role of smart technologies in manufacturing and maintenance systems.	L2	Understand
CO5	Discuss future engineering technologies and their industrial relevance.	L2	Understand

Introduction to AI for Mechanical Engineers Course Contents

Unit-I Introduction to Digital Engineering and Industrial Evolution 1h.17m.

Introduction to engineering in the digital era; Evolution of industrial revolutions (Industry 1.0, 2.0, 3.0, 4.0, and 5.0); Digital transformation in engineering industries; Traditional industries versus smart industries; Emerging trends in modern industries.

Unit-II Artificial Intelligence Fundamentals 2h.26m.

Introduction to Artificial Intelligence (AI); Types of AI; Introduction to intelligent systems; What is Machine Learning (ML)?; What is Deep Learning (DL)?; Difference between AI, ML, and DL.

Unit-III Generative AI and Responsible Engineering 1h.30m.

Introduction to Generative AI; AI applications in industries; Benefits and limitations of AI systems; AI ethics and responsible engineering practices; Role of AI in engineering innovation.

Unit-IV Engineering Data and Smart Sensing Systems 1h.20m.

Introduction to engineering data; Types of data; Importance of data in engineering decision-making; Introduction to sensors and transducers; Industrial data generation systems.

Unit-V Internet of Things and Cyber-Physical Systems 1h.14m.

Basics of Internet of Things (IoT); Introduction to cyber-physical systems; Smart monitoring systems; Introduction to cloud computing in industries; Connected industrial ecosystems.

Unit-VI Automation, Robotics, and Smart Manufacturing 2h.08m.

Introduction to automation; Types of industrial automation; Smart manufacturing systems; Introduction to industrial robots; Components of robotic systems; Collaborative robots (Cobots); Human-machine interaction systems.

Unit-VII Connected Manufacturing and Industrial Intelligence 1h.47m.

Automated material handling systems; Introduction to Computer Integrated Manufacturing (CIM); Smart factories and connected manufacturing; Introduction to predictive maintenance; Industrial intelligence and decision support systems.

Unit-VIII Future Technologies and Sustainable Engineering Systems 2h.43m.

Introduction to digital twins; Introduction to autonomous systems; Basics of smart mobility systems; AI-enabled electric and hydrogen vehicles; Sustainable manufacturing concepts; Green and intelligent industries; Introduction to smart cities; Human-centric engineering systems; Future trends in mechanical engineering; Industry 5.0 and sustainable industrial transformation

Web References:

1. https://www.coursera.org/learn/ses-djsce-mech-01-trial1/home/module/1

Program: Information Technology	F. Y. B.Tech	Semester: I
Fundamentals of Artificial Intelligence (RCP26ISC149)		

Pre-requisite:

1. Basic knowledge of Computer Systems and Applications

Course Objective(s):

1. Understand the fundamental concepts and evolution of Artificial Intelligence, including machine learning, deep learning, and generative AI frameworks.
2. Describe the working principles of major AI algorithms, deep learning architectures, and generative AI frameworks.
3. Apply appropriate AI concepts and techniques to address real-world organizational and business challenges.
4. Use AI principles to support responsible AI adoption, including considerations of ethics, governance, compliance, and organizational strategy.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand AI Fundamentals, Intelligent Architectures and Ethical Frameworks.	L2	Understand
CO2	Implement Data and Model Optimization Workflows.	L3	Apply
CO3	Understand Ethical Risks, Governance Frameworks, and Societal Impacts.	L2	Understand

Fundamentals of Artificial Intelligence
Course Contents

Unit-I History and Overview of Artificial Intelligence 07 Hrs.

Introduction, Origins of AI, Development of Modern AI, Anatomy of an Algorithm, Introduction to Neural Networks, Data Preprocessing and Transformation, Ethical Concerns of AI, Techniques to Mitigate Bias in AI, Cultural Issues With AI, AI Regulatory Landscape.

Unit-II Machine Learning Basics 04 Hrs.

Classification: Introduction, Applications, Key Algorithms, Regression: Introduction, Applications, Key Algorithms, Clustering: Introduction, Applications, Key Algorithms, Metrics for Performance Evaluation, Overfitting and Underfitting, Cross-Validation and Retraining, Data-Model-Application Process, Transition from ML to AI.

Unit-III Deep Learning and Generative AI 04 Hrs.

Fundamentals of Deep Learning: Neural Networks, Convolutional Neural Networks, Recurrent Neural Networks, Applications: Natural Language Processing, Computer Vision, Predictive Analysis
Generative AI: Overview of Generative Models, Generative Adversarial Networks, Applications of AI: Creative Industries, Marketing & Communications, Human Resources, Manufacturing Sales. Data Requirements for AI, Computational Costs, Model Interpretability, Challenges in Deep Learning.

Unit-IV The Future of AI and Artificial General Intelligence 06 Hrs.

Understanding Narrow AI, AGI, and Super AI, Testing for AGI, Economic Impacts, Societal Challenges, Ethical Considerations, Applications: Front Office, Factories, Customer Interaction, Business.

Web References:-

`https://www.coursera.org/programs/nmims-university-faculty-development-programKjd4b/learn/intro-to-artificial-intelligence?authProvider=nmims&source=search#modules`

Program: Civil Engineering	F. Y. B.Tech	Semester: I
Introduction to Engineering Mechanics (RCP26VSC149)		

Course Objective(s):

1. To give the students an introduction to engineering mechanics with an emphasis on engineering problem solving and the synthesis of calculus and physics.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe position, forces, and moments in terms of vector components in two and three dimensions.	L2	Understand
CO2	Apply the principles of free body diagrams and support conditions to determine reactions in engineering systems.	L3	Apply
CO3	Formulate equilibrium equations and analyze forces and moments in two- and three-dimensional rigid body systems.	L4	Analyze

Fundamentals of Artificial Intelligence
Course Contents

Unit-I Forces and Particle Equilibrium 03 Hrs.

Introduction to Engineering Mechanics; Definition and characteristics of force; Representation of forces in two-dimensional and three-dimensional coordinate systems; Resultant of force systems; Particle equilibrium; Equilibrium of systems of particles; Engineering applications and numerical problems.

Unit-II Moments and Couples 03 Hrs.

Definition of moment; Moment of a force about a point; Two-dimensional and three-dimensional moment calculations; Moment about a line or axis; Couple and moment due to a couple; Applications of moments in engineering structures; Numerical problems.

Unit-III Equilibrium and Equivalent Force Systems 03 Hrs.

Static equilibrium equations in two and three dimensions; Conditions of equilibrium; Equivalent force systems; Force-couple systems; Resultant of coplanar, parallel, and distributed force systems; Engineering applications and numerical problems.

Unit-IV Free Body Diagrams and Equilibrium Analysis 03 Hrs.

Centroids of simple and composite bodies; Method of composite parts; Resultant force on surfaces; Construction of Free Body Diagrams (FBD); Analysis of constrained bodies; Support reactions; Equilibrium analysis techniques; Engineering applications and numerical problems.

Unit-V Applications of Static Equilibrium 03 Hrs.

Application of equilibrium equations to two-dimensional and three-dimensional rigid bodies; Analysis of beams, frames, and engineering structures; Determination of unknown forces and moments; Real-world engineering applications; Problem-solving using static equilibrium principles.

Web References:-

https://www.coursera.org/programs/nmims-university-faculty-development-program-kjd4b/learn/engineering-mechanics-statics?authProvider=nmims&source=search