Jaypee University, Anoopshahr

B.Tech. (Robotics and AI)
Program Curriculum

Department of Computer Science Engineering & Information Technology

April 2025

2025 onwards Curriculum for B. Tech. in Robotics & Artificial Intelligence

General Course Structure and Theme

Definition of Credit:

1 Hr. Lecture (L) per week 1 credit

1 Hr. Tutorial (T) per week 1 credit

1 Hr. Practical (P) per week 0.5 credit

2 Hours Practical (P) per week 1 credit

The total number of credits proposed for the Four-Year B. Tech. program in Robotics & Artificial Intelligence is 164.

Course Category Code:

S. No.	AICTE Category	AICTE Recommended Breakup of Credits for RAI	JUA Breakup of Credits for RAI	UGC Category	UGC Recommended Credit Breakup	JUA Credit Breakup
1	Humanities and Social Sciences including Management Courses (HSC)	11	17	Ability Enhancement courses (AEC)	8	11
2	Basic Science Courses (BSC)	26	16	Multidisciplinary Courses (MDC)	9	26
3	Engineering Science courses including workshop, drawing, basics of electronics/ electrical/ mechanical/computer etc. (ESC)	21	7	Value Added Courses (VAC)	8	7
4	Professional Core Courses (PCC) and Lab Courses (LC)	80	63	MAJOR	80	63
5	Professional Elective courses relevant to chosen specialization/branch (PEC)	4	18	MINOR	32	27

6	Open subjects–Electives from other technical and/or emerging subjects (OEC)	4	9	Skill Enhancement Courses (SEC)	9	6
7	Project work, seminar and internship in industry or elsewhere (PRC)	14	20	PROJECT	12	14
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition] (OMC)	(non credit}	10	TRAINING	4	6
TOTAL		**160**	**160**		**160**	**160**

2025 onwards Curriculum for B. Tech. in Robotics & Artificial Intelligence

FIRST SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11MA111	Mathematics-1	3	1	0	4	4	MDC	BSC	CORE	MATHS	
2	25B11PH111	Physics-1	3	0	0	3	3	MDC	BSC	CORE	PHY	
3	25B11CI111	Software Development Fundamentals-I	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
4	25B17PH171	Physics Lab-1	0	0	2	2	1	MDC	BSC	CORE	PHY	
5	25B17CI171	Software Development Fundamentals Lab-I	0	0	2	2	1	MAJOR	PCC	CORE	CSE	
6	25B17ME271	Engineering Drawing & Design	0	1	2	3	2	MDC	ECC	CORE	ME	
7	25B11EE111	Basic Electronics	3	0	0	3	3	MDC	ESC	CORE	ECE	
8	25B17EE171	Basic Electronics Lab	0	0	2	2	1	MDC	ESC	CORE	ECE	
9	25B17CI172	Programming Practices Lab-I	0	0	2	2	1	MAJOR	PCC	CORE	CSE	
Total						24	19					

SECOND SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11MA211	Mathematics-2	3	1	0	4	4	MDC	BSC	CORE	MATHS	
2	25B11PH211	Physics-2	3	0	0	3	3	MDC	BSC	CORE	PHY	
3	25B11CI211	Software Development Fundamentals-II	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
4	25B17PH271	Physics Lab-2	0	0	2	2	1	MDC	BSC	CORE	PHY	
5	25B17CI271	Software Development Fundamentals Lab- II	0	0	2	2	1	MAJOR	PCC	CORE	CSE	
6	25B11HS216	Professional Communication	3	1	0	4	4	AEC-1	HSC	CORE	ARTS	
7	25B17ME272	Workshop	0	0	2	2	1	MDC	ESC	CORE	ME	
8	25B11CO211	Finance for everyone	3	0	0	3	3	SEC-3	HSC	CORE	Commerce	
9	25B11LS211	Environmental Science	3	0	0	3	3	VAC-3	OMC	CORE	Life Science	
10	25B17CI272	Programming Practices Lab-II (Python)	0	0	2	2	0(Qualifying)	MAJOR	PCC	CORE	CSE	
						28	23					

THIRD SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11CI311	Mathematical Foundations for Data Science	3	1	0	4	4	MAJOR	PCC	CORE	CSE	
2	25B11ME311	Mechanics for Robotics	3	0	0	3	3	MAJOR	PCC	CORE	ME	
3	25B11CI313	Data Structures	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
4	25B11EE311	Analog & Digital Electronics	3	0	0	3	3	MAJOR	PCC	CORE	ECE	
5	25B11CI513	Artificial Intelligence and Machine Learning	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
6	25B17CI376	Advanced Python Programming Lab	0	0	2	2	1	MAJOR	PCC	CORE	CSE	
7	25B17EE371	Analog & Digital Electronics Lab	0	0	2	2	0(Qualifying)	MAJOR	PCC	CORE	ECE	
8	25B11MT416	Digital Marketing	3	0	0	3	3	SEC-2	HSC	CORE	MANGT	
9	25B11SS114	Constitution and Development	3	1	0	4	4	VAC-1	OMC	CORE	Social Science	
10	25B17CI513	Artificial Intelligence and Machine Learning Lab	0	0	2	2	1	MAJOR	PCC	CORE	CSE	
						29	25					

FOURTH SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11SSXXX	HSS Elective – 1 (Universal Human Values)	3	0	0	3	3	AEC -2	HSC	CORE	Social Science	
2	25B11ME411	Design of Robotic Structures	3	0	0	3	3	MAJOR	PCC	CORE	ME	
3	25B11CI411	Algorithms and Problem Solving	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
4	25B11CI413	Deep Learning	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
5	25B11EE413	Sensors and Actuators for Robotics	3	0	0	3	3	MAJOR	PCC	CORE	ECE	
6	25B17CI471	Algorithms and Problem Solving Lab	0	0	2	2	1	MAJOR	PCC	CORE	CSE	
7	25B17CI473	Deep Learning Lab	0	0	2	2	1	MAJOR	PCC	CORE	CSE	
8	25B11CI413	Minor Elective – 1	3	0	0	3	3	MINOR	PEC	ELEC		
9	25B11SS214	Indian Knowledge System	3	0	0	3	3	MDC – 1	OMC	CORE	Social Science	
						25	23					

FIFTH SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11ME511	Kinematics of Robotics	3	0	0	3	3	MAJOR	PCC	CORE	ME	
2	25B11CI514	Computer Vision	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
3	25B11EE511	Robotic Control Systems	2	0	0	2	2	MAJOR	PCC	CORE	ECE	
4	25B17ME571	Kinematics for Robotics Lab	0	0	2	2	1	MAJOR	PCC	CORE	ME	
5	25B11XXXXX	Minor Elective – 2	3	0	0	3	3	MINOR	PEC	ELEC		
6	25B11XXXXX	Minor Elective – 3	3	0	0	3	3	MINOR	PEC	ELEC		
7	25B11MT417	Skill For Employability	3	1	0	4	4	AEC – 3	HSC	CORE	MANAGT	
8	25B11EE571	Robotic Control Systems Lab	0	0	2	2	0(Qualifying)	MAJOR	PCC	CORE	ECE	
9	25B17CI574	Computer Vision Lab	0	0	2	2	0(Qualifying)	MAJOR	PCC	CORE	CSE	
10	25B19RA591	Summer Training-I (4 weeks)	0	0	0	0	2	TRAINING	PRC	CORE	CSE/ME/ECE	
						24	21					

SIXTH SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11ME611	Dynamics of Robotics	3	0	0	3	3	MAJOR	PCC	CORE	ME	
2	25B11CI614	Reinforcement Learning	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
3	25B11CI615	Robot Operating System	3	0	0	3	3	MAJOR	PCC	CORE	CSE	
4	25B11EE611	Digital signal Processing and Embedded System	3	0	0	3	3	MAJOR	PCC	CORE	ECE	
5	25B17ME671	Dynamics of Robotics Lab	0	0	2	2	1	MAJOR	PCC	CORE	ME	
6	25B11XXXXX	Open Elective – 1	3	0	0	3	3	MINOR	OEC	ELEC		
7	25B11XXXXX	Minor Elective – 4	3	0	0	3	3	MINOR	PEC	ELEC		
8	25B17CI674	Reinforcement Learning Lab	0	0	2	2	0(Qualifying)	MAJOR	PCC	CORE	CSE	
9	25B17EE671	Digital signal Processing and Embedded System Lab	0	0	2	2	0(Qualifying)	MAJOR	PCC	CORE	ECE	
10	25B19RA691	Minor Project	0	0	4	4	2	PROJECT	PRC	CORE	CSE/ME/ECE	
						28	21					

SEVENTH SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11XXXXX	Minor Elective – 5	3	0	0	3	3	MINOR	PEC	ELEC		
2	25B11XXXXX	Open Elective – 2	3	0	0	3	3	MINOR	OEC	ELEC		
3	25B19RA791	Major Project Part – 1	0	0	0	8	4	PROJECT	PRC	CORE	CSE/ME/ECE	
4	25B19RA792	Summer Training - II (6 weeks)	0	0	0	0	4	TRAINING	PRC	CORE	CSE/ME/ECE	
						14	14					

EIGHTH SEMESTER

S.No.	Sub Code	Sub Name	L	T	P	Total Hrs	Credits	UGC/NEP Category	AICTE Category	University Category	Dept offered	Remarks
1	25B11XXXXX	Minor Elective – 6	3	0	0	3	3	MINOR	PEC	ELEC		
2	25B11XXXXX	Open Elective – 3	3	0	0	3	3	MINOR	OEC	ELEC		
3	25B19RA891	Major Project Part – 2	0	0	0	16	8	PROJECT	PRC	CORE	CSE/ME/ECE	
						22	14					

Total Program Credits: 19 + 23 + 25 + 23 + 21 + 21 + 14 + 14 = 160

List of Electives

Course Code	Course Name
25B11XXXXX	Microprocessors and its applications
25B11XXXXX	Embedded Systems
25B11XXXXX	System on Chip Design
25B11XXXXX	Sensor Technology
25B11XXXXX	Concepts of Graph theory
25B11XXXXX	Internet of Things
25B11XXXXX	Introduction to Quantum Mechanics
25B11XXXXX	Organic Electronics
25B11XXXXX	SoC Verification and Validation
25B11XXXXX	Network Theory
25B11XXXXX	Reconfigurable Computing
25B11XXXXX	AI and Hardware Acceleration
25B11XXXXX	AI for Electronic Design Automation (EDA)

Mandatory Internships/Summer Trainings

Summer Training -I (4 weeks) (In summer vacation after fourth semester)

Sr.	Course		Course	Contact Hours				Credi
No.			Category					ts
	No.	Title		L	T	P	Total	
1.	xxxxxx	Industrial/Govt./ NGO/MSME/ Rural Internship/ Innovation /Entrepreneurship (Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case student want to pursue their family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)	PRC	0	0	0	0	2
		TOTAL						2

Summer Training -II (6 weeks) (In summer vacation after sixth semester)

Sr. No.	Course		Course Category	Contact Hours				Credits
	No.	Title		L	T	P	Total	
1.	xxxxxx	Industrial/Govt./ NGO/MSME/ Rural Internship/ Innovation / Entrepreneurship (Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case student want to pursue their family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)	PRC	0	0	0	0	4
		TOTAL						4

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Course Description

Course Code	25B11MA111	**Offered to Program:** UG	**Offered Department:** Mathematics **Session:** 2025-26
Course Name	Mathematics-1		
Credits	4	**Contact Hours (L-T-P)**	3-1-0
Course Coordinator			

	COURSE OUTCOMES: After completing the course, students will be able to:	**COGNITIVE LEVELS**
25B11MA111.1	Explain the concept of limits, continuity and differentiability of functions of several variables.	Understand (Level 1)
25B11MA111.2	Explain the Taylor's series expansion of functions of several variables and apply it in finding maxima and minima of functions.	Analyze/Apply (Level 2, 3)
25B11MA111.3	Utilize matrix algebra for solving a system of linear equations and explain eigenvalues, eigenvectors, diagonalization and quadratic form.	Analyze/Apply (Level 2, 3)
25B11MA111.4	Make use of double and triple integrals to find area and volume of curves and surfaces.	Apply (Level 3)
25B11MA111.5	Explain the concept of vector calculus and apply Green's, Stoke's and Gauss divergence theorems in engineering problems.	Analyze/Apply (Level 2,3)

Unit	Subtitle of the Unit	Topics in the Unit	No. of Lectures	CO Mapping
1.	Partial Differentiation	Chain rule, change of variables, Taylor's Series for function of two or more variables, maxima and minima of functions of two variables, Jacobians.	8	25B11MA111.2
2.	Matrices	Linear Dependence and independence of rows, row echelon form, rank, gauss elimination method, Eigen values and vectors, symmetric matrices, reduction to diagonal and quadratic form.	9	25B11MA111.2, 25B11MA111.3
3.	Double Integral	Change of order and change of variables, Gamma And Beta functions, Applications to areas and volumes, Equations to curve and surfaces, plots of some well-known curves and surfaces.	9	25B11MA111.2, 25B11MA111.3
4.	Vector Differentiation and Integration	Gradient, divergence and curl, Normal and tangent to a plane surface. Line integrals, Green's theorem in a plane, surface integrals, Gauss and Stokes theorem.	9	25B11MA111.2, 25B11MA111.3
5.	Differential Equation and Laplace Transformation.	Differential equations with constant coefficients, Cauchy-Euler equations, Equations of the form y"-f(y)=0, simple applications. Laplace transform and inverse Laplace transform, Direc Delta and unit step function, solution of IVPs.	10	25B11MA111.3
		Total number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3(End Semester Examination)	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

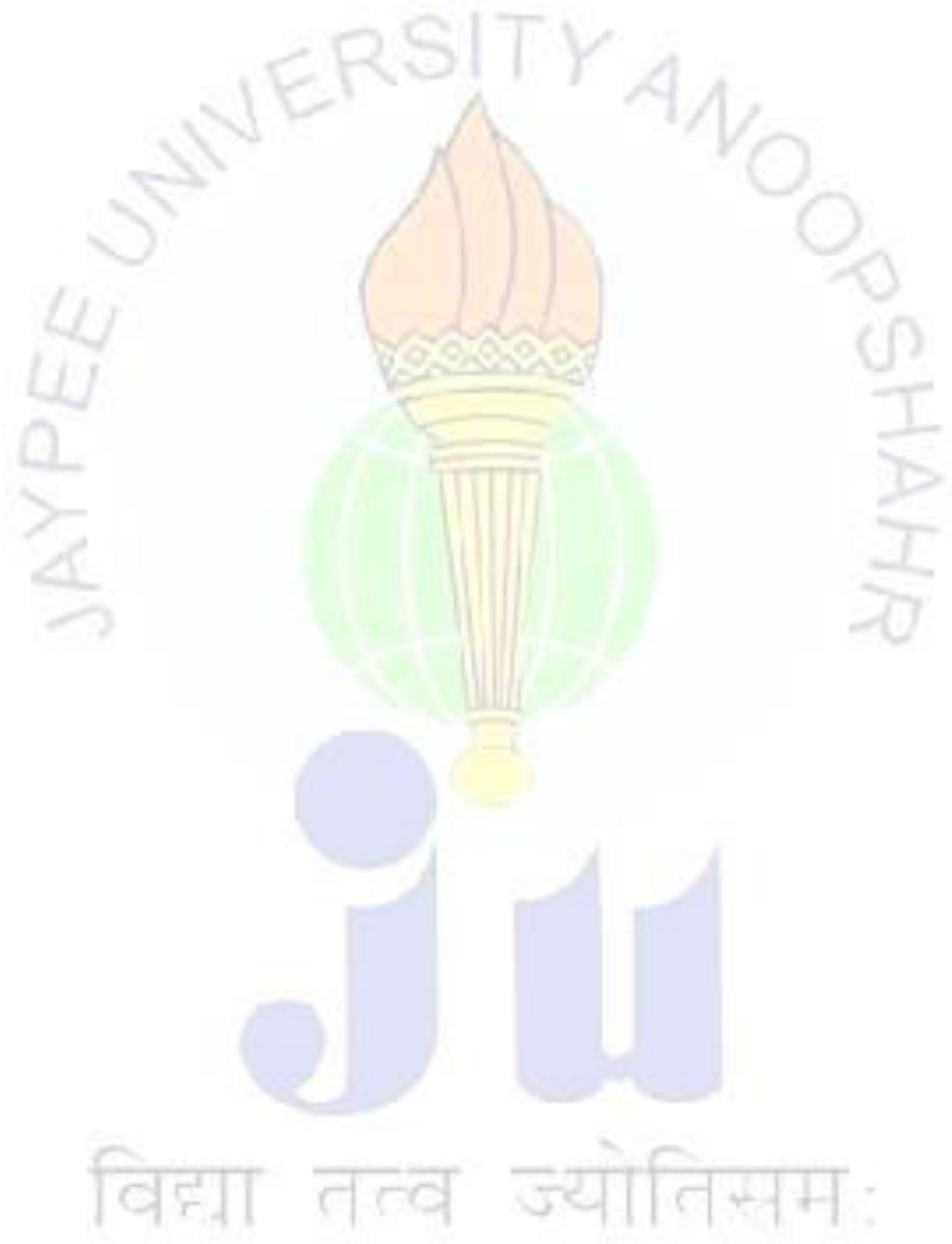
Text Books:

1.	Advanced Engineering Mathematics, by Erwin Kreyszig, 10th edition John Willey and Sons.

Reference Books:

1.	Lipschutz, S., & Lipson, M. (2009). Linear Algebra (Schaum's Outlines). McGraw-Hill.
2.	M.K. Jain, S.R.K. Iyengar Higher Engineering Mathematics, , 5th Ed., Narosa Publications, India, 2007.

Signature of coordinator	
Signature of Head of Department	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विद्या तत्व ज्योतिस्मम:

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Course Description

Course Code	25B11PH111	**Offered to Program:** B.Tech	**Offered Department:** PMSE
			Session: 2025-2026
Course Name	Physics-I		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11PH111.1	Conceptual knowledge of physics related to optics, relativity, quantum mechanics, atomic physics.	Remember (Level 1)
25B11PH111.2	Understanding of various physical phenomena with interpretation based on the mathematical expressions involved.	Understand (Level 2)
25B11PH111.3	Apply the concepts/principles to solve the problems related to wave nature of light, relativity, quantum mechanics and atomic physics.	Apply (Level 3)
25B11PH111.4	Analyze and evaluate the problems using physical and mathematical concepts involved.	Analyze (Level 4)

Module No.	Subtitle of the Module	Topics in the Module	No. of Lectures for the module	CO Mapping
1.	Optics	Analytical treatment of interference, Intensity distribution of fringe system, Fresnel's Bi-prism, Newton's rings, Michelson interferometer, Diffraction (limited to Fraunhofer class) from Single slit, double slit and Diffraction grating, Polarization, Phenomenological understanding of Birefringence, Principles of use of uni-axial crystals in practical polarizers, compensators and wave plates, Production and analysis of completely polarized light. Retardation Plate, Optical activity, Polarimeter. Resolving Power of Microscope	16	25B11PH111.1 25B11PH111.2 25B11PH111.3 25B11PH111.4

2.	Special Theory of Relativity	Frame of references, Galilean Transformations, Michelson-Morley experiment, Lorentz transformations, Addition of velocities, Mass variation with velocity, Mass-energy relation.	8	25B11PH111.1 25B11PH111.2 25B11PH111.3 25B11PH111.4
3.	Atomic Spectra	Origin of spectral lines, spin and orbital angular momentum, Quantum numbers, Designation of States, Atoms in magnetic field, Zeeman effect.	6	25B11PH111.1 25B11PH111.2 25B11PH111.3 25B11PH111.4
4.	Radiation	Black body radiation, Wein's law, Rayleigh Jeans law, Implications of Bose-Einstein statistics, Planck's law of radiation, Wein's Displacement Law.	7	25B11PH111.1 25B11PH111.2 25B11PH111.3 25B11PH111.4
5.	Quantum Mechanics	Schrödinger wave equation and its applications to the free particle in a box (1D+3D), potential barrier and tunnel diode as its application.	8	25B11PH111.1 25B11PH111.2 25B11PH111.3 25B11PH111.4
		Total number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**	
Term 1	20	
Term 2	20	
End Semester Examination	35	
IA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc.)

Text Books:

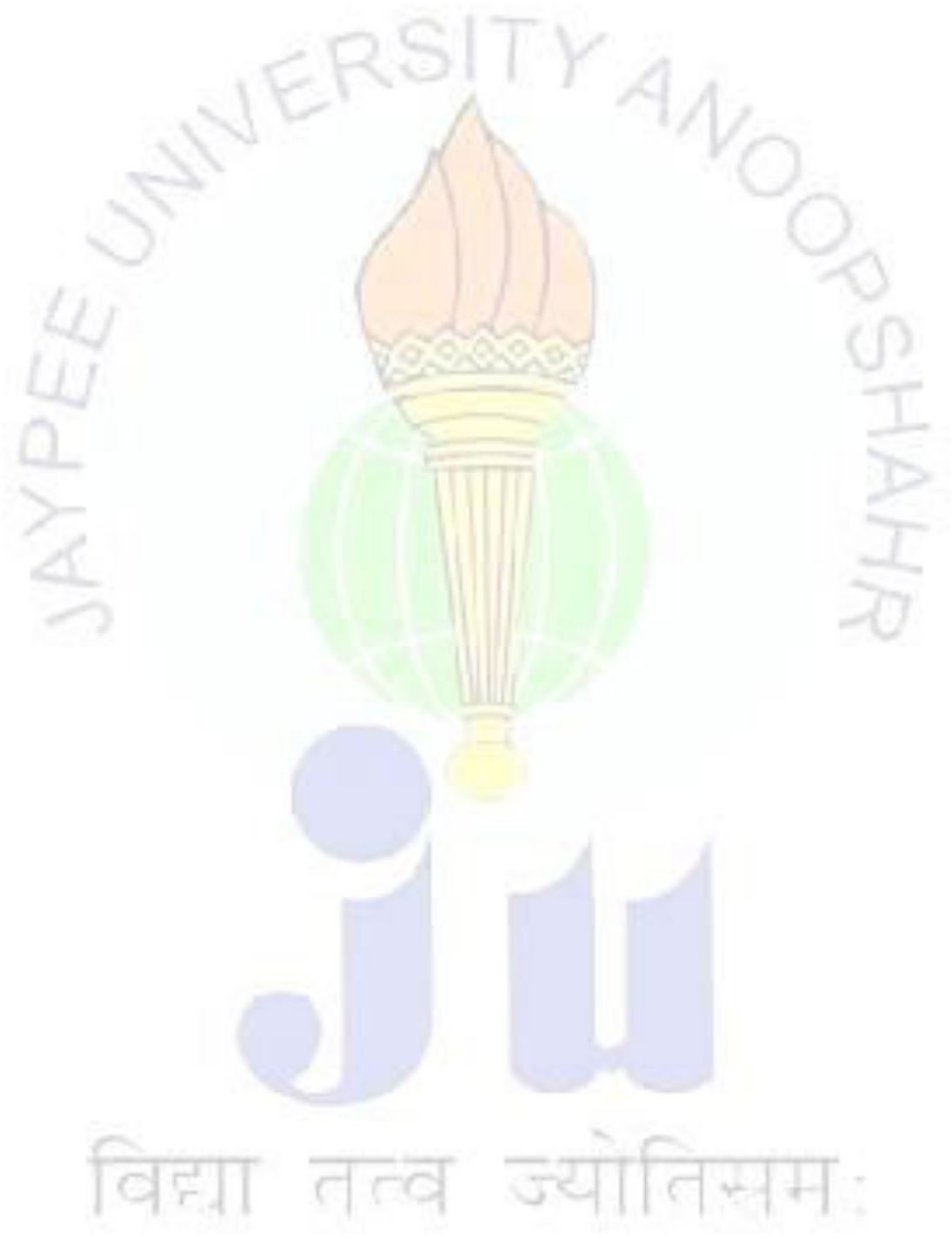
1.	H.K. Malik & A.K. Singh, Engineering Physics, Mc Graw Hill Education
2.	Brij Lal, M N Avadhanulu & N Subrahmanyam, A Text Book of Optics, S. Chand Publication
3.	A. Beiser, Concepts of Modern Physics, Mc Graw Hill International.

Reference Books:

1.	Reshnick, Relativity, New Age.
2.	K. Ghatak, Optics, Tata McGraw Hill

Signature of Coordinator	

Signature of Head of Department	



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Course Description

Course Code	23B11CI111	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE **Session:** 2025-26
Course Name	Software Development Fundamentals-1		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
23B11CI111.1	Explain the logic for solving problems considering various phases of software development life cycle and depicting them using algorithms and flowcharts	Understand (Level 2)
23B11CI111.2	Explain basics of C programming concepts to make decision for solving problems	Understand (Level 2)
23B11CI111.3	Utilize various data types and memory allocation schemes while analyzing the precedence of arithmetic and logical operations.	Apply (Level 3)
23B11CI111.4	Justify the need for arrays and structures in efficient data organization and manipulation.	Evaluating (Level 5)
23B11CI111.5	Apply and implement arrays, pointers, structures and file handling for solving real-world problems	Apply (Level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction	Introduction to Software Development Life Cycle, Step by step solution to simple problems, developing logic/flowchart/pseudo code to solve problems like 2D screen saver, simple/logical games, puzzles	6	23B11CI111.1 23B11CI111.2

2.	Data types, operators, and Control Flow	Data, variables and constants, data types, operators – binary, unary, ternary, operator precedence, operations using different operators, if, if-else, while, do-while, for, switch-case in C Programming	8	23B11CI111.3
3.	Array	Fundamentals of Array, Implementation of 1D/2D Array and related operations like insertion, traversal, updation, etc. in C programming using different problems.	7	23B11CI111.3 23B11CI111.4
5.	Functions	Introduction to Functions and its implementation in C programming language, Functions using Pass by value, functions using pass by reference, recursive functions	6	23B11CI111.4 23B11CI111.5
6.	Structures and Union	Introduction and implementation of Structures and Union in C programming, Array of Structures, Pointer to Structures and related operations like insertion, traversal, updation, etc. in C programming using different problems, Structures using function	6	23B11CI111.5
4.	Pointers	Pointers in C, Dynamic memory allocation for 1D/2D array, Arithmetical operations on pointers	6	23B11CI111.4 23B11CI111.5
7.	File Handling	Introduction to File, creation of files in C programming language, Modes of File Handling like read, write, update; different types of files like binary file and text file and respective operations like, opening, closing, reading, writing, end of file, traversing the file, for structured and unstructured data	6	23B11CI111.5
		Total number of Lectures	**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc.)	
Text Books:	
1.	Paul Deitel and Harvey Deitel, "C How to Program", 9th Edition, Pearson Education, 2022, ISBN: 978-0-13-739839-3
2.	E Balagurusamy, "Computing Fundamentals & C Programming", 2nd Edition, McGraw Hill Education, 2017, ISBN: 978-9352604166
3.	Greg Perry and Dean Miller, "C Programming Absolute Beginner's Guide", 3rd Edition, Que Publishing, 2013, ISBN: 978-0789751980
4.	David Griffiths and Dawn Griffiths, "Head First C: A Brain-Friendly Guide", O'Reilly Media, Inc., 2012, ISBN: 978- 1449399917
Reference Books:	
1.	Herbert Schildt, "The Complete Reference C", 4th Edition, McGraw Hill Education, 2017, ISBN: 978-0070411838
2.	Brian W. Kernighan and Dennis Ritchie, "The C Programming Language", 2nd Edition, Pearson Education India, 2015, ISBN: 978-9332549449
3.	Behrouz A. Forouzan, Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C", 3rd Edition, Cengage Learning, 2007, ISBN: 978-8131503638

Signature of coordinator	
Signature of Head of Department	

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Course Code	25B17PH171	**Offered to Program:** UG.	**Offered Department:** PMSE
			Session: 2025-26
Course Name	Physics Lab I		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17PH171.1	Recall optics and modern physics principles behind the experiments.	Remember (Level 1)
25B17PH171.2	Explain the experimental setup and the principles involved behind the experiments performed.	Understand (Level 2)
25B17PH171.3	Plan the experiment and set the apparatus and take measurements.	Apply (Level 3)
25B17PH171.4	Analyze the data obtained and calculate the error.	Analyze (Level 4)
25B17PH171.5	Interpret and justify the results.	Analyze (Level 4)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1	To determine the wavelength of sodium light with the help of Newton's rings.	4	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
2	To determine the wavelength of sodium light by using Fresnel's Bi-Prism.	4	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
3	To determine the specific rotation of cane sugar solution by using Polarimeter.	4	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
4	To verify Stefan's law by electrical method.	2	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
5	To determine the resistance per unit length of bridge wire and specific resistance of material of the given wire using Carey Foster's bridge.	4	25B17PH171.1

			25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
6	To determine the dispersive power of material of prism by Spectrometer.	2	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
7	To determine the wavelength of different spectral lines by spectrometer with the help of diffraction grating.	2	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
8	To study photo-electric effect and determine the Plank's constant (h).	2	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
9	To study the variation of magnetic field with distance along the axis of a current carrying coil and then to estimate the radius of coil with the help of Helmholtz galvanometer.	4	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
10	To verify Malus law (Cosine square law) for plane polarized light with the help of a photo-voltaic cell.	2	25B17PH171.1 25B17PH171.2 25B17PH171.3 25B17PH171.4 25B17PH171.5
Total number of Lectures		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60 (Attendance = 10, Quiz = 20, Projects = 20, Viva-Voice = 10)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc.)	
Reference Books:	
1.	Dey and Dutta, Practical Physics, Kalyani Publication.
2.	Experiment hand-outs.

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Course Code	25B17CI171	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session:2025-26
Course Name	Software Development Fundamentals-I Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSEOUTCOMES: After completing the course, students will be able to:		**COGNITIVELEVELS**
25B17CI171.1	Identify and describe programs/logic for data types, expressions, and conditional structures.	Remember(Level1)
25B17CI171.2	Perform programs for array and functions	Apply(Level3)
25B17CI171.3	Implement programs for structure and union	Apply(Level3)
25B17CI171.4	Perform programs of pointers and recursive functions	Apply(Level3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1.	Developinglogic/flow-chart/pseudocodetosolveproblems,simple/logical games,puzzles	4	25B17CI171.1 25B17CI171.2
2.	Data,variablesandconstants,datatypes,operators– binary,unary,ternary,operatorprecedence, associativity	4	25B17CI171.1 25B17CI171.2
3.	Develop C programs using conditional structure(if,if-else,nestedif),anditerativecontrolstructure(do-while, while, for). Implementswitch casestatement	2	25B17CI171.1 25B17CI171.2

4.	Arrayinitialization,readingandwritingoperationswitharray,onedimensional,two-dimensionalarray,strings,andrelatedoperationslikeaddition,multiplication,traversal,transpose etc.	4	25B17CI171.1 25B17CI171.2
5.	Userdefinedfunctionsandinbuiltfunctions, Functionsdefinition,declaration,calling,Passbyvalue, functions witharray	4	25B17CI171.2 25B17CI171.3
6.	Struct keyword, Structure and Union, Structurevariable, dot operator, arrow operator, Array ofStructures,structureusingfunctions.	4	25B17CI171.3 25B17CI171.4
7.	Pointers in C, Dynamic memory allocation for1D/2Darrayandstructures,Arithmeticaloperations on pointers, functions using pass byreference,recursivefunctionslikepalindrome, factorial,fibonacciseries,numbersystemetc	4	25B17CI171.3 25B17CI171.4
8.	File creation, Modes of File Handling like read,write, update; different types of files like binaryfile and text file and respective operations like,opening, closing, reading, writing, end of file, traversing the file for structured and unstructured data	4	25B17CI171.3 25B17CI171.4
Total number of Lectures		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60 (Attendance=10,Quiz=10, Projects=20, Viva-Voce =20)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	YashavantKanetkar, " Let Us C".
2.	E Balagurusamy, "Computing Fundamentals & C Programming", 2nd Edition, McGraw Hill Education, 2017, ISBN: 978-9352604166
Reference Books:	
1.	HerbertSchildt,"TheCompleteReferenceC",4thEdition,McGrawHillEducation,2017,ISBN:978-0070411838
2.	BrianW.KernighanandDennisRitchie,"TheCProgrammingLanguage",2ndEdition,PearsonEducationIndia,2015, ISBN: 978-9332549449
3.	BehrouzA.Forouzan,RichardF.Gilberg,"ComputerScience:AStructuredProgrammingApproachUsingC",3rd Edition,CengageLearning,2007,ISBN:978-8131503638

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Course Description

Course Code	25B17ME171	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME
			Session: 2025-26
Course Name	Engineering Drawing & Design		
Credits	2	**Contact Hours (L-T-P)**	0-1-2
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17ME171.1	Apply principles of orthographic projection to create multiview drawings of engineering components.	Understand (Level 2) Apply (Level 3)
25B17ME171.2	Construct sectional views to reveal internal details of engineering parts and assemblies.	Apply (Level 3) Create (Level 6)
25B17ME171.3	Construct isometric drawings to visualize 3D objects.	Apply (Level 3) Create (Level 6)
25B17ME171.4	Employ CAD software to create, modify, and document engineering drawing	Apply (Level 3) Create (Level 6)
25B17ME171.5	Analyze and interpret engineering drawings to understand design specifications.	Apply (Level 3) Analyze (Level 4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lab Hours for the module**	**CO Mapping**
1.	Introduction	Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.	4	25B17ME171.1
2.	Orthographic Projections	Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.	4	25B17ME171.1

3.	Projections of Regular Solids	Solids such as Prism, Cylinder, Pyramid, and Cone inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale.	4	25B17ME171.1
4.	Sections and Sectional Views of Right Angular Solids	Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids.	4	25B17ME171.2
5.	Isometric Projections covering	Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.	4	25B17ME171.3
6.	CAD Drawing (2D)	Introduction to CAD software (e.g., AutoCAD): user interface, basic commands, and file management. Basic CAD commands and tools: line, circle, arc, rectangle, trim, extend, move, copy, rotate, scale. 2D drawings: orthographic views, sectional views, and detail drawings. Layers, linetypes, and hatching. Dimensioning and annotation in CAD. 2D engineering drawings using CAD.	6	25B17ME272.4
7.	Introduction to CAD (3D)	Introduction to 3D modeling concepts. Basic 3D commands: extrusion, revolution, and other solid modeling operations. 3D view manipulation. Simple 3D models using CAD software.	4	25B17ME272.4
		Total number of Lab Hours	**30**	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, File work = 10, Experimental work = 30, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	N. D. Bhatt "Engineering Drawing", Charotar Publishing House, Edition, 2012.
2.	K. L. Narayana "Engineering Drawing", Scitech Publication, Edition, 2011.
3.	Basant Agrawal & C. M. Agrawal "Engineering Drawing", TMH Publication, Edition, 2008 & 2013.
4.	(Corresponding set of) CAD Software Theory and User Manuals
Reference Books:	
1.	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
2.	Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.

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Course Description

Course Code	25B11EE111	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ELECTRONICS
			Session: 2025-26
Course Name	Basic Electronics		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11EE111.1	Recall the concepts of various circuit elements and Kirchhoff's laws.	Remembering (Level 1)
25B11EE111.2	Understand the basics of semiconductor PN junction diodes and Op-Amp, and their applications.	Understand (Level 2)
25B11EE111.3	. Apply network theorems to effectively solve complex DC circuits.	Apply (Level 3)
25B11EE111.4	Explain the operation of transistors (BJT and MOSFET) and analyze their biasing techniques.	Analyze (Level 4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Basic Circuit Analysis	Kirchhoff's Laws, Voltage Divider rule, Current Divider Rule, DC circuit analysis (Nodal, Mesh), Superposition and Thevenin/Norton Theorem	10	25B11EE111.1
2.	PN Junction diode and Applications	PN Junction, Biasing the PN Junction, Current–Voltage Characteristics of a PN Junction, PN Junction Diodes, Half Wave Rectifier & Full Wave Rectifier Clipper & Clamping Circuits	9	25B11EE111.2
3.	Zener Diode and Applications	Zener Diode and applications, Line and Load Regulations of reference circuits.	4	25B11EE111.3
4.	Introduction to BJT	Introduction to BJT, operation, characteristics, Biasing and Stability	7	25B11EE111.4
5.	Introduction to MOSFET	Introduction to MOSFET, operation, characteristics and biasing	6	25B11EE111.4
6.	Op-amps and applications	Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters, Ideal Op-Amp, Equivalent Circuit of Op-Amp, Op-Amp Applications:	9	25B11EE111.2

		Inverting Configuration, Non-Inverting Configuration, Voltage Follower, summer, comparator, difference Amplifier, Integrator, Differentiator		
		Total number of Lectures	**45**	

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
T2	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	R. L. Boylestad, and L. Nashelsky, "Electronic Devices and Circuit Theory", 11th edition, Prentice Hall of India, 2014.
2.	D.C. Kulshreshtha, "Basic Electrical Engineering", Revised 1st edition, Tata McGraw Hill, 2017

Reference Books:

1.	R.C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 9th edition, John Wiley & Sons, 2013.
2.	Charles K. Alexander (Author), Matthew N.O Sadiku, "Fundamentals of Electric Circuits", 6th edition, Tata McGraw Hill, 2019.

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Course Code	25B11EE171	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ELECTRONICS
			Session: 2025-26
Course Name	Basic Electronics Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11EE 171.1	Recall various electronic components and working of basic measuring instruments	Remember (Level 1)
25B11EE 171.2	Understand the input-output characteristics of BJT	Understand (Level 2)
25B11EE 171.3	Verify Kirchhoff's laws and apply network theorems to solve DC circuit	Apply (Level 3)
25B11EE 171.4	Analyze operational amplifier in various configurations and characteristics of basic diodes including their applications	Analyze (Level 4)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1.	Introduction to basic electrical equipment and components Introduction to various components (Resistor, Capacitor, Inductor, and IC) and instruments Multimeter, Bread board, Regulated D.C. power supply, and CRO.	2	25B11EE171.1
2.	Basic Circuit Analysis Verification of KVL and KCL using a given circuit.	2	25B11EE171.3
3.	Basic Circuit Analysis Verification of Superposition theorem.	2	25B11EE171.3

4.	PN Junction diode and Applications To study the forward bias I-V (current-voltage) characteristics of a simple p-n junction diode. Also determine the forward resistance of the diode	2	25B11EE171.4
5.	PN Junction diode and Applications To observe the output waveform of half/full wave rectifier and calculate its ripple factor and efficiency	4	25B11EE171.4
6.	Zener diode and Applications To study the reverse bias I-V (current-voltage) characteristics of a Zener diode. Also determine the breakdown voltage, static and dynamic resistances.	2	25B11EE171.4
7.	PN Junction diode and Applications Realization of desired wave shapes using clipper and clamper circuits	4	25B11EE171.4
8.	Bipolar Junction Transistors To plot input- output characteristics of a common emitter NPN BJT	4	25B11EE171.2
9.	Operational Amplifier To realize inverting and non inverting amplifier configuration using Op-Amp IC- 741	4	25B11EE171.4
10.	Operational Amplifier To realize adder and subtractor circuits using Op-Amp IC-741	4	25B11EE171.4
Total number of Lectures		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	R. L. Boylestad, and L. Nashelsky, "Electronic Devices and Circuit Theory", 11th Ed., Prentice Hall of India, 2014.
2.	D.C. Kulshreshtha, "Basic Electrical Engineering", Revised 1st Ed., Tata McGraw Hill, 2017
Reference Books:	
1.	S.M. Sze, K.K. Ng, "Physics of Semiconductor Devices", Wiley India, 3rd Ed., 2006.
2.	R. A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Ed., Pearson, 2000.

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CourseCode	25B17CI172	**Offered to Program:** UG **(specifyUG/PG)**	**Offered Department:** CSE
			Session:2025-26
CourseName	Programming Practices Lab-I		
Credits	1	**ContactHours (L-T-P)**	0-0-2

COURSEOUTCOMES: After completing the course, students will be able to:		**COGNITIVELEVELS**
25B17CI172.1	Identify and describe programs/logic for data types, expressions, and conditional structures.	Remember(Level1)
25B17CI172.2	Perform programs for array and functions	Apply(Level3)
25B17CI172.3	Implement programs for structure and union	Apply(Level3)
25B17CI172.4	Perform programs of pointers and recursive functions	Apply(Level3)

Sr. No	List of Experiments	No. of labs hrs. required	CO Mapping
1.	Developing logic/flow-chart/pseudo code to solve problems, simple/logical games, puzzles.	4	25B17CI172.1 25B17CI172.2
2.	Evaluate the following expressions: 22 + 3 < 6 && !5 || 22 = =7 && 22 – 2 > +5 a + 2 > b || !c && a = = d *a – 2 < = e Where a=11, b=6, c=0, d = 7 and e=5. An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program in C to read the name of the user, number of units consumed and print out the charges. Write a C-program using function to check whether the given number is prime or not. Write a program in C to find the sum and average of given three numbers. Write a program in C to find the area and perimeter of a circle.	4	25B17CI172.1 25B17CI172.2

	Write a program in C to find the largest number among 3 numbers. Write a C program to compute simple interest. Write a C program that reads from the user an arithmetic operator and two operands, perform the corresponding arithmetic operation on the operands using switch statement		
3.	Write a C program to find sum of Natural numbers from 1 to N using for loop. Write a C-program using functions to generate the Fibonacci series. Write a C program to find the factorial of a number using do-while, where the number n is entered by user.	2	25B17CI172.1 25B17CI172.2
4.	Write a program in C to check whether a string is palindrome or not. Write a C program that reads N integer numbers and arrange them in ascending order using selection Sort. Write a C program to search an integer from N numbers in ascending order using binary searching technique.	2	25B17CI172.1 25B17CI172.2
5.	Write a program in C using functions to swap two numbers using global variables concept and call by reference concept.	4	25B17CI172.2 25B17CI172.3
6.	Write a C-program using structures to read, write, compute average - marks and display the students scoring above and below the average marks for a class of N students.	4	25B17CI172.3 25B17CI172.4
7.	Write a program in C to find the sum and mean of all elements in an array using pointers. Write a C program to swap two numbers using call by address (pointers or reference) method.	2	25B17CI172.3 25B17CI172.4
8.	Write a program in C to create, open and write some content in file. Write a program to copy the content of one file into another file.	4	25B17CI172.3 25B17CI172.4
9.	Write a program to copy the content of one file into another file.	4	
Total number of Lectures		**30**	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60 (Attendance=10,Quiz=10, Projects=20, Viva-Voce =20)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
TextBooks:	
1.	YashavantKanetkar, " Let Us C".
2.	E Balagurusamy, "Computing Fundamentals & C Programming", 2nd Edition, McGraw Hill Education, 2017, ISBN: 978-9352604166
ReferenceBooks:	
1.	HerbertSchildt,"TheCompleteReferenceC",4thEdition,McGrawHillEducation,2017,ISBN:978-0070411838
2.	BrianW.KernighanandDennisRitchie,"TheCProgrammingLanguage",2ndEdition,PearsonEducationIndia,2015, ISBN: 978-9332549449
3.	BehrouzA.Forouzan,RichardF.Gilberg,"ComputerScience:AStructuredProgrammingApproachUsingC",3rd Edition,CengageLearning,2007,ISBN:978-8131503638

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Course Description

Course Code	25B11MA211	**Offered to Program:** UG	**Offered Department:** Mathematics **Session:** 2025-26
Course Name	Mathematics-2		
Credits	4	**Contact Hours (L-T-P)**	3-1-0
Course Coordinator			

	COURSE OUTCOMES: After completing the course, students will be able to:	**COGNITIVE LEVELS**
25B11MA211.1	Apply different methods for solving ordinary differential equations of second order.	Apply (Level 3)
25B11MA211.2	Explain different tests/methods of convergence for infinite series.	Apply/Evaluate (Level 3, 5)
25B11MA211.3	Find the series solution of differential equations and use it to construct Legendre‟s polynomials and Bessel‟s functions.	Analyze/Apply (Level 2, 3)
25B11MA211.4	Classify the partial differential equations and apply Fourier series to find their solution.	Analyze (Level 2)
25B11MA211.5	Explain Taylor‟s & Laurent‟s series expansion, singularities, residues and transformations.	Analyze/Apply (Level 2,3)

Unit	Subtitle of the Unit	Topics in the Unit	No. of Lectures	CO Mapping
1.	Second Order Linear Differential Equations Convergence of Series.	Linear Differential Equations of Second Order with constant coefficients and with variable coefficients, Change of Variable, Variation of Parameters. Convergence of series, Tests of convergence, Alternating Series, Absolute & Conditional Convergence, Uniform Convergence.	12	25B11MA211.2
2.	Series Solution of Special Functions, Fourier Series and Partial Differential Equations.	Series Solutions, Bessel Function, Recurrence Relations and Orthogonality. Legendre functions, Recurrence relations and Orthogonality. Fourier Series. Classification and Solution of PDE, Equation of vibrating string, Solution of one dimensional wave & heat equations.	11	25B11MA211.2, 25B11MA211.3
3.	Complex Variables Complex Integration	Limit, Continuity and Differentiability of Functions of Complex Variables, Analytic Functions, Cauchy‟s Riemann Equations. Cauchy Integral Theorem, Cauchy Integral Formula and Applications.	11	25B11MA211.2, 25B11MA211.3
4.	Series Expansion, Contour Integration and Conformal Mapping	Taylor and Laurent Series Expansion, Poles and Singularities. Residues, Cauchy's residue theorem and its applications. Bilinear transformation.	11	25B11MA211.2, 25B11MA211.3
		Total number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3(End Semester Examination)	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1. Advanced Engineering Mathematics, by Erwin Kreyszig, 10th edition John Willey and Sons
2. Jain, R. K. &Iyenger, S. R. K., Advanced Engineering Mathematics, 5th Ed., Narosa Publishing House, New Delhi, 2016.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, 10th edition John Willey and Sons.

Reference Books:

1. Brown, J.W. & Churchill, R.V., Complex Variables and Applications, 6th Ed., McGrawHill, 1996.

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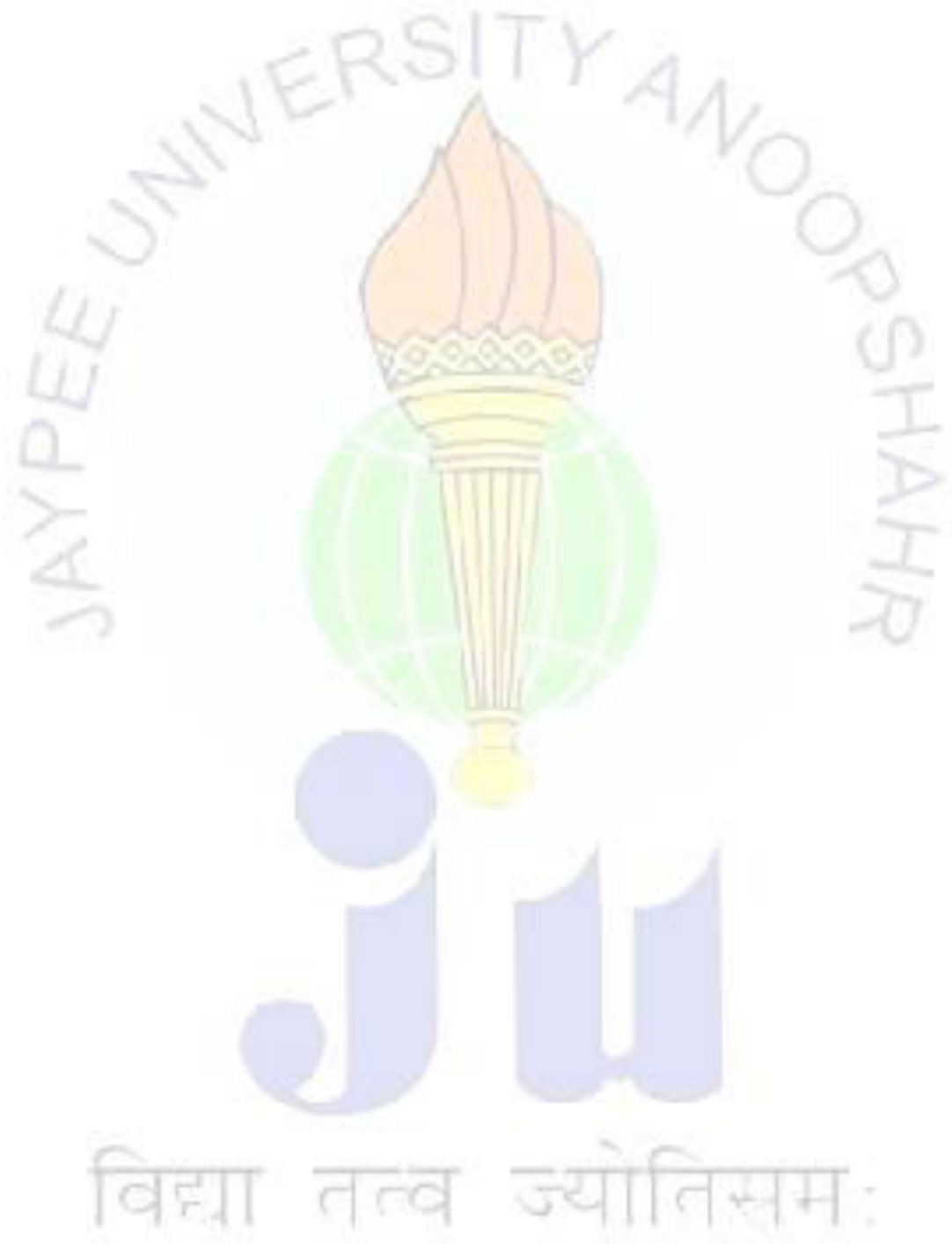
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Course Description

Course Code	25B11PH211	**Offered to Program:** UG.	**Offered Department:** PMSE
			Session: 2025-2026
Course Name	Physics-2		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator		Dr. Priyanka A. Jha	

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11PH211.1	Conceptual knowledge of the basic concepts relating to electromagnetic theory, lasers, fiber optics and solid state physics.	Remember (Level 1)
25B11PH211.2	Understanding of the various physical phenomena with interpretation based on the mathematical expressions involved.	Understand (Level 2)
25B11PH211.3	Apply the basic principles in solving a variety of problems related to lasers, electromagnet theory, fiber and solid state physics.	Apply (Level 3)
25B11PH211.4	Analyze and examine the solution of the problems using physical and mathematical concepts involved in the course.	Analyze (Level 4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Electromagnetic theory	Introduction of electromagnetism, Basic idea of Cartesian, Spherical polar and cylindrical coordinate systems, Basics of fields, Gradient, Divergence and Curl, Coulomb's law, Electric Flux & Gauss's law , Applications of Gauss law for Spherical and Cylindrical symmetries (all important cases), Electric field due to charged conductor, Force per unit area on the surface of the charged conductor, Laplace and Poisson's equations and their applications to solve electrostatic problems in Cartesian and cylindrical systems, Treatment of electrostatic problems using Laplace and Poisson's equations in spherical coordinate system, Maxwell's	21	25**B**11PH211.1 25B11PH211.2 25B11PH211.3 25B11PH211.4

		correction to Ampere's law, Displacement current, Maxwell's equations in free space and dielectric media (both differential and integral forms) Poynting's theorem (derivation) and Poynting vector, Electromagnetic waves in free space (equations and solutions) and Transverse nature of EM waves, Energy and momentum in EM waves, Radiation pressure, Propagation of EM waves through boundary, Boundary Conditions across the medium ,Reflection and Transmission of EM waves at normal incidence, Reflection and Transmission at oblique incidence- Laws of Reflection and Refraction , Oblique incidence-p polarization, Fresnel's equations, Total internal Reflection and Brewster's Law for EM waves		

2.	Lasers, Optical Fiber and their applications	Introduction to Laser, spontaneous and stimulated emission, population inversion, Einstein A and B coefficients, Principles and working of lasers, Three level Laser Scheme, Ruby laser, Applications of lasers , Concept of optical fiber and Principle of Total Internal Reflection in optical fiber, Numerical aperture and Single, multistep & graded index fiber, Attenuation coefficient, Transmission losses in optical fiber, Applications of an optical fiber: Endoscopy and sensing applications (discussion of one specific example) of an optical fiber.	8	25**B**11PH211.1 25B11PH211.2 25B11PH211.3 25B11PH211.4
3.	Solid State Physics	Basic ideas of Bonding, Ionic bonding, covalent bonding and Metallic Bonding, Inter-atomic coulomb forces in ionic crystals and Determination of equilibrium separation, Minimum Potential energy and determination of Madelung constant 'α 'for NaCl crystal in 1D , Lattice points and space lattice, Basis and crystal structure, Unit cell and Primitive cell, Seven crystal systems and Fourteen, Bravais space lattice, Coordination number, nearest neighbor distance, atomic radius and packing factor in crystal structure, Calculation of lattice constant, Lattice planes and Miller indices,Separation between lattice planes, Derivation and examples, X-ray diffraction, Bragg's law of X- ray diffraction, Electrical properties of metals: Classical free electron theory of conduction in metals , Quantum mechanical treatment: Quantum theory of electronic conduction in metals , Kronig Penney Model: Periodic Potential and Allowed Energies, Emergence of Bands through Kronig Penney Model and Band Theory of Solids, Distinction between metals, Semiconductors and insulators, intrinsic and extrinsic semiconductors,Effective Mass: Concept and Significance, Brillouin zone: Relation with Lattice Structures, Types of Brillouin zones, Energy and Momentum ,Brillouin zone: Origin of Forbidden Bands	16	25**B**11PH211.1 25B11PH211.2 25B11PH211.3 25B11PH211.4
		Total number of Lectures	**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
Term 1	20	
Term 2	20	
End Semester Examination	35	
IA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

ecommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc.)	
Text Books:	
1.	Feynman, Richard P., *The Feynman Lectures on Physics*. Vol. 1 (2nd ed.). Addison-Wesley, 2005.
2.	Halliday, David; Resnick, Robert, *Fundamentals of Physics*. John Wiley & Sons, 1970.
3.	Kleppner, Daniel; Kolenkow, Robert, *An Introduction to Mechanics*. McGraw-Hill, 1973.
Reference Books:	
1.	Morin, David, *Introduction to Classical Mechanics: Problems and Solutions*. Cambridge University Press, 2005.
2.	Goldstein, H., *Classical Mechanics* (2nd ed.). Addison-Wesley, 1980.

Signature of Coordinator	
Signature of Head of Department	

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Course Description

Course Code	25B11CI211	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session:2025-26
Course Name	Software Development Fundamentals-II		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSEOUTCOMES: After completing the course, students will be able to:		**COGNITIVELEVELS**
25B11CI211.1	Explain various object-oriented concepts like class and objects, friend function, function and operator overloading, etc.	Understand(Level2)
25B11CI211.2	Apply and implement the relationships of association, aggregation, composition, and inheritance	Apply(Level3)
25B11CI211.3	Analyze the output of the source code and able to debug the errors	Analyze (Level4)
25B11CI211.4	Design the class diagram for real life problems and implement it using virtual functions, abstract classes, templates, and exception handling	Create(Level6)
25B11CI211.5	Apply SQL commands to create tables and perform various operations like insert, delete, select, etc	Apply(Level3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to Object Oriented Programming	Comparison of Procedural and Object-Oriented Approach, Characteristics of Object-Oriented Languages, Separation of behavior and implementation	2	25B11CI211.1

2.		OO Concepts using C++	Objects, Classes, Internal representations of Objects, Constructors, Destructors Functionand Operator Overloading, Static and Friend Functions	8	25B11CI211.1
3.		Inheritance using C++	Base Class, Derived class, Method Overriding, Private and Public Inheritance, Multiple Inheritance.	5	25B11CI211.2
4.		Polymorphism using C++	Virtual Functions, Pure Virtual Functions, Abstract Classes, Dynamic Dispatch, Internal representations of method tables, RTTI	3	25B11CI211.2, 25B11CI211.3
5.		UML/Relationship Implementation in C++	Models, Views and Model Elements, Class Diagram, Relationships of Association, Aggregation, Composition, and Inheritance, etc. and their implementing	8	25B11CI211.2 25B11CI211.3
6.		Exceptions, Templates, and STL in C++	Exceptions, Try, Catch and Throw, Re-throwing exceptions, Exception and Inheritance, Function Templates, Overloading Functions Template, Class Templates, Collection classes and iteration protocols (STL)	9	25B11CI211.4
7.		Introduction to Database	Fundamentals of Database and Database Management System, Introduction to Relational Database, Table, Attributes, Records, Introduction to SQL, Data types in SQL, Various operations on single table like create, insert, delete, update, alter, etc. using SQL, SQL queries on single table using select statement with or without where/ group by clause, etc.	10	25B11CI211.5
			Total number of Lectures	**45**	

	Evaluation Criteria	
	Components	**Maximum Marks**
	T1	20
	T2	20
	End Term Examination	35
	TA	25 (Attendance=10,ClassTest/Quiz=5, Assignments=5, Internal Assessment=05)
	Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Herbert Schildt, C++: The Complete Reference, McGraw-Hill Osborne Media, 4th Edition, 2017
2.	Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, 7 th Edition, 2016
3.	Stroustrup B., The C++ Programming Language, Addison Wesley, 4th Edition, 2013
Reference Books:	
1.	Avi Silberschatz, Henry F. Korth, and S. Sudarshan, "Database System Concepts", 6th edition, McGrawHill, 2010.
2.	Robert Lafore, Object Oriented Programming in C++, SAMS, 4th Edition, 2002

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Course Code	25B17PH271	**Offered to Program:** UG.	**Offered Department:** PMSE
			Session: 2025-26
Course Name	Physics Lab II		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17PH271.1	Recall laser, fibre optics, semiconductor and solid state physics principles behind the experiments.	Remember (Level 1)
25B17PH271.2	Explain the experimental setup and the principles involved behind the experiments performed.	Understand (Level 2)
25B17PH271.3	Plan the experiment and set the apparatus and take measurements.	Apply (Level 3)
25B17PH271.4	Analyze the data obtained and calculate the error.	Analyze (Level 4)
25B17PH271.5	Interpret and justify the results	Analyze (Level 4)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1	To determine the band gap in a semiconductor using its p-n junction diode.	2	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
2	To measure resistivity of semiconductor at different temperatures by Four Probe Method.	4	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
3	To study the Hall effect in semiconductor and to determine its allied coefficients.	4	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
4	To study the Magnetostriction in metallic rod with the help of Michelson interferometer arrangement.	4	25B17PH271.1 25B17PH271.2 25B17PH271.3

			25B17PH271.4 25B17PH271.5
5	To find the susceptibility of a paramagnetic substance (FeCl3) in the form of liquid or a solution.	4	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
6	Study of dielectric (constant) behaviour and determination of Curie's temperature of ferroelectric ceramics.	2	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
7	To study the magneto resistance of given semiconductor material.	4	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
8	To determine the value of specific charge (e/m) of an electron by Magnetron method.	2	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
9	To determine the value of specific charge (e/m) of an electron by Thomson method.	2	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
10	To determine the numerical aperture and bending loss of a given multimode optical fiber.	2	25B17PH271.1 25B17PH271.2 25B17PH271.3 25B17PH271.4 25B17PH271.5
Total number of Lectures		**30**	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60 (Attendance = 10, Quiz = 20, Projects = 20, Viva-Voice = 10)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc.)	
Reference Books:	
1.	Dey and Dutta, Practical Physics, Kalyani Publication.
2.	Experiment hand-outs.

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Course Code	25B17CI271	**Offered to Program:** UG **(specifyUG/PG)**	**Offered Department:** CSE
			Session:2025-26
Course Name	Software Development Fundamentals-II Lab		
Credits	1	**ContactHours (L-T-P)**	0-0-2

COURSEOUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI271.1	Write programs in C++ to implement OOPs concepts related to objects, classes, constructor, destructor, and friend function	Apply(Level3)
25B17CI271.2	2 Write programs in C++ using OOPs concept like encapsulation, inheritance, polymorphism and abstraction	Apply(Level3)
25B17CI271.3	Write programs in C++ using Standard Template Library.	Apply(Level3)
25B17CI271.4	Perform exception handling in C++ programs.	Apply(Level3)
25B17CI271.5	Write MySQL queries to perform operations like ADD, DELETE, UPDATE, SELECT on relational databases.	Apply(Level3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1.	Write output based C++ programs to implement the concepts of Objects, Classes, Internal representations of Objects, encapsulation, Constructors, Destructors, Function and Operator Overloading, Static and Friend Functions.	5	25B17CI271.1
2.	Write programs in C++ to implement concepts of Base Class, Derived class, Method Overriding, Private and Public Inheritance, Multiple Inheritance.	4	25B17CI271.2

3.	Write programs in C++ using Virtual Functions, Pure Virtual Functions, Abstract Classes, Dynamic Dispatch, Internal representations of method tables, RTTI, operator overriding.	5	25B17CI271.1 25B17CI271.2
4.	Write programs in C++ using based on Class diagram, Relationships of Association, Aggregation, Composition, and Inheritance	4	25B17CI271.1 25B17CI271.2
5.	Write programs in C++ using Exceptions, Try, Catch and Throw, Re-throwing exceptions, Exception and Inheritance, Function Templates, Overloading Functions Template, Class Templates, Collection classes and iteration protocols (STL)	5	25B17CI271.3 25B17CI271.4
6.	Design simple SQL queries using MYSQL to apply various operations on single table like create, insert, delete, update, alter, etc., Queries on single table using select statement with or without where/ group by clause, etc.	7	25B17CI271.5
Total number of Lectures		**30**	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance=10,Quiz=10, Projects=20, Viva-Voce =2 0)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
TextBooks:	
1.	Herbert Schildt, C++: The Complete Reference, McGraw-Hill Osborne Media, 4th Edition, 2017
2.	Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, 7th Edition, 2016
ReferenceBooks:	
1.	Stroustrup B., The C++ Programming Language, Addison Wesley, 4th Edition, 2013
2.	Avi Silberschatz, Henry F. Korth, and S. Sudarshan, "Database System Concepts", 6th edition, McGrawHill, 2010.
3.	Robert Lafore, Object Oriented Programming in C++, SAMS, 4th Edition, 2002

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Course Description

Course Code	25H11HS216	**Offered to Program:** UG **(specify UG/PG)**	**Offered By:** Department of Arts **Session:** 2025-26
Course Name	Professional Communication		
Credits	4	**Contact Hours (L-T-P)**	3-1-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25H11HS216.1	Understand the significant aspects of communication	Understand (Level 2)
25H11HS216.2	Apply grammatical knowledge for constructing appropriate sentences	Apply (Level 3)
25H11HS216.3	Apply the significant communication skills required to succeed in professional world	Apply (Level 3)
25H11HS216.4	Apply their understanding of the aspects of academic and professional writing in academic and professional discourse	Apply (Level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to communication and Grammar	Human communication- Nature, Process and types, Spoken & Written communication, 7C's of effective communication, verbal and non verbal communication Barriers of communication , redundancies, collocation, connotation Grammar – Verbs, Subject-Verb agreement Tenses, Sentence Structures, one word substitution	9	25H11HS216.1 25H11HS216.2

2	Communication skills	Listening comprehension-techniques of effective listening, Developing verbal proficiency - pronunciation, phrases, vocabulary and common errors, Reading skills – identify, evaluate and interpret the main idea, proofreading, reading diagrams and images	9	25H11HS216.3
3	Academic and Business Writing skills	explaining the concepts, making arguments, Signposting, paraphrasing, metadiscourse markers, cohesion and coherence, brain storming, mindmapping Writing business emails, agenda, minutes of meeting, memorandum, circulars, cover letter and CV, reports, note taking	9	25H11HS216.4
4	Speaking skills	Commonly used Short English phrases, fillers, introducing yourself and others, describing a process, making requests and enquiries, using slangs and common workplace uterances, Storytelling and Public speaking - delivering speech and vote of thanks Initiating and Sustaining a conversation conversation/discussion, giving formal presentations Group Discussions,	9	25H11HS2163
5	Professional Communication	English for professional communication: popular phrases, idioms ,attending meetings; How to question, give opinions, handle arguments, negotiating; telephonic conversation, web conferencing skills, etiquettes and mannerisms, PPT Collaborative and interpersonal communication ; expressing agreement/disagreement, giving opinions,	9	25H11HS216.3, 25H11HS216.4
		Total number of Lectures	**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Hamilton, D. (2019). Business and Professional Communication: KEYS for Workplace Excellence. SAGE Publications
2.	Knapp, M. L., & Hall, J. A. (2009). Nonverbal communication in human interaction (7th ed.). Cengage Learning.
3.	Petty, R. E., & Cacioppo, J. T. (1986). Communication and persuasion: Central and peripheral routes to attitude change.
Reference Books/Resources:	
1.	Sen, Madhuchanda. 2010. An Introduction to Critical Thinking. Delhi: Pearson
2.	Elkington, J., and Hartigan, P. 2008. The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Boston, MA: Harvard Business Press.
3.	Ramon & Prakash.(2012). Business Communication. Oxford
4.	Jones, L.(2001). Working in English Student's Book.Cambridge University Press
5.	Wood, T.J.(2015).Interpersonal Communication: Everyday Encounters. Cengage Learning
6.	Web links: Global Business Foundation Skills (GBFS) – Refer websites like https://www. sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/
7	DeVito, J. A. (2011). Essentials of Human Communication. United Kingdom: Allyn & Bacon.

Signature of coordinator	
Signature of Head of Department	

Course Description

Course Code	25B17ME272	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME
			Session: 2025-26
Course Name	Workshop		
Credits	1	**Contact Hours (L-T-P)**	0-0-2
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17ME272.1	Describe the fundamentals of the manufacturing environment and outline the relevant safety measures.	Remember (Level 1)
25B17ME272.2	Apply the appropriate hand tools, power tools, and measuring instruments to fabricate components.	Understand (Level 2) Apply (Level 3)
25B17ME272.3	Fabricate various jobs in the carpentry, fitting, and welding shops.	Apply (Level 3) Create (Level 5)
25B17ME272.4	Operate machines such as lathe, shaper, drilling, and grinders to create and finish metal components	Understand (Level 2) Apply (Level 3) Create (Level 5)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lab hours for the module**	**CO Mapping**
1.	Introduction	Introduction to the basics of the manufacturing environment and detail the associated safety measures. Introduction to carpentry operations such as marking, sawing, planing, chiseling, grooving, boring, joining, etc. Preparation of wooden joints as per the given specification.	2	25B17ME272.1
2.	Carpentry Shop	Introduction to carpentry operations such as marking, sawing, planing, chiseling, grooving, boring, joining, etc. Preparation of wooden joints as per the given specification.	6	25B17ME272.2 25B17ME272.3

3.	Welding Shop	Introduction to various welding processes like electric arc welding, gas welding, soldering, brazing. Preparation of butt joint and lap joint using electric arc welding. Preparation of butt joint and lap joint using Gas welding.	6	25B17ME272.2 25B17ME272.3
4.	Sheet Metal Shop	Introduction to various sheet metal operations such as cutting, rolling, punching, drawing, notching, folding etc. Preparation of a square tray using GI sheet. Preparation of a funnel using GI sheet.	4	25B17ME272.2 25B17ME272.3
5.	Fitting Shop	Introduction to various tools like, work holding tools, fitting marking and measuring tools-marking table, surface plate, angle plate, try-square, scriber, divider, centre punch, callipers, vernier calliper, fitting cutting tools, hacksaw, chisels, twist drill, taps, files, dies, reamers, etc. Preparation of prepare square fit as per given specifications.	6	25B17ME272.2 25B17ME272.3
6.	Machine Shop	Introduction to various machine tools like lathe machine, drilling machine, etc. Preparation of specimen on Lathe machine. Preparation of specimen on drilling machine.	6	25B17ME272.2 25B17ME272.3 25B17ME272.4
		Total number of Lab Hours	**30**	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, File work = 10, Experimental work = 30, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Workshop Technology Part 1, CHAPMAN W. A. J., 5ed (2001).
2.	Elements of Workshop Technology, Choudhury S K, Vol 1: Machine Tools.
3.	Workshop Technology Part 1 & 2 by Raghuwanshi B.S
4.	Elements of Workshop Technology, Choudhury S K, Vol 2: Machine Tools.
Reference Books:	
1.	Mechanical Workshop Practice, John K.C., 2nd Edition, PHI, 2010
2.	Workshop Technology Part 2, CHAPMAN W. A. J., 5ed (2001).

Signature of coordinator	
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Course Description

Course Code	25B11CO211	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Commerce **Session:** 2025-26
Course Name	Finance for Everyone		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CO211.1	Define financial literacy and identify key institutions providing financial services.	Remembering (Level 1)
25B11CO211.2	Explain the role of financial literacy in personal and economic development.	Understanding (Level 2)
25B11CO211.3	Illustrate how financial literacy affects day-to-day financial decisions.	Apply (Level 3)
25B11CO211.4	Compare the services provided by different financial institutions (banks, credit unions, insurance co. etc.).	Analyze (Level 4)
25B11CO211.5	Assess the impact of financial literacy on long-term financial stability.	Evaluating (Level 5)
25B11CO211.6	Develop a basic financial literacy awareness program including about financial markets.	Creating (Level 6)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction, Financial Planning and Budgeting	Meaning, importance and scope of financial literacy; Prerequisites of financial literacy – level of education, numerical and communication ability; Various financial institutions – banks, Insurance companies, post offices, mobile app-based services. Need of availing of financial Services from banks, insurance companies and postal services. Concept of economic wants and means for satisfying these needs; Balancing between	8	25B11CO211.1 25B11CO211.2 25B11CO211.3

		economic wants and resources; Meaning, Importance and need for financial planning; Personal budget, family budget, business budget and national budget; Procedure for financial planning and preparing a budget; Budget surplus and budget deficit, Avenues for savings from surplus, Sources for meeting the deficit.		
2.	Banking Services	Types of banks; Banking products and services – Various services offered by banks; Types of bank deposit accounts – savings bank account, term deposit, current account, recurring deposit; pan card, address proof, KYC norm; Various types of loans – education loan, consumer durable loan, vehicle loan, housing loan, short term, medium term, long term, microfinance, bank overdraft, cash credit, mortgage, reverse mortgage, hypothecation, pledge, Agricultural and related interest rates offered by various nationalized banks;Cashless banking, e-banking, check counterfeit currency; CIBIL, ATM, net banking, RTGS, NEFT, IMPS, electronic clearance services (ECS), debit and credit card,app based payment system, bank draft and pay order; banking complaints and ombudsman.	8	25B11CO211.2 25B11CO211.3 25B11CO211.4
3.	Financial Services from India Post Office	Post office savings schemes: savings bank, recurring deposit, term deposit, monthly income scheme, kisan vikaspatra, NSC, PPF, senior citizen savings scheme ,sukanyasamriddhi yojana ; india post payments bank. money transfer: money order, e-money order. instant money order, collaboration with the western union financial services; movidesh, international money transfer service, money gram international money transfer, Indian postal order.	8	25B11CO211.2 25B11CO211.3 25B11CO211.4
4.	Insurance Services	Life insurance policies: life insurance, term life insurance, endowment policies, pension policies, ULIP, health insurance plans, comparison of policies offered by various life insurance companies, comparison of policies offered by various health insurance companies. Property insurance policies. Post office life insurance schemes: postal life insurance and rural postal life insurance.	8	25B11CO211.2 25B11CO211.3 25B11CO211.4
5.	Stock Markets – Some Basic Concepts	Terms used in stock markets: SENSEX, NIFTY, primary markets, secondary markets, initial public offering(IPO), follow-on public offering (FPO), offer for sale (OFS), block deal, equity shares, preference shares, debentures, bonus shares, stock split, dividend, buyback, DEMAT account, trading account, delivery instruction slip (DISlips),blue chips, defensive stocks, face value, market value, market capitalisation, pre-opening session, trading session, opening price, closing price, business days, bull, bear, bull market, bear market, risk, stop loss, derivatives, call option, put option, hedge, holding period; Tax on short term capital gains and long-term capital gains,Mutual Fund and its various schemes.	13	25B11CO211.2 25B11CO211.3 25B11CO211.4
		Total number of Lectures	**45**	
Evaluation Criteria				

Components	Maximum Marks	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Chandra, P. ―Investment Game: How to Win‖ Tata McGraw Hill Education, New Delhi.
2.	Kothari, R. ―Financial Services in India-Concept and Application‖ Sage Publications India Pvt. Ltd., New Delhi.
3.	Milling, B. E. ―The Basics of Finance: Financial Tools for Non-Financial Managers" Universe Company, Indiana,
4.	Mittra, S., Rai, S. K., Sahu, A. P., & Starn, H. J. ―Financial Planning" Sage Publications India Pvt. Ltd., New Delhi.
5	Zokaityte, A. ―Financial Literacy Education" Palgrave Macmillan, London.

Reference Books:

1.	Anand, D.K., Finance for Everyone, Vikas Publishing, First Edition, January 2019

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Course Description

Course Code	25B11LS211	**Offered to Program:** **All UG programs**	**Offered Department:** Department of Life Sciences
			Session: 2025-26
Course Name	Environmental Sciences		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11LS211.1	Analyze the relationships between organisms and their environment to understand ecological dynamics and environmental impacts.	Level 1, 2
25B11LS211.2	Interpret the effects of population dynamics, community interactions, and succession on environmental stability and biodiversity.	Level 2
25B11LS211.3	Explain the principles of ecosystem structure and function to understand how biotic and abiotic components interact and influence environmental processes.	Level 3
25B11LS211.4	Evaluate the management and conservation strategies for natural resources and biodiversity to ensure sustainable use and protection.	Level 3, 4
25B11LS211.5	Analyze the impact of pollution and global environmental change on natural systems and human societies to develop effective mitigation strategies.	Level 3, 4

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Organisms and the environment	Ecology, levels of ecological organization, environment, climate, niche, atmosphere, water cycle, light, temperature, fire, soil, interactions among living organisms, range of tolerance, ecological adaptations in plants and animals.	8	25B11LS211.1
2	Population, biotic community, and succession	Population characteristics, population growth forms, ecological interdependence and interactions, species interaction, predation, parasitism, amensalism, commensalism, protocooperation, mutualism, competition, plant community analysis, ecological succession.	10	25B11LS211.2
3	Ecosystem: Structure and functions	What is an ecosystem? Structure: food chains, food webs and function of ecosystem: Energy flow in an ecosystem, nutrient cycle and ecological succession.	10	25B11LS211.3

		Ecological Interactions. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
4	Natural resources and biodiversity	Renewable and non-renewable resources, Land resources and land use change; land degradation, soil erosion and desertification, deforestation: causes, consequences and remedial measures, water: use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international and inter-state), energy resources: Environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs. Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Nature reserves, tribal populations and rights (Niyamgiri-Vedanta, POSCO), and human wildlife conflicts in Indian context (Sundarban-Human-Tiger encounters). Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	9	25B11LS211.4
5	Pollution and global environmental change	Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Nuclear hazards and human health risks (Chernobyl, 3 mile Island, Daiichi- Fukushima). Solid waste management: Control measures of urban and industrial waste, special reference e-waste, biomedical waste. Pollution Tragedies: Love canal, Bhopal Gas, Endosulfan, Minamata and Flint water.	8	25B11LS211.5
Total number of Lectures			**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Basu, M. and Xavier, S.,Fundamentals of Environmental Studies, Cambridge University Press, 2016.
2.	Mitra, A. K and Chakraborty, R., Introduction to Environmental Studies, Book Syndicate, 2016.
3.	Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). Environment, 8th Edition. Wiley Publishing, USA. (pp. 1-472).
4.	Brusseau, M.L., Pepper, I.L., and Gerba, C.P. (2019). Environmental and Pollution Science, 3rd Edition. Academic Press, USA. (pp. 1-520)
5.	Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010
Reference Books:	
1.	Odum, E. P., Barrett G., W., 2011, Fundamentals of Ecology, 5ed., Cengage Learning. ISBN-13: 978-8131500200
2.	Sharma, P. D., 2011. Ecology and Environment, Rastogi Publications. ISBN-13: 978-8171339655
3.	Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
4.	Singh, J.S., Singh, S.P. and Gupta, S.R. 2014.Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi

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Course Description

Course Code	25B17CI271	**Offered to Program:** UG **(specifyUG/PG)**	**Offered Department:** CSE **Session:**2025-26
CourseName	Programming Practices Lab-II (Python)		
Credits	0(Qualifying)	**ContactHours (L-T-P)**	0-0-2

COURSEOUTCOMES: After completing the course, students will be able to:		**COGNITIVELEVELS**
25B17CI271.1	Demonstrate a strong understanding of fundamental programming concepts, including variables, data types, operators, control flow, and functions.	Remember(Level1)
25B17CI271.2	Develop proficiency in Python programming language, including syntax, semantics, and standard libraries.	Apply(Level3)
25B17CI271.3	Demonstrate a fundamental understanding of software development methodologies, including modular design, pseudo code, flowcharting, structure charts, data types, control structures, functions, and arrays.	Apply(Level3)
25B17CI271.4	Demonstrate appropriate design, coding, testing, and documenting of computer programs that implement project specifications and requirements.	Apply(Level3)
25B17CI271.5	Apply computer programming concepts to new problems or situations.	Apply(Level3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Map ping**
1.	1. Write a program to display the data types of given literals. 2. Write a Python script to perform arithmetic operations on two user inputs. 3. Write a program to demonstrate use of keywords and identifiers. 4. Create a script to swap two numbers using a temporary variable. 5. Develop a program to demonstrate use of different types of operators.	2	25B17CI271.1
2.	1. Write a program to check whether a number is even or odd. 2. Write a program to find the largest of three numbers using nested if-else. 3. Create a number guessing game using while loop. 4. Display multiplication table using for loop. 5. Implement a program to count vowels in a string using loops and conditions.	2	25B17CI271.1, 25B17CI271.2
3.	1. Define a function to check whether a number is prime. 2. Create a function to calculate factorial using recursion. 3. Write a Python script to demonstrate default and keyword arguments. 4. Implement a lambda function to square each element in a list. 5. Write a program using function to return the maximum of three numbers.	2	25B17CI271.3

4.	1. Write a program to perform various operations on a list (append, insert, delete, sort). 2. Implement a program to reverse a list without using reverse() function. 3. Write a program to demonstrate slicing on lists and tuples. 4. Count frequency of elements in a tuple. 5. Convert list to tuple and vice versa.	2	25B17CI271.3
5.	1. Write a program to count the number of words in a sentence. 2. Implement a Python script to check whether a string is palindrome. 3. Demonstrate use of string functions like upper(), lower(), split(), join(). 4. Replace all spaces in a string with hyphens. 5. Extract domain name from an email address.	2	25B17CI271.4
6.	1. Create a dictionary of student names and marks and display them. 2. Write a script to sort dictionary by keys and values. 3. Demonstrate set operations: union, intersection, difference. 4. Remove duplicate elements from a list using set. 5. Create nested dictionaries and access specific values.	4	25B17CI271.4
7.	1. Write a program to read content from a file and display it. 2. Write to a file, then read and print the content. 3. Count number of lines, words and characters in a file. 4. Copy contents of one file to another. 5. Append new content to an existing file.	4	25B17CI271.4 25B17CI271.5
8.	1. Write a program to handle divide-by-zero exception. 2. Implement try-except-finally structure with custom exceptions. 3. Create a script to raise an exception if age is less than 18. 4. Handle file not found exception gracefully. 5. Write a program with multiple exception handling blocks.	4	25B17CI271.6
9.	1. Create a class Car with attributes and display method. 2. Demonstrate single and multiple inheritance with examples. 3. Implement encapsulation using private and public members. 4. Show method overriding with a base and derived class. 5. Create a class with constructor and destructor.	4	25B17CI271.5
10.	1. Design a simple student record management system using OOP and file handling. 2. Develop a calculator using functions and GUI (optional tkinter). 3. Create a quiz app that asks 5 questions and shows the score. 4. Design a contact book storing info in a file. 5. Create a library book tracking system using classes.	4	25B17CI271.5
Total number of Lectures		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60 (Attendance=10,Quiz=20, Projects=20, Viva-Voce =10)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Downey, A. (2015). Think Python: How to Think Like a Computer Scientist. O'Reilly Media.
2.	T. Budd, Exploring Python, TMH, 1st Ed, 2011
3.	P. K. Sinha & Priti Sinha , “Computer Fundamentals”, BPB Publications, 2007
4.	Goodrich, M. T., Tamassia, R., & Goldwasser, M. H. (2013). Data Structures and Algorithms in Python. Wiley.
Reference Books:	
1.	Rober Sedgewick, K Wayne -Introduction to Programming in Python: An interdisciplinary Approach" Pearson India.
2.	Lutz, M. (2014). Learning Python, 5th Edition. O'Reilly Media.
3.	Jeffrey C. Jackson, “Web Technologies : A Computer Science Perspective”, Pearson Web links: https://www.programiz.com/python-programming https://www.tutorialspoint.com/ Python Official Documentation: https://docs.python.org/3/

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Course Description

Course Code	25B11CI311	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Mathematical Foundation of Data Science		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CI311.1	Understand and apply fundamental concepts of linear algebra in data representation and manipulation.	Understand (Level 2)
25B11CI311.2	Apply calculus concepts to solve optimization problems relevant to machine learning algorithms.	Apply (Level 3)
25B11CI311.3	Analyze and interpret data using principles of probability and random variables.	Analyze (Level 4)
25B11CI311.4	Apply statistical inference techniques to draw conclusions from data.	Apply (Level 3)
25B11CI311.5	Formulate and solve problems in data science using mathematical frameworks.	Apply (Level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Linear Algebra	Vectors and Matrices: Basic operations, types of matrices, transpose, determinant, inverse. Systems of Linear Equations: Gaussian elimination, matrix representation. Vector Spaces: Subspaces, linear independence, basis, dimension, rank.	12	25B11CI311.1 25B11CI311.2

		Eigenvalues and Eigenvectors: Characteristic equation, diagonalization. Applications in Data Science: Data representation as vectors and matrices, dimensionality reduction (PCA).		

2.	Calculus	Basic Calculus: Limits, continuity, derivatives, partial derivatives, gradient. Integral Calculus: Single and multiple integrals, applications. Optimization: Unconstrained and constrained optimization, Lagrange multipliers. Applications in Data Science: Gradient descent, cost functions in machine learning.	10	25B11CI311.3
3.	Probability and Random Variables	Probability Theory: Sample space, events, axioms of probability, conditional probability, Bayes' theorem. Random Variables: Discrete and continuous random variables, probability mass function (PMF), probability density function (PDF), cumulative distribution function (CDF). Expected Value and Variance: Properties and calculations. Common Probability Distributions: Bernoulli, binomial, Poisson, uniform, exponential, normal. Applications in Data Science: Modelling uncertainty, probabilistic models.	13	25B11CI311.3 25B11CI311.4
4.	Statistics and Statistical Inference	Descriptive Statistics: Measures of central tendency, dispersion, and correlation. Sampling Distributions: Central Limit Theorem. Estimation: Point estimation, confidence intervals. Hypothesis Testing: Null and alternative hypotheses, significance level, p-value, common tests (t-test, z-test, chi-squared test). Applications in Data Science: Data analysis, model evaluation, A/B testing.	10	25B11CI311.4 25B11CI311.5
		Total number of Lectures	**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10, Internal Assessment = 05)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Sven A. Wegner, "Mathematical Introduction to Data Science", 1st Edition Springer Berlin, Heidelberg, 2024, ISBN: 978-3-662-69425-1
2.	James Stewart, "Calculus", 2nd Edition, Cenege, 2022, ISBN: 978-9352604166
3.	Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", 9th Edition, Cengage, 2020, ISBN: 9353506247
Reference Books:	
1.	Andrew R. Webb, Keith D. Copsey, "Statistical Pattern Recognition", 4th Edition, Wiley, 2017, ISBN: 9780070411838

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Course Description

Course Code	25B11ME311	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME
			Session: 2025-26
Course Name	Mechanics for Robotics		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11ME311.1	Define fundamental concepts of force, moment, and couple and analyze particle equilibrium and concurrent force systems to determine resultant and equilibrant forces in robotic manipulators.	Remember (Level 1) Apply (Level 3) Analyze (Level 4)
25B11ME311.2	Apply Varignon's theorem and analyze force-couple systems to determine the center of gravity and mass for robotic balancing and stability.	Apply (Level 3) Analyze (Level 4)
25B11ME311.3	Construct free body diagrams and apply equilibrium equations to perform static analysis of robotic structures like beams, trusses, and frames.	Apply (Level 3) Analyze (Level 4)
25B11ME311.4	Analyze internal forces and stresses in robotic components, including axial, shear, and bending moments, and assess deformation	Analyze (Level 4) Evaluate (Level 5)
25B11ME311.5	Analyze a robotic system by applying the principles of mechanics covered in the course	Apply (Level 3) Analyze (Level 4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction	Fundamental Concepts: Force, Moment, Couple, Types of Forces: Concurrent, Coplanar, Non-Concurrent, Non-Coplanar, Vector Representation of Forces, Cartesian and Polar Vector Notation.	3	25B17ME311.1
2.	Force System and Equilibrium	Particle Equilibrium: Conditions for Equilibrium, Resultant and Equilibrant Forces, Concurrent Force Systems, Force Analysis in Manipulators. Varignon's Theorem, Couple Moments and Equivalent Force-Couple Systems, Center of Gravity and Center of Mass, Free	9	25B11ME311.1 25B11ME311.2

		Body Diagrams (FBD), Equilibrium Equations.		
3	Static Analysis	Static Analysis of Simple Structures: Beams, Trusses, Frames, Structural Analysis of Robot Arms and End-Effectors.	6	25B11ME311.2 25B11ME311.3
4	Analysis of Structures	Internal Forces and Stresses, Axial, Shear, and Bending Moments, Stress-Strain Relationships, Deformation Analysis: Axial, Shear, and Bending Deformation.	9	25B11ME311.3 25B11ME311.4
5	Friction and Kinematics of rigid bodies	Laws of Friction: Coulomb's Law, Angle of Friction, Frictional Forces in Robotics: Wheel-Road Interaction, Joint Friction, Introduction to Kinematics: Position, Velocity, and Acceleration Analysis, Manipulator Kinematics	9	25B11ME311.4
6	Kinetics of rigid bodies	D' Alembert principle, Fore and motion analysis of rigid bodies, Analysis of general plane motion, Dynamics of Mobile Robots	9	25B11ME311.5
Total number of Lectures			45	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	S. S. Bhavikatti "Engineering Mechanics", New Age International Publishers, Second Edition, July 1998.
2.	A. Nelson "Engineering Mechanics: Statics and Dynamics", The McGraw-Hill Companies, 4th Reprint, 2012
3.	A.K Tayal "Engineering Mechanics: Statics and Dynamics", Umesh Publication, 11th Edition, 2000

Reference Books:

1.	Irving H. Shames, G. Krishna Mohan Rao, Engineering Mechanics Statics and Dynamics, Pearson Education, 4th Edition.
2.	F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill

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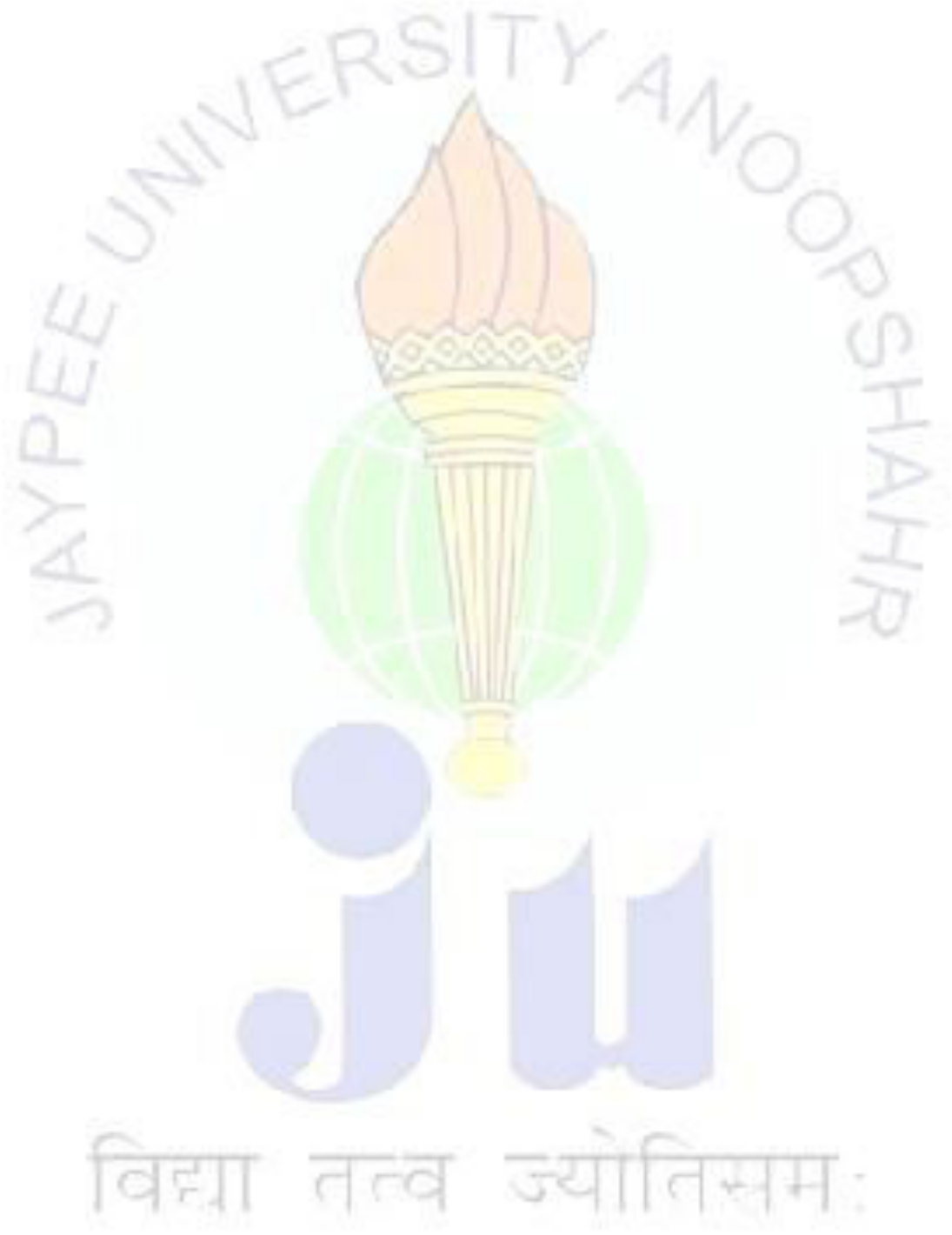

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Course Description

Course Code	25B11CI313	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Data Structure		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CI313.1	Explain abstract data types, memory allocation schemes and need of linear and non-linear data structures.	Understand (Level 2)
25B11CI313.2	Apply and implement various linear data structures, like array, linked list, stack, and queue in different problems and applications	Apply (Level 3)
25B11CI313.3	Analyze the performance of various sorting and searching techniques	Analyze (Level 4)
25B11CI313.4	Demonstrate and implement various operations like search, traverse, insertion, deletion, etc. on different non-linear data structures	Understand (Level 2)
25B11CI313.5	Apply appropriate data structure to design an efficient solution for given and identified problem	Create (Level 6)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction	Fundamentals of Data Structures, Allocation Memory, Abstract Data Types, , Linear and Non Linear DS	3	25B11CI313.1

2.	Linear Data Structures	Implementation of Array, Linked List: Singly, Doubly, Circular, Implementation of Stack and Queue, Stack and Queue operations using STL, Recursion, Recursion removal using Stack	7	25B11CI313.2
3.	Searching and Sorting	Searching – Linear Search, Binary Search, Interpolation Search, Median Search; Hashing – Hash Table, Chaining, Probing; Sorting – Merge, Quick, Radix, Bucket, and Count; Time and Space complexity analysis of searching and sorting algorithms	9	25B11CI313.3
4.	Non-Linear Data Structure – Multi List and Tree	Implementation of Multi List, Binary Tree, K-ary Tree, Binary Search Tree, Threaded Tree, Balanced BST: AVL Tree and RB Tree, B Tree, B+ Tree, Priority Queue using Binary Heap, Binomial Heap, and Fibonacci Heap	13	25B11CI313.4
5.	Non-Linear Data Structure – Graph	Fundamentals of Graph, Adjacency Matrix and List; Graph Traversal using DFS and BFS, Basic Algorithms – Shortest Path, Minimum Spanning Tree	4	25B11CI313.4
6.	Advanced Data Structures	Interval Tree, Segment Tree, Range Tree, KD Tree, Quad Tree, String Data Structures: Suffix Tree, Tries, Suffix Array	6	25B11CI313.5
		Total number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Dinesh P. Mehta and Sartaj Sahni, Handbook of Data Structures and Applications, 2nd Ed., Chapman and Hall/CRC Computer and Information Science Series, CRC Press
2.	Ellis Horowitz,Sartaj Sahni and Dinesh P. Mehta, Fundamentals of Data Structures in C++, Galgotia Press, 2009
3.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 3rd Edition, 2009
4.	Seymour Lipschutz, Data Structures with C, Schaum's Outline Series, McGraw Hill, 2010

Reference Books:

1.	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983

2.	John R. Hubbard, Data Structures with C++, Schaum's Outline Series, McGraw Hill, First Edition, 2017.

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Course Description

Course Code	25B11EE311	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Electronics
			Session: 2025-26
Course Name	Analog & Digital Electronics		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11EE311.1	Ability to apply Boolean algebra and Karnaugh maps for logic simplification and design of combinational circuits.	Understand (Level 2)
25B11EE311.2	Design and analyze MSI devices and arithmetic circuits like adders and ALUs.	Understand (Level 2)
25B11EE311.3	Design and implement sequential circuits, including flip-flops, counters, and finite state machines.	Apply (Level 3)
25B11EE311.4	Design and analyze various amplifier models and biasing schemes for BJTs and FETs.	Evaluating (Level 5)
25B11EE311.5	Analyze high-frequency amplifiers, feedback systems, and their impact on gain and bandwidth.	Apply (Level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**

1	Logic Simplification and Combinational Logic Design:	Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.	10	25B11EE311.1 25B11EE311.2
2	MSI devices and Arithmetic circuits	MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU.	8	25B11EE311.2 25B11EE311.3
3	Sequential Logic Design:	Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Rippleand Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation.	10	25B11EE311.3 25B11EE311.4
4	Design and Analysis of Amplifier Models	Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	9	25B11EE311.3 25B11EE311.4
5	High-Frequency Amplifier Models, Feedback Topologies, and Frequency Response Analysis	High frequency transistor models, frequency response of single stage andmultistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	8	25B11EE311.4 25B11EE311.5
		Total number of lectures	45	

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	N. H. E. Weste and C. Harris, "Principles of CMOS VLSI Design: A System Perspective, 3rd Edition, Pearson Education 2007
2.	J. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits: A Design Perspective, 2nd Edition, Prentice Hall 2004
3.	CMOS VLSI Design: A Circuits and Systems Perspective – Neil H.E. Weste, David Harris
Reference Books:	
1.	ASIC Design and Synthesis – Michael John Sebastian Smith
2.	Modern VLSI Design: System-on-Chip Design – Wayne Wolf

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Course Description

Course Code	25B11CI513	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Artificial Intelligence and Machine Learning		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CI513.1	Understand the fundamental concepts and applications of Artificial Intelligence.	Understanding (2)
25B11CI513.2	Apply basic search algorithms to solve problems in AI.	Applying (3)
25B11CI513.3	Understand fundamental concepts of knowledge representation and reasoning.	Understanding (2)
25B11CI513.4	Apply basic machine learning algorithms for supervised learning tasks.	Applying (3)
25B11CI513.5	Evaluate the performance of basic machine learning models.	Analyzing (4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to Artificial Intelligence	What is AI? History and Evolution of AI. Branches of AI. Intelligent Agents: Rationality, Types of Agents, Structure of Agents. Applications of AI across various domains.	6	25B11CI513.1 25B11CI513.2

2.	Problem Solving by Search	Problem Formulation: States, Actions, Goal Tests, Path Costs. Uninformed Search Strategies: Breadth-First Search (BFS), Depth-First Search (DFS), Uniform Cost Search. Informed (Heuristic) Search Strategies: Greedy Best-First Search, A* Search, Heuristic Functions. Introduction to Adversarial Search: Game Playing, Minimax Algorithm (brief overview).	12	25B11CI513.3
3.	Knowledge Representation and Reasoning	Introduction to Knowledge Representation. Propositional Logic: Syntax, Semantics, Inference. First-Order Logic: Syntax, Semantics, Quantifiers. Rule-Based Systems: Forward and Backward Chaining (basic concepts).	9	25B11CI513.3 25B11CI513.4
4.	Introduction to Machine Learning	What is Machine Learning? Types of Learning (Supervised, Unsupervised, Reinforcement - brief introduction). Supervised Learning: Classification vs. Regression. Basic Classification Algorithms: Linear Regression for Classification (Logistic Regression), K-Nearest Neighbors (KNN). Basic Regression Algorithms: Linear Regression. Feature Engineering: Basic concepts.	12	25B11CI513.4 25B11CI513.5
5.	Evaluating Machine Learning Models	Performance Metrics for Classification: Accuracy, Precision, Recall, F1-Score. Performance Metrics for Regression: Mean Squared Error (MSE), Mean Absolute Error (MAE). Introduction to Training, Testing, and Validation Sets. Overfitting and Underfitting (basic concepts).	6	25B11CI513.5 25B11CI513.5
		Total number of Lectures	**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 5, Internal Assessment = 5)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Russell, Stuart; Norvig, Peter, Artificial Intelligence: A Modern Approach, Pearson, 2020 (4th Edition), Hardcover
2.	Alpaydin, Ethem, Introduction to Machine Learning, MIT Press, 2020 (4th Edition), Hardcover
3.	Nilsson, Nils J., Principles of Artificial Intelligence, Morgan Kaufmann, 1980, Hardcover
4.	Marsland, Stephen, Machine Learning: An Algorithmic Perspective, Chapman and Hall/CRC, 2015 (2nd Edition), Paperback
Reference Books:	
1.	Flach, Peter, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, 2012.
2.	Build a Large Language Model (From Scratch) by Sebastian Raschka, 2025

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Course Code	25B17CI376	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Advanced Python Programming Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI376.1	Implement advanced object-oriented programming concepts in Python.	Applying (3)
25B17CI376.2	Develop applications using advanced data structures and collections in Python.	Applying (3)
25B17CI376.3	Write efficient and concurrent Python code using threads and processes.	Applying (3)
25B17CI376.4	Implement database interaction and data persistence using Python.	Applying (3)
25B17CI376.5	Build applications using Python frameworks.	Applying (3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1-2	Advanced Object-Oriented Programming: Implementing inheritance, polymorphism, and design patterns.	4	25B17CI376.1
3-4	Working with Advanced Data Structures: Implementing and using collections like defaultdict, Counter, namedtuple, and deque.	4	25B17CI376.2
5-6	File Handling and I/O: Working with different file formats (CSV, JSON, XML) and handling binary files.	4	25B17CI376.2
7-8	Concurrency with Threads: Creating and managing threads, using locks and semaphores for thread synchronization.	4	25B17CI376.3
9-10	Concurrency with Processes: Creating and managing processes, using pipes and queues for inter-process communication.	4	25B17CI376.3

11-12	Database Interaction: Connecting to a database (SQLite, PostgreSQL), performing CRUD operations using Python.	4	25B17CI376.4
13-14	Web Framework (Flask or Django): Building a simple web application using a Python framework.	4	25B17CI376.5
15	Web Services: Creating and consuming RESTful APIs.	2	25B17CI376.5
Total number of labs 15		30	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, Quiz = 10, Projects = 10, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Beazley, David M.; Jones, Brian K., Python Cookbook, O'Reilly Media, 2013, Paperback (3rd Edition)
2.	Lutz, Mark, Learning Python, O'Reilly Media, 2013, Paperback (5th Edition)
3.	Zelle, John, Python Programming: An Introduction to Computer Science, Franklin, Beedle & Associates, 2016, Paperback (3rd Edition)
4.	Porcaro, Nick, Python Web Development with Flask, Packt Publishing, 2018, Paperback

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Course Description

Course Code	25B17EE371	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Electronics **Session:** 2025-26
Course Name	Analog & Digital Electronics Lab		
Credits	0 (Qualifying)	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17EE371.1	Understand and verify the functionality of basic digital logic gates and their implementation using digital ICs.	Remember (Level 1)
25B17EE371.2	Apply Boolean algebra techniques to design and simplify combinational circuits using SOP and POS forms.	Apply (Level 3)
25B17EE371.3	Design and analyze various amplifier models and biasing schemes for BJTs and FETs.	Apply (Level 3)
25B17EE371.4	Analyze high-frequency amplifiers, feedback systems, and their impact on gain and bandwidth.	Apply (Level 3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1.	Introduction to Digital Logic ICs and Verification of Logic Gates.	4	25B17EE371.1 25B17EE371.2
2.	Implement Sum of Products (SOP) and Product of Sums (POS) forms for given Boolean functions.	2	25B17EE371.1 25B17EE371.2
3.	Design and simulate circuits for binary to BCD, Gray code to binary, and vice versa.	4	25B17EE371.1 25B17EE371.2
4.	Design and simulate 4-to-1 MUX and 1-to-4 DEMUX.	4	25B17EE371.1 25B17EE371.2
5.	Implement and simulate a 1-bit full adder and full subtractor.	2	25B17EE371.2 25B17EE371.3
6.	Implement and simulate 2 bit magnitude comparator.	4	25B17EE371.3 25B17EE371.4
7.	Design and simulate SR, JK, D, and T flip-flops and verify their behavior.	4	25B17EE371.3 25B17EE371.4

8.	**Study and Verification of Diode Circuits (Rectifiers, Clipping, Clamping)** Design and analyze diode-based circuits for rectification and waveform shaping.	4	25B17EE371.3 25B17EE371.4
9.	**Design and Analysis of Voltage Amplifiers (BJT & FET)** Design and analyze voltage amplifiers using BJT and FET	4	25B17EE371.3 25B17EE371.4
Total number of Lab hours		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	N. H. E. Weste and C. Harris, "Principles of CMOS VLSI Design: A System Perspective, 3rd Edition, Pearson Education 2007
2.	J. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits: A Design Perspective, 2nd Edition, Prentice Hall 2004
3.	**CMOS VLSI Design: A Circuits and Systems Perspective** – Neil H.E. Weste, David Harris

Reference Books:

1.	**ASIC Design and Synthesis** – Michael John Sebastian Smith
2.	**Modern VLSI Design: System-on-Chip Design –** Wayne Wolf

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Course Description

Course Code	25B11MT416	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Management
			Session: 2025-26
Course Name	Digital Marketing		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11MT416.1	Define key digital marketing concepts, channels, and terminologies.	Remember (Level 1)
25B11MT416.2	Explain the role of digital marketing in achieving business objectives.	Understand (Level 2)
25B11MT416.3	Apply digital marketing tools to create and manage online campaigns.	Apply (Level 3)
25B11MT416.4	Analyze the performance of digital marketing campaigns using analytics.	Analyze (Level 4)
25B11MT416.5	Evaluate the effectiveness and ROI of digital marketing strategies including influencer and affiliate marketing strategies.	Evaluate (Level 5)
25B11MT416.6	Create a comprehensive digital marketing plan for a business or brand.	Create (Level 6)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Unit 1: Introduction to Digital Marketing and Digital Marketing Tools	Definition, evolution, importance, comparison with traditional marketing; Websites, social media, email, search engines, mobile marketing.	6	25B11MT416.1 25B11MT416.2
2.	Unit 2: SEO and SEM	Keywords, on-page/off-page SEO, link building, Google algorithms; Google Ads, PPC campaigns, bidding strategies, ad copywriting.	11	25B11MT416.3

3.	Unit 3: Social media and Content Marketing and Email Marketing	Platforms (Facebook, Instagram, LinkedIn), content strategies, paid vs. organic; Blogging, video marketing, storytelling, content calendars; Email campaign design, segmentation, automation, A/B testing.	10	25B11MT416.3
4.	Unit:4 Digital Analytics and Digital Marketing Strategy	Google Analytics, KPIs, conversion tracking, data interpretation; Campaign planning, budgeting, integration of channels.	10	25B11MT416.4 25B11MT416.5 25B11MT416.6
5.	Unit: 5 Emerging Trends in Digital Marketing	AI in marketing, AR/VR, voice search, personalization trends; Influencer partnerships, affiliate programs, tracking performance.	8	25B11MT416.1 25B11MT416.5
		Total Number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25 (Attendance = 5, Class Test/Quiz = 5, Assignments = 10, Internal Assessment = 05)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	. Dave Chaffey and Fiona Ellis-Chadwick, Digital Marketing: Strategy, Implementation and Practice, Pearson, 2019.
2.	Simon Kingsnorth, Digital Marketing Strategy: An Integrated Approach to Online Marketing, Kogan Page Ltd., 2022.
3.	Satinder Kumar, and Supreet Kaur, Taxmann's Digital Marketing, Taxmann Publication Pvt. Ltd., 2023

Reference Books:

1.	Puneet Bhatia, Fundamentals of Digital Marketing, Pearson, 2023.

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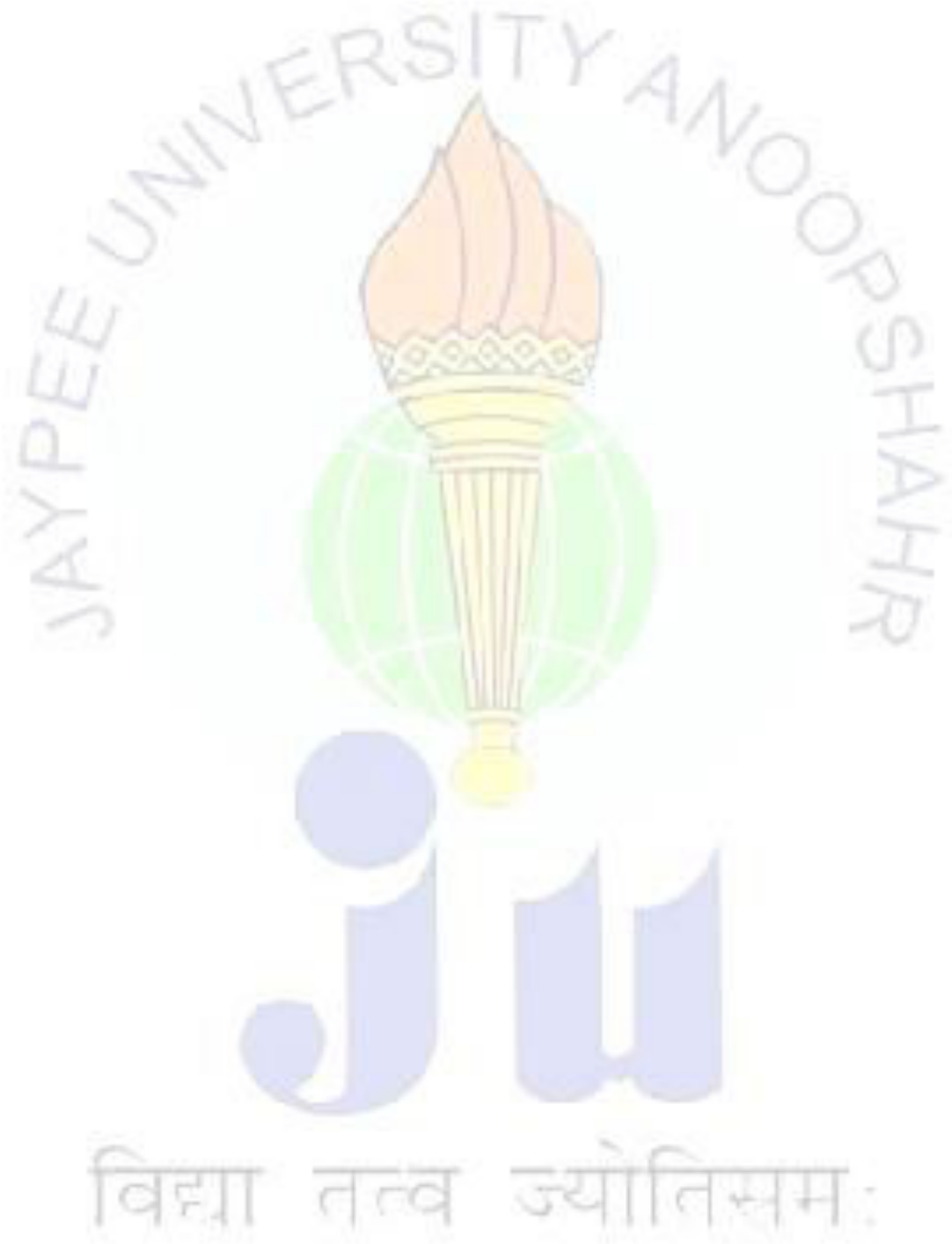
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Course Description

Course Code	25B11SS114	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department: Social Science** **Session:** 2025-26
Course Name	Constitution and Development		
Credits	4	**Contact Hours (L-T-P)**	3-1-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11SS114.1	Understand and compare different developmental paradigms prevailing during the formation of the Indian Constitution and its continued impact	Understand (Level 2)
25B11SS114.2	Analyze major Constitutional Debates and major Legal Jurisprudence	Analyze (Level 4)
25B11SS114.3	Critically assess major contemporary debates on development at both national and global levels.	Evaluate (Level 5)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Developmental Paradigms	Modernity and Dependency Theory, Multiple competing Ideologies and visions	10	25B11SS114.1

2.	Constitutional Debates on the Question of Development	Fundamental Rights and Directive Principles, Decentralization and Centralization, Agriculture and Industries	10	25B11SS114.2
3.	Major Judicial Cases and Constitutional Amendments	Amendments- 4^{th}, 17^{th}, 29^{th}, 34^{th}, 42^{nd}, 44^{th}, 73^{rd}, 74^{th} Cases- Golaknath, Kesavananda Bharti, Minerva Mills	10	25B11SS114.3
4.	Contemporary debates: Issues of Growth	Environment and Growth. Labour Rights and Ease of Business, and Make in India	8	25B11SS114.3
5.	Contemporary debates: Issues of Identity	Multiculturalism and National Identity, Globalization	7	25B11SS114.3
		Total number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Bardhan, Pranab K.. The Political Economy of Development in India. India, Oxford University Press, 1998.
2.	Politics and Ethics of the Indian Constitution. India, Oxford University Press, 2009.
3.	Thiruvengadam, Dr Arun K. The Constitution of India: A Contextual Analysis. United Kingdom, Bloomsbury Publishing, 2017.

Reference Books/Resources:

1.	https://www.youtube.com/watch?v=rkZPWLE51AY

2.	https://www.facebook.com/PeepulTreeStories/videos/era-of-planned-growth-first-five-year-plan/380177084210690/?locale=ms_MY
3.	https://www.youtube.com/watch?v=DoF_UIfZnkE
4.	https://www.youtube.com/watch?v=vJYWY5TByhc
5.	Austin, Granville. The Indian constitution : cornerstone of a nation. India, Oxford University Press, 1999.
6.	Basu, Durga Das. Introduction to the Constitution of India. India, S.C. Sarkar, 1966.

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Course Description

Course Code	25B17CI573	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE **Session:** 2025-26
Course Name	AI and ML Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI573 .1	Construct problem solving agent using various Informed and uninformed search strategies	Remember (Level 1)
25B17CI573 .2	Utilize evolutionary search algorithms to solve the real world complex problems	Apply (Level 3)
25B17CI573 .3	Analyze and apply algorithms to solve problems requiring constraint satisfaction and game theory	Apply (Level 3)
25B17CI573 .4	Implement data preprocessing techniques for machine learning tasks using Python libraries.	Apply (Level 3)
25B17CI573 .5	Implement and evaluate unsupervised learning algorithms for clustering and dimensionality reduction. Develop practical machine learning solutions for real-world datasets	Apply (Level 3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1.	Introduction to Programming in Python: Familiarize the following concepts of Python programming language like Arrays, Lists, functions, Tuples, Dictionary, Sets, Objects and classes	2	25B17CI573 .1 25B17CI573 .2
2.	Problem solving**:** Problem solving agents, Uninformed search strategies (BFS, UCS, DFS, DLS, IDS) Informed Search and Exploration (BFS, A*, IDA*, SMA*,IDA*)	4	25B17CI573 .1 25B17CI573 .2
3.	Constraint satisfaction problems**:** Formulating Problems as constraint satisfaction problems	2	25B17CI573 .1 25B17CI573 .2
4.	Adversarial Search problems**:** Adversarial Search (optimal decision in games, alpha beta pruning)	4	25B17CI573 .3
5.	Introduction to NumPy for numerical operations in Python . Introduction to Pandas for data manipulation and analysis in Python	2	25B17CI573 .4

6.	Implementing and Evaluating Decision Trees and Random Forests for Classification.	2	25B17CI573 .4
7.	Implementing and Evaluating Support Vector Machines (SVM) for Classification.	2	25B17CI573 .5
8.	Implementing and Evaluating Decision Trees and Random Forests for Regression Tasks, Evaluating Regression Models using Mean Squared Error (MSE), Mean Absolute Error (MAE), R-squared	4	25B17CI573 .5
9	Implementing and Evaluating the K-Means Clustering Algorithm, Implementing and Evaluating Principal Component Analysis (PCA) for Dimensionality Reduction	4	25B17CI573 .5
10.	Mini-Project: Applying learned Artificial Intelligence and machine learning techniques to a chosen real-world dataset	4	25B17CI573 .5
Total number of Lectures		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60 (Attendance = 15, Quiz = 15, Projects = 15, Viva-Voce = 15)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Pressman, Roger S. Software engineering: a practitioner's approach. Palgrave Macmillan, 2005.
2.	Jalote, Pankaj. An integrated approach to software engineering. Springer Science & Business Media, 2012.
3.	KK Aggarwal, Software Engineering, 2001.

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Course Description

Course Code	25B11ME411	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME **Session:** 2025-26
Course Name	Design of Robotic Structures		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11ME411.1	Explain and apply fundamental principles of machine design, including load analysis, stress/strain theories, and failure theories, to analyze robotic components.	Remember (Level 1) Understand (Level 2) Apply (Level 3)
25B11ME411.2	Analyze and calculate stress, deflection, and deformation in beams, shafts, and robotic arm components under various loading conditions.	Understand (Level 2) Apply (Level 3)
25B11ME411.3	Design and select shafts, axles, fasteners, gears elements for specific robotic applications.	Apply (Level 3) Analyze (Level 4)
25B11ME411.4	Design and select bearings, actuators, and power transmission elements for robotic system	Apply (Level 3) Analyze (Level 4)
25B11ME411.5	Integrate knowledge of machine design principles to design and analyze robotic joints and power transmission systems.	Analyze (Level 4) Evaluate (Level 5) Create (Level 6)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Fundamentals of Machine Design in Robotics	Fundamental principles of machine design in robotics, Load analysis and stress considerations in robotic applications, theories of failure	6	25B11ME411.1
2.	Deformation (Beam and Shaft)	Deflection calculations for beams using analytical methods. Torsion analysis of shafts: stress, strain, and deformation. Combined loading scenarios: bending and torsion.	9	25B11ME411.2

3	Design of shafts, axles and fasteners for robotic arms	Material selection for shafts and axles. Fastener selection (bolts, screws) for robotic arm structural connections. Stress analysis of fastened joints.	6	25B11ME411.2 25B11ME411.3
4	Gear design for robotic joints.	Types of gears used in robotics: spur, helical, bevel. Gear tooth stress analysis: bending and contact stresses. Gear selection for specific robotic applications: speed, torque, precision.	9	25B11ME411.3
5	Design and selection of bearings and actuators	Types of bearings used in robotics (ball, roller, journal). Bearing selection criteria (load, speed, precision, life). Types of actuators (electric motors, servos, pneumatic, hydraulic). Actuator selection based on torque, speed, and control. Integration of actuators and bearings into robotic joints.	8	25B11ME411.4
6	Design and selection of power transmission elements	Types of power transmission elements (belts, chains, lead screws). Design and selection of belts and pulleys. Design and selection of chains and sprockets. Design and selection of lead screws and nuts.	7	25B11ME411.4 25B11ME411.5
Total number of Lectures			45	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2.	Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
3.	Machine design -Black & Adams, Mc Graw Hill
4.	Machine design-M.F. Spott, Prentice Hall India

Reference Books:

1.	Robert C. Juvinall, Kurt M. Marshek, Fundamentals of Machine Component Design, 6th Edition, Wiley, 2017.
2.	Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, Robotic Engineering: An Integrated Approach, Prentice Hall, 1989
3.	**Handbook of Robotics**: Bruno Siciliano, Oussama Khatib, Handbook of Robotics, Springer, 2008

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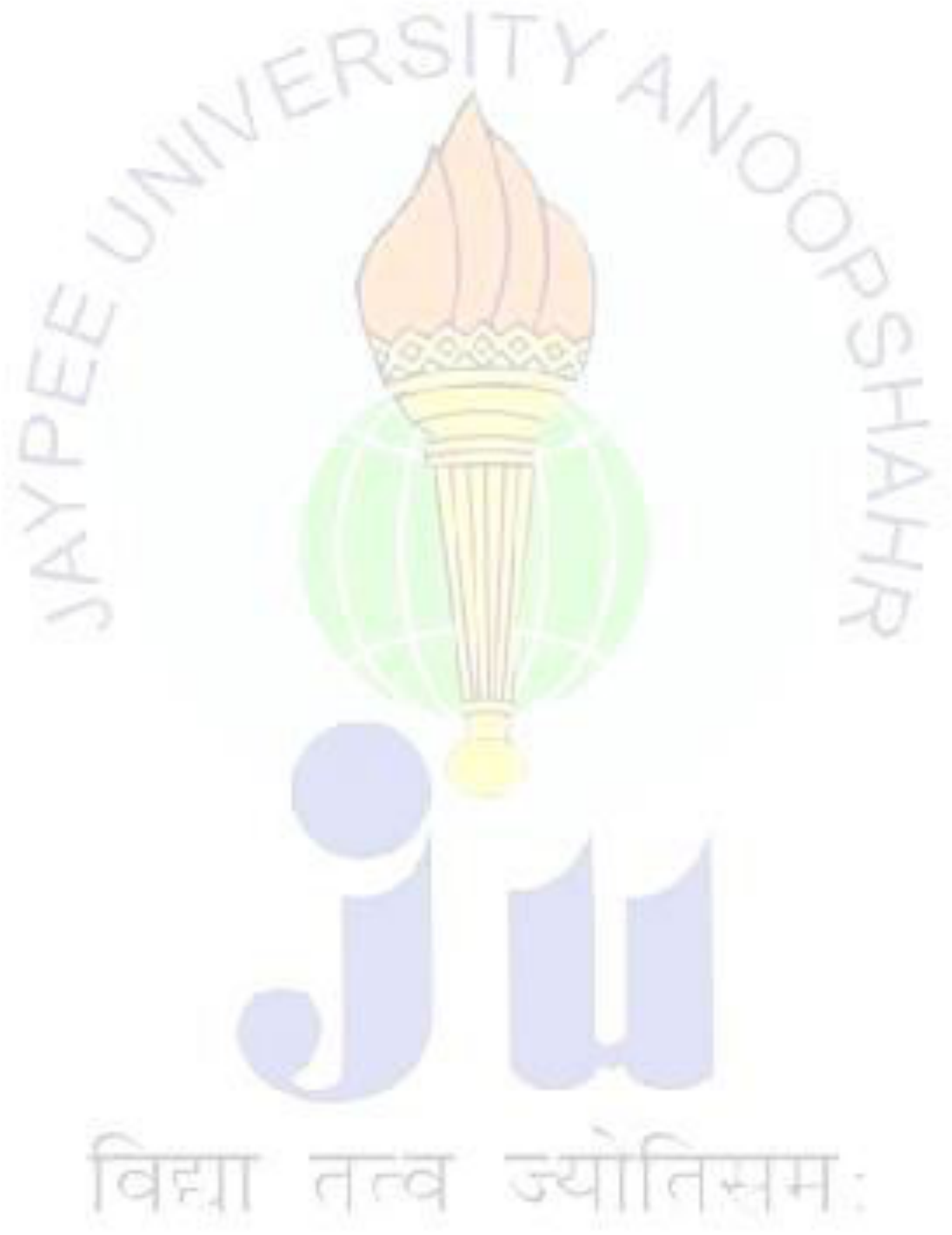

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Course Description

Course Code	25B11CI411	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Algorithm and Problem Solving		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI471.1	Apply advanced algorithm design paradigms like Divide and Conquer, Greedy, and Dynamic Programming to solve complex problems.	Apply (3)
25B17CI471.2	Analyze the time and space complexity of advanced algorithms using asymptotic notation.	Analyze (4)
25B17CI471.3	Design efficient algorithms for graph-related problems.	Analyze (4)
25B17CI471.4	Understand and apply string matching algorithms for pattern recognition.	Apply (3)
25B17CI471.5	Analyze and solve problems using backtracking and branch and bound techniques.	Analyze (4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Algorithm Design Techniques	Divide and Conquer: Recurrence relations, Master Theorem, applications (e.g., Merge Sort, Quick Sort analysis, Strassen's Matrix Multiplication). Greedy Algorithms: Principles, applications (e.g., Activity Selection, Fractional Knapsack, Dijkstra's Algorithm, Prim's Algorithm, Kruskal's Algorithm), limitations.	15	25B11CI411.1 25B11CI411.2

		Dynamic Programming: Principles, memoization, tabulation, applications (e.g., 0/1 Knapsack, Longest Common Subsequence, Matrix Chain Multiplication, All-Pairs Shortest Paths - Floyd-Warshall).		

2.	Graph Algorithms	Graph Representations (Adjacency Matrix, Adjacency List). Breadth-First Search (BFS) and Depth-First Search (DFS): Applications (e.g., connectivity, cycle detection). Shortest Path Algorithms: Dijkstra's Algorithm (revisited with details), Bellman-Ford Algorithm, Floyd-Warshall Algorithm. Minimum Spanning Trees: Prim's Algorithm (revisited with details), Kruskal's Algorithm (revisited with details). Network Flow Problems: Basic concepts, Max-Flow Min-Cut Theorem (introduction).	12	25B11CI411.3
3.	String Matching Algorithms	Naive String Matching Algorithm. Rabin-Karp Algorithm. Knuth-Morris-Pratt (KMP) Algorithm. Boyer-Moore Algorithm (brief introduction). Applications in text processing and pattern recognition.	8	25B11CI411.3 25B11CI411.4
4.	Backtracking and Branch and Bound	Backtracking: General method, applications (e.g., N-Queens problem, Sum of Subsets problem, Hamiltonian Cycle). Branch and Bound: General method, applications (e.g., 0/1 Knapsack problem, Traveling Salesperson Problem). Comparison and analysis of these techniques.	10	25B11CI411.4 25B11CI411.5
		Total number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**
Term-I	20
Term-II	20
End Semester	35
TA	25

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Dasgupta, Papadimitrou, Vazirani, "Algorithms", 2nd Edition, Tata McGraw-Hill, 2008.
2.	Antti Laksonen, "Competetive Programmers Handbook", Finland University Press, 2017.
3.	Steven Skiena, "The Algorithm Design Manual", Springer, 2008
4.	Cormen, Leiserson, Rivest, and Stein, "Introduction to Algorithms", 3rd Edition, MIT Press., 2018.

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Course Description

Course Code	25B11CI413	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Deep Learning		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CI413.1	Understand the fundamental concepts and building blocks of deep learning.	Understanding (2)
25B11CI413.2	Design and implement various neural network architectures for different learning tasks.	Creating (6)
25B11CI413.3	Apply optimization techniques and regularization methods to train deep learning models effectively.	Applying (3)
25B11CI413.4	Analyze the performance of deep learning models using appropriate evaluation metrics.	Analyzing (4)
25B11CI413.5	Apply deep learning techniques to solve real-world problems in areas such as computer vision and natural language processing.	Applying (3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Fundamentals of Deep Learning	Introduction to Deep Learning, History and Motivation, Basic Neural Network Concepts (Neurons, Weights, Biases, Activation Functions), Feedforward Networks, Backpropagation Algorithm (Intuition and Overview), Gradient Descent and its Variants.	9	25B11CI413.1

2.	Convolutional Neural Networks (CNNs)	Convolutional Operation, Pooling Layers, CNN Architectures (LeNet, AlexNet, VGG, ResNet, Inception), Applications of CNNs in Image Classification, Object Detection, and Image Segmentation.	12	25B11CI413.2, 25B11CI413.5
3.	Recurrent Neural Networks (RNNs)	Sequential Data, Recurrent Neural Network Architectures, Backpropagation Through Time (BPTT), Vanishing and Exploding Gradients, Long Short-Term Memory (LSTM), Gated Recurrent Units (GRUs), Applications of RNNs in Natural Language Processing (Text Generation, Sentiment Analysis, Machine Translation).	12	25B11CI413.2, 25B11CI413.5
4.	Training Deep Neural Networks	Optimization Algorithms (SGD, Adam, RMSprop), Regularization Techniques (L1/L2 Regularization, Dropout, Batch Normalization), Weight Initialization, Learning Rate Scheduling, Early Stopping.	8	25B11CI413.3
5.	Deep Learning Evaluation and Applications	Performance Evaluation Metrics for Deep Learning (Accuracy, Precision, Recall, F1-Score, AUC, Loss), Model Selection and Hyperparameter Tuning, Introduction to Generative Models (VAEs, GANs - Overview), Case Studies and Real-World Applications of Deep Learning.	4	25B11CI413.4, 25B11CI413.5
Total number of Lectures			**45**	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
End Semester Examination	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10, Internal Assessment = 05)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Goodfellow, Ian; Bengio, Yoshua; Courville, Aaron, Deep Learning, MIT Press, 2016
2.	Bishop, Christopher M., Pattern Recognition and Machine Learning, Springer, 2006
3.	Géron, Aurélien, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly Media, 2022
4.	Aggarwal, Charu C., Neural Networks and Deep Learning: A Textbook, Springer, 2018
5.	Jurafsky, Daniel; Martin, James H., Speech and Language Processing, Pearson, 2023 (3rd Edition draft - relevant for RNNs and NLP applications)
Reference Books:	
1.	Generative Deep Learning, 2nd Edition (David Foster , 2023)
2.	Build a Large Language Model (From Scratch) by Sebastian Raschka, 2025

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Course Description

Course Code	25B11EE413	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Electronics
			Session: 2025-26
Course Name	Sensors and Actuators for Robotics		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11EE413.1	Identify and describe various sensors and actuators used in robotics.	Understand (Level 2)
25B11EE413.2	Explain working principles of commonly used sensors and actuators.	Understand (Level 2)
25B11EE413.3	Analyze sensor signals and actuator requirements for robotic functions	Apply (Level 3)
25B11EE413.4	Select and justify appropriate sensors and actuators for specific applications.	Evaluating (Level 5)
25B11EE413.5	Design basic sensor-actuator systems for robotics with proper interfacing.	Apply (Level 3)

Module No.	Subtitle of the Module	Topics in the Module	No. of Lectures for the module	CO Mapping
1	Introduction to Sensors and Actuators	This module provides an overview of sensors and actuators in robotic systems, covering their classification, characteristics, and performance parameters. It introduces the basic concepts of static and dynamic response and explains sensor interfacing fundamentals, including analog/digital signals and signal conditioning techniques.	10	25B11EE413.1 25B11EE413.2

2	Position, Proximity, and Velocity Sensors	The module discusses sensors used to detect position, proximity, and velocity, including encoders (optical and magnetic), potentiometers, and linear variable differential transformers (LVDTs). It covers Hall effect sensors, capacitive and inductive proximity sensors, ultrasonic and infrared sensors, as well as tachometers and Doppler-based velocity sensors.	8	25B11EE413.2 25B11EE413.3
3	Force, Tactile, and Environmental Sensors	This module explores force and tactile sensing using strain gauges, load cells, and force-torque sensors. It also addresses tactile sensor arrays and environmental sensors for measuring temperature, humidity, and gas concentration. The concept of sensor fusion and its relevance in robotic systems is introduced.	10	25B11EE413.3 25B11EE413.4
4	Actuators in Robotics	The focus of this module is on actuators used in robotic motion. It includes classification and working of electric, pneumatic, and hydraulic actuators. It explains the operational characteristics and control strategies of DC motors, servo motors, and stepper motors. Pneumatic and hydraulic actuators are discussed with respect to their structure, function, and real-world applications.	9	25B11EE413.3 25B11EE413.4
5	Sensor-Actuator Integration and Applications	This module addresses integration techniques of sensors and actuators with microcontrollers and embedded systems. It covers communication protocols like I2C, SPI, and UART, and introduces feedback control systems in robotics. The module concludes with case studies and examples of sensor-actuator applications in autonomous robots, robotic manipulators, and mobile robotic systems, along with trends in smart sensors and intelligent actuators.	8	25B11EE413.4 25B11EE413.5
		Total number of lectures	45	

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Saeed B. Niku, *Introduction to Robotics: Analysis, Control, Applications*, Wiley
2.	Clarence W. de Silva, Sensors and Actuators for Mechatronics, CRC Press
3.	John Turner and Martyn Hill, Instrumentation for Engineers and Technicians, Pearson
Reference Books:	
1.	Richard S. Figliola and Donald E. Beasley, Theory and Design for Mechanical Measurements, Wiley
2.	Ernest O. Doebelin, Measurement Systems: Application and Design, McGraw-Hill

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Course Description

Course Code	25B17CI471	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE **Session:** 2025-26
Course Name	Algorithm and Problem Solving Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI471.1	Implement advanced algorithm design paradigms like Divide and Conquer, Greedy, and Dynamic Programming.	Applying (3)
25B17CI471.2	Implement and analyze graph algorithms for various graph-related problems.	Applying (3)
25B17CI471.2	Implement string matching algorithms for pattern recognition tasks.	Applying (3)
25B17CI471.4	Implement backtracking and branch and bound techniques to solve combinatorial problems.	Applying (3)
25B17CI471.5	Analyze the time and space complexity of implemented algorithms through experimentation.	Analyzing (4)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1-2	Implementing Merge Sort and Quick Sort (Divide and Conquer)	4	25B17CI4711, 25B17CI4715
3-4	Implementing Activity Selection and Fractional Knapsack (Greedy Approach)	4	25B17CI4711, 25B17CI4715
5-6	Implementing 0/1 Knapsack and Longest Common Subsequence (Dynamic Programming)	4	25B17CI4711, 25B17CI4715
7-8	Implementing Breadth-First Search (BFS) and Depth-First Search (DFS) on Graphs	4	25B17CI4712, 25B17CI4715
9	Implementing Dijkstra's Algorithm for Single-Source Shortest Path	2	25B17CI4712, 25B17CI4715

10	Implementing Prim's or Kruskal's Algorithm for Minimum Spanning Tree	2	25B17CI4712, 25B17CI4715
11	Implementing the Naive String Matching Algorithm	2	25B17CI4713, 25B17CI4715
12	Implementing the Rabin-Karp Algorithm or Knuth-Morris-Pratt (KMP) Algorithm	2	25B17CI4713, 25B17CI4715
13-14	Implementing Backtracking to solve the N-Queens Problem or Sum of Subsets Problem	4	25B17CI4714, 25B17CI4715
15	Implementing Branch and Bound for the 0/1 Knapsack Problem (with bounding function)	2	25B17CI4714, 25B17CI4715
Total number of labs 15		30	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, Quiz = 10, Projects = 10, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Dasgupta, Papadimitrou, Vazirani, "Algorithms", 2nd Edition, Tata McGraw-Hill, 2008.
2.	Antti Laksonen, "Competetive Programmers Handbook", Finland University Press, 2017.
3.	Steven Skiena, "The Algorithm Design Manual", Springer, 2008
4.	Cormen, Leiserson, Rivest, and Stein, "Introduction to Algorithms", 3rd Edition, MIT Press., 2018.

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Course Description

Course Code	25B17CI473	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Deep Learning Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI473.1	Implement fundamental deep learning models using a deep learning framework.	Applying (3)
25B17CI473.2	Design and train Convolutional Neural Networks (CNNs) for image-related tasks.	Creating (6)
25B17CI473.3	Design and train Recurrent Neural Networks (RNNs) for sequence-based tasks.	Creating (6)
25B17CI473.4	Apply various optimization and regularization techniques to improve the performance of deep learning models.	Applying (3)
25B17CI473.5	Evaluate and compare different deep learning models for specific applications.	Analyzing (4)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1-2	Introduction to a Deep Learning Framework (TensorFlow or PyTorch): Setting up the environment, basic tensor operations, building a simple feedforward neural network for a toy problem (e.g., XOR).	4	25B17CI473.1
3-4	Implementing a Feedforward Neural Network for a Classification Task: Data loading and preprocessing (e.g., MNIST), model definition, training loop, and evaluation.	4	25B17CI473.1
5-6	Building Convolutional Neural Networks (CNNs) for Image Classification: Implementing basic CNN layers (convolutional, pooling), training a CNN on a small image dataset (e.g., CIFAR-10), and evaluating performance.	4	25B17CI473.2
7-8	Designing and Training Deeper CNN Architectures: Implementing and experimenting with pre-trained models (e.g., VGG, ResNet) for image classification, fine-tuning techniques.	4	25B17CI473.2, 25B17CI473.4
9-10	Implementing Recurrent Neural Networks (RNNs) for Sequence Modeling: Building a basic RNN for a text-based task (e.g., sentiment analysis or	4	25B17CI473.3

	character-level language modeling), understanding sequence data handling.		
11-12	Implementing Long Short-Term Memory (LSTM) or Gated Recurrent Units (GRUs): Training an LSTM/GRU network for a more complex sequence task (e.g., text generation or machine translation), addressing vanishing gradient problems.	4	25B17CI473.3
13	Applying Regularization Techniques: Experimenting with L1/L2 regularization and dropout to improve model generalization and prevent overfitting.	2	25B17CI473.4
14	Optimizing Deep Learning Models: Implementing different optimization algorithms (e.g., Adam, RMSprop) and learning rate scheduling techniques.	2	25B17CI473.4
15	Model Evaluation and Comparison: Evaluating and comparing the performance of different deep learning models on a chosen dataset, analyzing results, and drawing conclusions.	2	25B17CI473.5
Total number of labs 15		30	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, Quiz = 10, Projects = 10, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Géron, Aurélien, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly Media, 2022, Paperback
2.	Goodfellow, Ian; Bengio, Yoshua; Courville, Aaron, Deep Learning, MIT Press, 2016, Hardcover
3.	Chollet, François, Deep Learning with Python, Manning Publications, 2021, Paperback
4.	Rosebrock, Adrian, Deep Learning for Computer Vision with Python, PyImageSearch, 2017, Paperback

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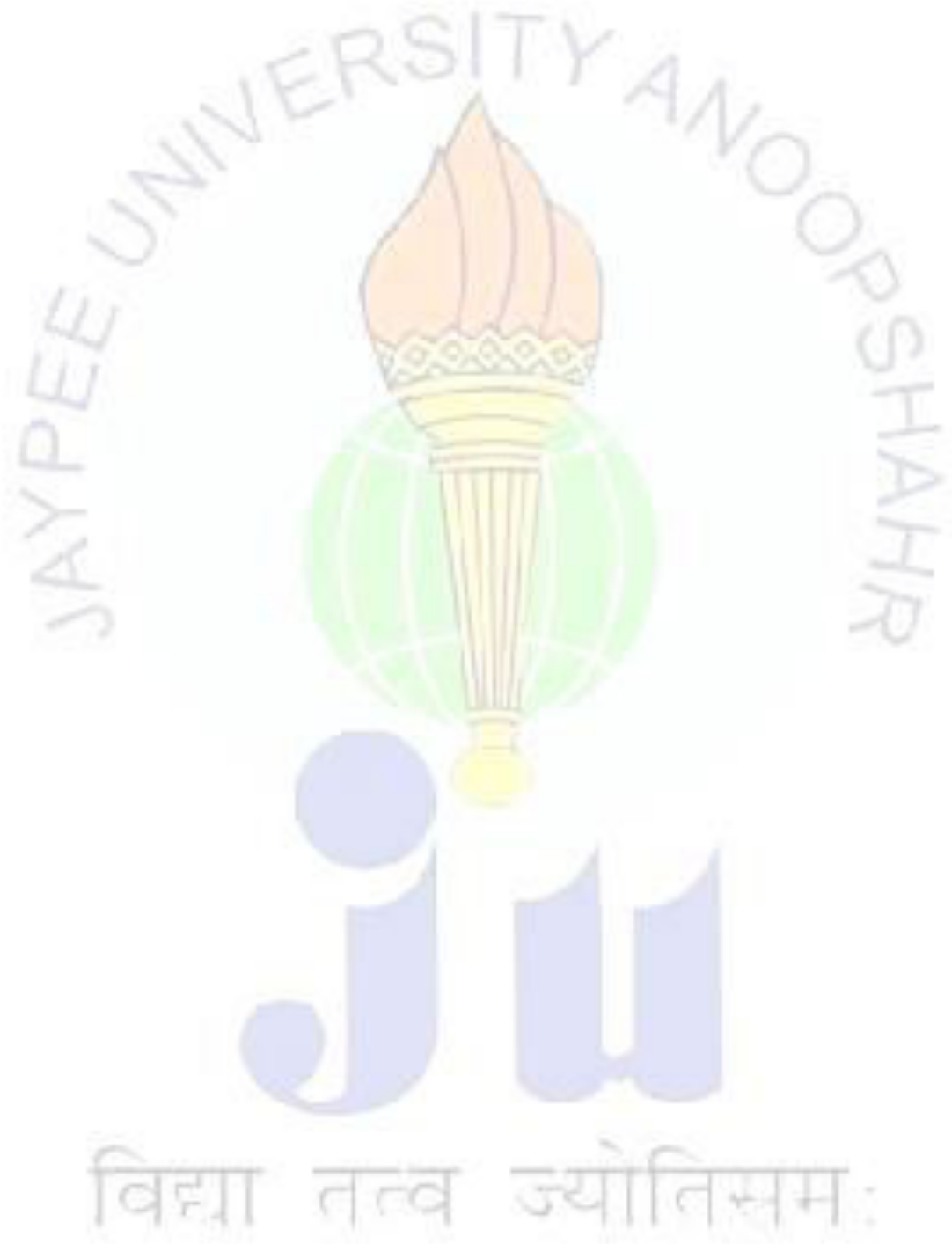
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Course Description

Course Code	25B11SS214	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department: Social Science**
			Session: 2025-26
Course Name	Indian Knowledge System		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11SS214.1	Understand the System of Logic in Indian Traditional Knowledge	Understand (Level 2)
25B11SS214.2	Examine the interplay between religion, philosophy, and knowledge production in Indian history.	Understand (Level 2)
25B11SS214.3	Apply traditional knowledge in addressing contemporary challenges related to health, environment, and livelihood.	Apply (Level 3)
25B11SS214.4	Critically assess the sustainability and efficiency of ancient Indian urban models in contemporary urban development.	Evaluating (Level 5)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	System of Logic and Reasoning	Pratyaksha, Anumana, Upamana, Sabda, Arthapatti, Anupalabdhi, Aithya, Tarka	10	25B11SS214. 1

2.	Religion, Philosophy and Knowledge Production	Basic principles of Hinduism, Jainism, Buddhism and Sufism. Metaphysical outlook. Epistemology. Ethics and Morality. Liberation and spirituality	15	25B11SS214. 2
3.	Basic Needs and IKS	Definitions and global standards. Major conferences and India's participation in them. Case Study- Food Sovereignty, Maternal Health.	10	25B11SS214. 3
4.	Urban Design	Sanitation, Transportation, Municipal Services, Architectural Design. Case Study- Mohenjo-Daro and Harappa, Temple towns of South India. Modern Day Applications	10	25B11SS214. 4
		Total number of Lectures	**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 15)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Sengupta, Nirmal. Traditional Knowledge in Modern India: Preservation, Promotion, Ethical Access and Benefit Sharing Mechanisms. India, Springer India, 2019.
2.	Indian Knowledge Systems. India, Indian Institute of Advanced Study, 2005.

Reference Books:

1.	IIT Gandhinagar's Lecture series- https://www.youtube.com/playlist?list=PLRfu94TCePTtVPR-kC4RpIGIwo7-ViCGP

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Course Description

Course Code	25B11ME511	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME
			Session: 2025-26
Course Name	Kinematics of Robotics		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11ME511.1	Understand and explain the fundamental concepts, types, and real-world applications of robots, including the role of kinematics and transformation matrices in robotic systems.	Remember (Level 1) Understand (Level 2)
25B11ME511.2	Apply the Denavit-Hartenberg convention to model the kinematics of serial robotic manipulators, construct transformation matrices, and analyze open-loop kinematic chains.	Apply (Level 3)
25B11ME511.3	Develop forward kinematics models using Denavit-Hartenberg conventions for serial manipulators.	Apply (Level 3) Analyze (Level 4)
25B11ME511.4	Analyze and compute the Jacobian matrix to evaluate linear and angular velocities of robotic manipulators, identify singularities, and perform differential motion analysis.	Analyze (Level 4) Evaluate (Level 5)
25B11ME511.5	Develop and analyze kinematic models of wheeled mobile robots, differentiate between holonomic and non-holonomic systems, and understand basic principles of path and trajectory planning.	Analyze (Level 4) Evaluate (Level 5)
25B11ME511.6	Evaluate the workspace, reachability, and dexterity of robotic manipulators, and apply trajectory generation and motion interpolation techniques in both joint and Cartesian spaces.	Analyze (Level 4) Evaluate (Level 5)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to Robotics and Kinematics	Definition and types of robots, Overview of robotic systems and applications, Importance of kinematics in robotics, Coordinate frames and transformations, Homogeneous transformation matrices	8	25B11ME511.1
2.	Forward Kinematics	Denavit-Hartenberg (DH) convention, DH parameter assignment and matrix formulation, Transformation	7	25B11ME511.3

		chains for serial manipulators, Examples: 2R, 3R, 6R manipulators, Kinematic chains and open-loop structures		
3	Inverse Kinematics	Concept and challenges of inverse kinematics, Analytical vs. numerical solutions, Solvability, redundancy, and multiple solutions, Algebraic and geometric approaches, Inverse kinematics of planar and spatial manipulators	6	25B11ME511.4
4	Velocity Kinematics	Linear and angular velocities, Jacobian matrix: definition and computation, Differential motion and velocity propagation, Singularities and their types, Velocity analysis of common robotic arms	9	25B11ME511.5
5	Kinematics of Mobile Robots	Types of mobile robots (differential drive, omnidirectional, etc.), Kinematic models of wheeled mobile robots, Non-holonomic and holonomic constraints, Path and trajectory planning basics	8	25B11ME511.5
6	Introduction to Workspace and Motion Planning	Workspace analysis of manipulators, Reachability and dexterity, Trajectory generation in joint and Cartesian space, Motion interpolation techniques.	7	25B11ME511.6
Total number of Lectures			45	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	John J. Craig, Introduction to Robotics: Mechanics and Control, 3rd Edition, Pearson, 2005
2.	John J. Uicker Jr., Gordon R. Pennock, Joseph E. Shigley, Theory of Machines and Mechanisms, 6th Edition, Cambridge University Press, 2023
3.	A. Ghosh, A.K. Mallik, Theory of Mechanisms and Machines, Affiliated East-West Press.
4.	S.S. Rattan, Theory of Machines, Tata McGraw-Hill Education

Reference Books:

1.	Robert J. Schilling, Fundamentals of Robotics: Analysis and Control, 1st Edition, Prentice Hall, 1990
2.	Robert L. Norton, Kinematics and Dynamics of Machinery, 3rd Edition, McGraw-Hill Education, 2017
3.	Joseph Duffy, Statics and Kinematics with Applications to Robotics, Cambridge University Press, 1996

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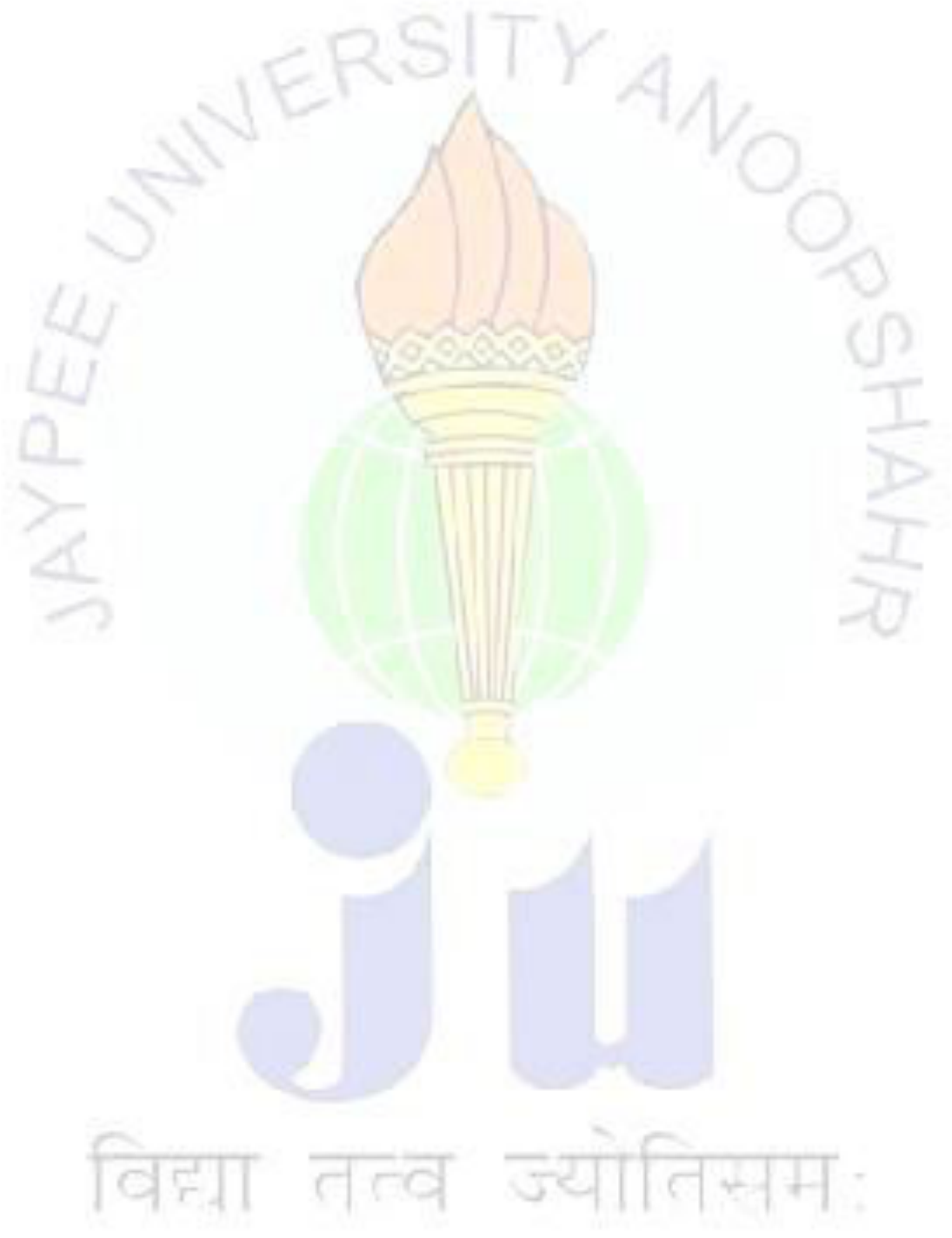

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Course Description

Course Code	25B11CI514	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Computer Vision		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CI514.1	Understand the fundamental principles and applications of computer vision.	Understanding (2)
25B11CI514.2	Apply image processing techniques for image enhancement and restoration.	Applying (3)
25B11CI514.3	Implement feature detection and description algorithms for image analysis.	Applying (3)
25B11CI514.4	Analyze and apply techniques for object recognition and image classification.	Analyzing (4)
25B11CI514.5	Understand the concepts and applications of advanced computer vision tasks such as object detection and segmentation.	Understanding (2)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to Computer Vision	What is Computer Vision? Applications of Computer Vision, History of Computer Vision, Human Vision System (brief overview), Image Formation, Image Representation (Digital Image, Color Spaces).	6	25B11CI514.1

2.	Image Processing Fundamentals	Image Enhancement (Spatial Domain: Point Operations, Filtering; Frequency Domain: Fourier Transform, Filtering), Image Restoration (Noise Models, Inverse Filtering, Wiener Filtering), Image Segmentation (Thresholding, Edge-Based Segmentation).	12	25B11CI514.2
3.	Feature Detection and Description	Interest Point Detection (Harris Corner Detector, SIFT, SURF, FAST), Feature Description (SIFT Descriptor, SURF Descriptor, BRIEF, ORB), Feature Matching.	10	25B11CI514.3
4.	Object Recognition and Classification	Image Classification Pipeline, Bag-of-Words Model, Visual Vocabulary Creation, Image Representation using Features, Classification Algorithms (k-NN, SVM, Introduction to Deep Learning for Classification).	10	25B11CI514.4
5.	Advanced Computer Vision Tasks	Object Detection (Sliding Window Approach, Introduction to Deep Learning based Object Detection: R-CNN family, YOLO, SSD), Image Segmentation (Semantic Segmentation, Instance Segmentation - basic concepts), Introduction to Video Analysis.	7	25B11CI514.5, 25B11CI514.4
Total number of Lectures			**45**	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
End Semester Examination	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10, Internal Assessment = 05)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Szeliski, Richard, Computer Vision: Algorithms and Applications, Springer, 2010
2.	Forsyth, David A.; Ponce, Jean, Computer Vision: A Modern Approach, Pearson Education, 2015 (2nd Edition)
3.	Shapiro, Linda G.; Stockman, George C., Computer Vision, Prentice Hall, 2001
4.	Sonka, Milan; Hlavac, Vaclav; Boyle, Roger, Image Processing, Analysis, and Machine Vision, Cengage Learning, 2014 (4th Edition)
5	Goodfellow, Ian; Bengio, Yoshua; Courville, Aaron, Deep Learning, MIT Press, 2016 (relevant for deep learning based vision)

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Course Description

Course Code	25B11EE511	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Electronics
			Session: 2025-26
Course Name	Robotic Control Systems		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11EE511.1	Describe the role and structure of control systems in robotic applications.	Understand (Level 2)
25B11EE511.2	Explain fundamental concepts of feedback, stability, and system response.	Understand (Level 2)
25B11EE511.3	Analyze and interpret sensor-actuator behavior in closed-loop systems.	Apply (Level 3)
25B11EE511.4	Apply basic control techniques using microcontrollers for robotic tasks.	Evaluating (Level 5)
25B11EE511.5	Design simple control systems for robots using embedded platforms.	Apply (Level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1	Fundamentals of Control Systems in Robotics	This module introduces the basic concepts of control systems with a focus on robotic applications. It covers open-loop and closed-loop control, system elements, feedback, stability, and transient and steady-state response. Block diagram representation is introduced in the context of robotic subsystems.	10	25B11EE511.1 25B11EE511.2

2	Sensors, Actuators, and System Dynamics	The module discusses the interaction between sensors, actuators, and control logic in robotic systems. It explores how physical measurements like position, velocity, and torque are sensed, and how actuators (DC motors, servos, etc.) respond to control signals. Concepts of system modeling and dynamic response are introduced at an intuitive level, without heavy mathematical formulation.	8	25B11EE511.2 25B11EE511.3
3	Microcontroller-Based Control Implementation	This module focuses on using microcontrollers to implement basic control systems in robotics. It includes microcontroller architecture, I/O interfacing with sensors and actuators, ADCs, PWM generation, and timer-based control loops. Simple real-time control routines are discussed, with emphasis on code structure and timing.	10	25B11EE511.3 25B11EE511.4
4	PID and Discrete Control Techniques	An introduction to PID controllers—proportional, integral, and derivative components—along with their roles in robotic feedback systems. Tuning methods and implementation using microcontrollers are covered. The module also introduces discrete-time control concepts, sampling, and digital filtering for sensor noise.	9	25B11EE511.3 25B11EE511.4
5	Applications and Case Studies in Robotic Control	This module presents practical robotic control applications such as line-following robots, obstacle avoidance, speed and position control of wheels and arms, and balance control in mobile platforms. It includes real-world examples using platforms like Arduino and Raspberry Pi, and discusses trends in intelligent control and integration with IoT systems.	8	25B11EE511.4 25B11EE511.5
		Total number of lectures	45	

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Saeed B. Niku, *Introduction to Robotics: Analysis, Control, Applications*, Wiley
2.	Karl J. Åström and Richard M. Murray, *Feedback Systems: An Introduction for Scientists and Engineers*, Princeton University Press
3.	Thomas B. Sheridan, *Telerobotics, Automation, and Human Supervisory Control*, MIT Press
Reference Books:	
1.	John Craig, *Introduction to Robotics: Mechanics and Control*, Pearson
2.	Bolton W., *Mechatronics*, Pearson

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Course Description

Course Code	25B17ME571	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME
			Session: 2025-26
Course Name	Kinematics of Robotics Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17ME571.1	Identify and use tools and software relevant to robotic kinematics	Remember (Level 1) Apply (Level 3)
25B17ME571.2	Model and simulate robot kinematic chains using DH conventions	Understand (Level 2) Apply (Level 3)
25B17ME571.3	Implement forward and inverse kinematics for planar robotic manipulators	Apply (Level 3) Analyze (Level 4)
25B17ME571.4	Calculate Jacobian matrices and interpret singular configurations	Analyze (Level 4) Evaluate (Level 5)
25B17ME571.5	Plan and simulate end-effector trajectories for robotic arms	Apply (Level 3) Create (Level 6)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lab hours for the module**	**CO Mapping**
1.	Introduction	Introduction to Robotics Simulation Software (e.g., MATLAB, ROS, V-REP, RoboAnalyzer)	2	25B17ME571.1
2.	Degree of Freedom	Understanding and Simulating Degrees of Freedom	2	25B17ME571.1
3	Links and Joints of a Manipulator	Modeling Links and Joints of a Serial Manipulator	2	25B17ME571.2
4	Transformation Matrix	DH Parameter Assignment and Transformation Matrix Calculation	2	25B17ME571.2
5	Forward Kinematics	Forward Kinematics of 2R and 3R Manipulators	4	25B17ME571.3

6	Inverse Kinematics	Inverse Kinematics for Simple Planar Arms (2R, 3R)	4	25B17ME571.3
7	Workspace Analysis	Workspace Analysis using Simulation	4	25B17ME571.3
8	Matrix Calculation	Jacobian Matrix Calculation and Singularities	2	25B17ME571.4
9	Velocity Kinematics	Velocity Kinematics and End-Effector Velocity Mapping	4	25B17ME571.5
10	Trajectory Planning	Trajectory Planning (Linear, Joint Space)	2	25B17ME571.5
11	Simulation Robot Arm	Simulating a Pick-and-Place Task	2	25B17ME571.5
Total number of Lab Hours			30	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, File work = 10, Experimental work = 30, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	John J. Craig, Introduction to Robotics: Mechanics and Control, 3rd Edition, Pearson, 2005
2.	John J. Uicker Jr., Gordon R. Pennock, Joseph E. Shigley, Theory of Machines and Mechanisms, 6th Edition, Cambridge University Press, 2023
3.	A. Ghosh, A.K. Mallik, Theory of Mechanisms and Machines, Affiliated East-West Press.
4.	S.S. Rattan, Theory of Machines, Tata McGraw-Hill Education

Reference Books:

1.	Robert J. Schilling, Fundamentals of Robotics: Analysis and Control, 1st Edition, Prentice Hall, 1990
2.	Robert L. Norton, Kinematics and Dynamics of Machinery, 3rd Edition, McGraw-Hill Education, 2017
3.	Joseph Duffy, Statics and Kinematics with Applications to Robotics, Cambridge University Press, 1996

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Course Description

Course Code	25B11MT417	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Management
			Session: 2025-26
Course Name	Skills for Employability		
Credits	4	**Contact Hours (L-T-P)**	3-1-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11MT417.1	Recall key formulas, theorems, and concepts in arithmetic, algebra, geometry, and data interpretation to apply them in problem solving.	Remember (Level 1)
25B11MT417.2	Explain quantitative concepts and their applications in real-world contexts.	Understand (Level 2)
25B11MT417.3	Solve quantitative problems using appropriate mathematical and logical techniques.	Appy (Level 3)
25B11MT417.4	Break down complex quantitative, logical and verbal reasoning-based problems into manageable parts and identify patterns or relationships.	Analyze (Level 4)
25B11MT417.5	Apply the best practice related to professional etiquettes and corporate grooming in professional settings.	Apply (Level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Unit 1: Quantitative Ability- I	Numbers and Number Systems; Progressions; Averages and Allegations; Percentages; Profit and Loss; Interest; Ratio, proportion and Variation; Time, work and Distance; Trains, Races, and Circular Tracks.	10	25B11MT417.1 25B11MT417.2 25B11MT417.3

2.	Unit 2: Quantitative Ability- II	Permutation and Combination; Probability; Set Theory; Trigonometry; Geometry; Clocks and Calendars.	8	25B11MT417.1 25B11MT417.2 25B11MT417.3
3.	Unit 3: Logical Reasoning	Seating Arrangements and Family Tree; Rankings; Team Formations; Puzzle Test, Coding-Decoding; Number and Letter Series.	10	25B11MT417.1 25B11MT417.2 25B11MT417.3 25B11MT417.4
4.	Unit 4: Verbal Reasoning	Syllogisms; Logical Deductions; Set Theory, Venn Diagrams and Network Diagrams; Binary Logic; Critical Reasoning- Paragraph/Reading Comprehension.	10	25B11MT417.3 25B11MT417.4
5.	Unit 5: Professional Etiquettes and Corporate Grooming	Etiquette for Personal Contact: Personal Appearance, Gestures, Postures, Facial Expressions, Eye-contact, Space distancing. Basic Email Etiquettes: Proper Grammar, Spelling, Punctuation, Styling and Formatting, Body of Email, Response, Privacy. Meeting Etiquette. Presentation Etiquettes: Importance of Preparation and Practice; Effective Delivery Techniques, Audience Analysis, Handling Stage Fright. Corporate Grooming: Concept, Hygiene and Grooming Guide – Do's and Don'ts of Grooming, Appearance and Attire, Connecting and Building Rapport - Listening Skills, Conversational Skills, Body Language.	7	25B11MT417.5
		Total Number of Lectures	**45**	

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25 (Attendance = 5, Class Test/Quiz = 05, Assignments = 10, Internal Assessment = 05)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Arun Sharma, Quantitative Aptitude for CAT 2025, Mc Graw Hill, 2024.
2.	R.S. Aggarwal, Quantitative Aptitude (revised Edition 2025), S. Chand, 2025.
3.	Arun Sharma, Verbal Ability & Reasoning Comprehension for CAT 2025. Mc Graw Hill, 2024.
4.	R.S. Aggarwal, A Modern Approach to Verbal Reasoning, S. Chand, 2028.
5.	Deepak Tralshawala, Personal and Professional Etiquette in Corporate World, Indie Press, 2024.
Reference Books:	
1.	Seema Gupta, Correct Manners and Etiquette, V & S Publishers, 2012.
2.	Shital Kakkar Mehra, Business Etiquette: A Guide for the Indian Professional, HarperCollins, 2012.
3.	Arun Sharma, Data Interpretation for CAT 2025, Mc Graw Hill, 2024.

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Course Description

Course Code	25B17EE571	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Electronics
			Session: 2025-26
Course Name	Robotic Control Systems Lab		
Credits	0(Qualifying)	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17EE571.1	Describe the role and structure of control systems in robotic applications.	Understand (Level 2)
25B17EE571.2	Explain fundamental concepts of feedback, stability, and system response.	Understand (Level 2)
25B17EE571.3	Analyze and interpret sensor-actuator behavior in closed-loop systems.	Apply (Level 3)
25B17EE571.4	Apply basic control techniques using microcontrollers for robotic tasks.	Evaluating (Level 5)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1.	Generate a Pulse Width Modulated (PWM) signal using a microcontroller to control the speed of a DC motor. Vary the duty cycle and observe motor behavior.	4	25B17EE571.1 25B17EE571.2
2.	Interface a servo motor with a microcontroller and control its angular position through input commands or potentiometer feedback.	2	25B17EE571.1 25B17EE571.2
3.	Develop a basic line follower using IR sensors and implement a control algorithm to follow black/white paths with decision logic.	4	25B17EE571.1 25B17EE571.2
4.	Simulate a Proportional-Integral-Derivative (PID) control loop for a simple system (e.g., motor, temperature, or position) using MATLAB/Simulink or Python.	4	25B17EE571.1 25B17EE571.2
5.	Interface an ultrasonic sensor with a microcontroller to measure distance and program an autonomous obstacle-avoiding robot.	2	25B17EE571.2 25B17EE571.3
6.	Implement a closed-loop system for DC motor speed control using an optical encoder for real-time feedback. Adjust motor speed based on setpoint comparison.	4	25B17EE571.3 25B17EE571.4
7.	Interface a joystick with a microcontroller to manually control a 2-DOF robotic arm and analyze the control logic for smooth movement.	4	25B17EE571.3 25B17EE571.4

8.	Interface a stepper motor and implement a program to rotate it to specific angles with step accuracy using microcontroller-based control logic.	4	25B17EE571.3 25B17EE571.4
9.	**Mini Project: Real-Time Robotic Control Application** Design and implement a mini project such as a pick-and-place robot, balancing bot, or automated guided vehicle (AGV) demonstrating application of real-time control systems.	4	25B17EE571.3 25B17EE571.4
Total number of Lectures		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Saeed B. Niku, *Introduction to Robotics: Analysis, Control, Applications*, Wiley
2.	Karl J. Åström and Richard M. Murray, *Feedback Systems: An Introduction for Scientists and Engineers*, Princeton University Press
3.	Thomas B. Sheridan, *Telerobotics, Automation, and Human Supervisory Control*, MIT Press

Reference Books:

1.	John Craig, Introduction to Robotics: Mechanics and Control, Pearson
2.	Bolton W., *Mechatronics*, Pearson

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Course Description

Course Code	25B17CI574	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Computer Vision Lab		
Credits	0(Qualifying)	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI574.1	Implement fundamental image processing techniques using Python libraries.	Applying (3)
25B17CI574.2	Implement feature detection and description algorithms for image analysis.	Applying (3)
25B17CI574.3	Apply techniques for object recognition and image classification.	Applying (3)
25B17CI574.4	Implement basic computer vision applications.	Applying (3)
25B17CI574.5	Use a deep learning framework for a computer vision task.	Applying (3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1-2	Introduction to Python for Computer Vision: Image loading, displaying, and basic manipulation using OpenCV.	4	25B17CI574.1
3-4	Image Enhancement: Implementing spatial domain techniques (histogram equalization, filtering).	4	25B17CI574.1
5-6	Image Restoration: Implementing frequency domain filtering (Fourier Transform) for noise removal.	4	25B17CI574.1
7-8	Feature Detection: Implementing corner detection (Harris) and edge detection (Canny).	4	25B17CI574.2
9-10	Feature Description: Implementing SIFT or ORB feature descriptors.	4	25B17CI574.2
11-12	Object Recognition: Implementing a basic object recognition system using feature matching.	4	25B17CI574.3

13	Image Classification: Training a basic classifier (k-NN or SVM) for image classification.	2	25B17CI574.3
14	Building a Computer Vision Application: Implementing a simple application (e.g., a basic image stiching or a simple augmented reality application).	2	25B17CI574.4
15	Introduction to Deep Learning for Computer Vision: Using a pre-trained CNN for a vision task.	2	25B17CI574.5
Total number of labs 15		30	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, Quiz = 10, Projects = 10, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Szeliski, Richard, Computer Vision: Algorithms and Applications, Springer, 2010, Hardcover
2.	Forsyth, David A.; Ponce, Jean, Computer Vision: A Modern Approach, Pearson Education, 2015, Hardcover
3.	Bradski, Gary; Kaehler, Adrian, Learning OpenCV: Computer Vision with the OpenCV Library, O'Reilly Media, 2008, Paperback
4.	Shapiro, Linda G.; Stockman, George C., Computer Vision, Prentice Hall, 2001, Hardcover

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Course Description

Course Code	25B11ME611	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME
			Session: 2025-26
Course Name	Dynamics of Robotics		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11ME611.1	Explain the significance of dynamics in motion planning and control using basic Newton-Euler and Lagrangian concepts.	Understand (Level 2)
25B11ME611.2	Apply dynamic modeling techniques to analyze inertial forces and compute joint torques in robotic manipulators under motion and external loads.	Apply (Level 3)
25B11ME611.3	Analyze and apply techniques for static and dynamic balancing of rotating and reciprocating systems, including engine components, using appropriate balancing machines.	Analyze (Level 4)
25B11ME611.4	Formulate dynamic equations of robotic manipulators using Lagrangian mechanics by applying generalized coordinates and energy-based methods, including inertial and Coriolis effects.	Apply (Level 3)
25B11ME611.5	Analyze the dynamic behavior of actuators and their interaction with robotic manipulators, including the effects of torque-speed characteristics and transmission elements like gears and pulleys.	Analyze (Level 4)
25B11ME611.6	Analyze free and forced vibrations in mechanical systems, including torsional and damped scenarios, and apply methods for vibration isolation and control in robotic and machine elements.	Analyze (Level 4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to Dynamics in Robotic Systems	Types of robotic joints and links. Importance of dynamics in motion planning and control. Newton-Euler and Lagrangian formulations (intro).	3	25B11ME611.1
2.	Force and Torque Analysis in Robot Mechanisms	Dynamic modeling of links and manipulators. Inertial forces and moments in robotic arms. Joint torques due to motion and external loads.	9	25B11ME611.2

3	Balancing of Rotating and Reciprocating Masses	Static and dynamic balancing of rotating masses. Balancing of single and multi-cylinder engines. Primary and secondary balancing. Balancing machines – types and applications	6	25B11ME611.3
4	Lagrangian Dynamics	Generalized coordinates and energy methods, Deriving equations of motion using Lagrange's equations, Robot dynamics modeling: link inertia, Coriolis, and centrifugal effects Example: Lagrangian dynamics of 2R and 3R robots	9	25B11ME611.4
5	Actuation and Drive Dynamics	Dynamics of actuators (DC motors, servo motors). Torque-speed characteristics. Dynamic interaction between actuator and manipulator. Transmission elements (gears, pulleys) and their dynamic effects	9	25B11ME611.5
6	Vibrations in Machines	Introduction to Vibration in machines. Free and forced vibrations. Damped and undamped systems. Natural frequency and resonance. Torsional vibration and two/three rotor systems. Vibration isolation and absorption	9	25B11ME611.6
Total number of Lectures			45	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
T3	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Mark W. Spong, Seth Hutchinson, M. Vidyasagar , Robot Modeling and Control by
2.	John J. Craig , Introduction to Robotics: Mechanics and Control
3.	S.S. Rattan, Theory of Machines, Tata McGraw-Hill Education

Reference Books:

1.	Robert J. Schilling, Fundamentals of Robotics: Analysis and Control, 1st Edition, Prentice Hall, 1990
2.	Robert L. Norton, Kinematics and Dynamics of Machinery, 3rd Edition, McGraw-Hill Education, 2017

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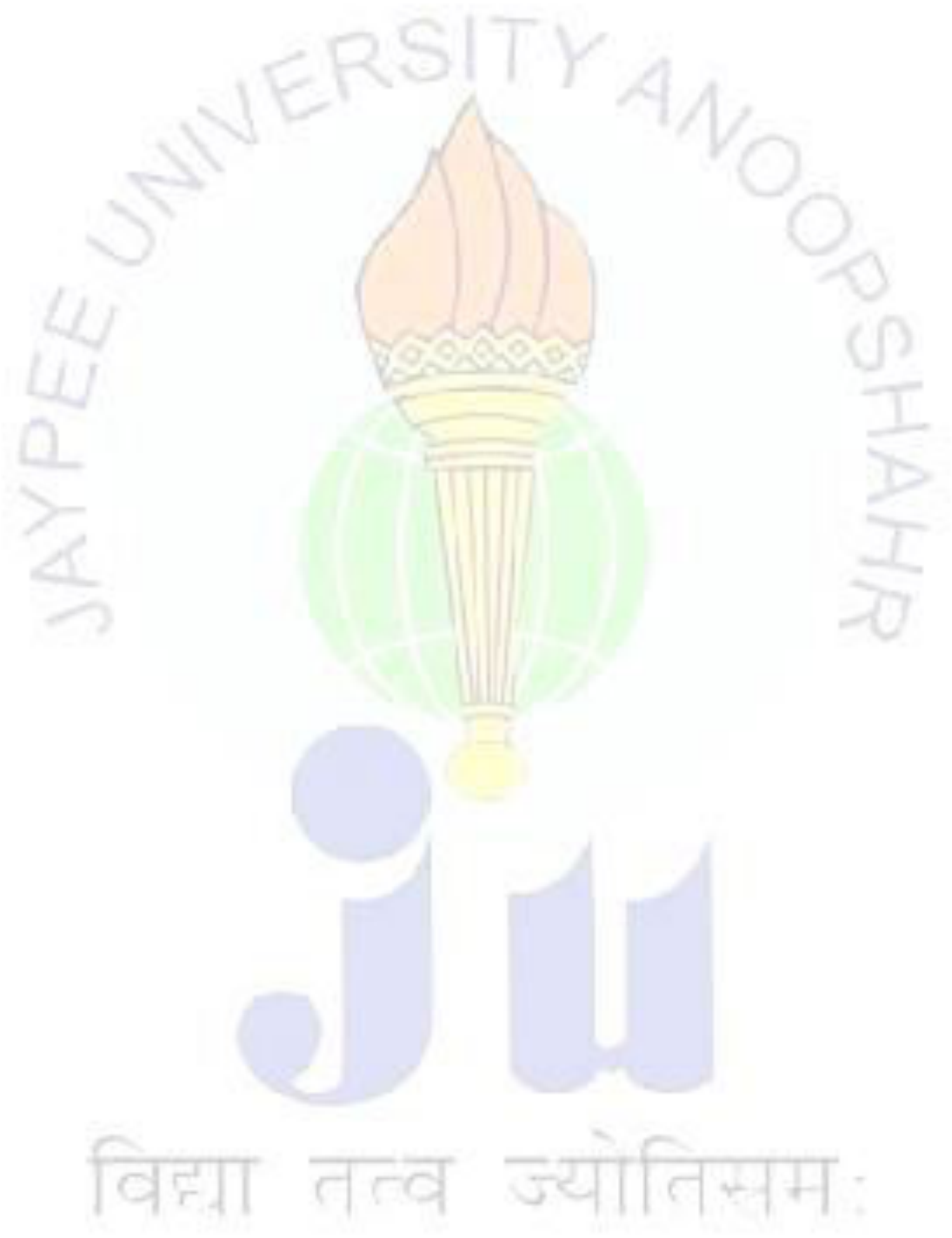

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Course Description

Course Code	25B11CI614	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Reinforcement Learning		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CI614.1	Understand the fundamental concepts and components of reinforcement learning.	Understanding (2)
25B11CI614.2	Apply dynamic programming methods for solving Markov Decision Processes.	Applying (3)
25B11CI614.3	Implement and analyze temporal difference learning algorithms for prediction and control.	Applying (3)
25B11CI614.4	Understand and apply policy gradient methods for learning optimal policies directly.	Applying (3)
25B11CI614.5	Analyze and compare different reinforcement learning algorithms for various application domains.	Analyzing (4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to Reinforcement Learning	What is Reinforcement Learning? Agents, Environments, Rewards, Actions, Policies, Goals. History and Applications of RL. Components of an RL Problem: Markov Decision Processes (MDPs), States, Actions, Transition Probabilities, Rewards, Discount Factor.	6	25B11CI614.1

2.	Dynamic Programming for MDPs	Policy Evaluation (Prediction), Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration.1	9	25B11CI614.2
3.	Temporal Difference (TD) Learning	TD Prediction: TD(0), TD(λ), Eligibility Traces. TD Control: Sarsa, Q-learning, Expected Sarsa. Convergence of TD Algorithms.	12	25B11CI614.3
4.	Policy Gradient Methods	Policy Parameterization, Policy Gradient Theorem, REINFORCE Algorithm, Actor-Critic Methods (Basic concepts). Variance Reduction Techniques (Baselines).	9	25B11CI614.4
5.	Exploration vs. Exploitation & Advanced Topics	ε-greedy Exploration, Softmax Exploration, Upper Confidence Bound (UCB). Function Approximation in RL (Introduction). Deep Reinforcement Learning (Basic Concepts). Case Studies and Applications of RL (e.g., Robotics, Game Playing).	9	25B11CI614.5
Total number of Lectures			**45**	

Evaluation Criteria

Components	**Maximum Marks**	
T1	20	
T2	20	
End Semester Examination	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10, Internal Assessment = 05)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Sutton, Richard S.; Barto, Andrew G., Reinforcement Learning: An Introduction, MIT Press, 2018 (2nd Edition)
2.	Bertsekas, Dimitri P.; Tsitsiklis, John N., Neuro-Dynamic Programming, Athena Scientific, 1996
3.	Watkins, Christopher J. C. H.; Dayan, Peter, Q-learning, Machine Learning, 1992 (Foundational Paper)
4.	Williams, Ronald J., Policy gradient methods for reinforcement learning with function approximation, Kluwer Academic Publishers, 1992 (Foundational Paper)
5	Lillicrap, Timothy P.; Hunt, Jonathan J.; Pritzel, Alexander; Wierstra, Daan; Ewalds, Martin A.; Wayne, Greg; Abdolmaleki, Abbas; Sharma, Nemanja; de Freitas, Nando, Continuous control with deep reinforcement learning, arXiv preprint arXiv:1509.02971, 2015 (Introduction to Deep RL)

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Course Description

Course Code	25B11CI615	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Robot Operating System		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11CI615.1	Understand the fundamental concepts and architecture of the Robot Operating System (ROS).	Understanding (2)
25B11CI615.2	Develop ROS nodes and packages for robot control and perception.	Applying (3)
25B11CI615.3	Utilize ROS communication mechanisms (topics, services, actions) to enable inter-process communication.	Applying (3)
25B11CI615.4	Simulate and visualize robots and environments using ROS tools (Gazebo, RViz).	Applying (3)
25B11CI615.5	Apply ROS to solve basic robotic problems, such as robot navigation and manipulation.	Applying (3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1.	Introduction to ROS	What is ROS? History and Motivation, ROS Distribution, ROS Concepts: Nodes, Messages, Topics, Services, Actions, Parameters, Packages, Metapackages, ROS File System, ROS Computational Graph, ROS Community.	6	25B11CI615.1

2.	ROS Architecture and Tools	ROS Core Components: roscore, roslaunch, rospack, rosrun, rostopic, rosservice, rosnode, rosparam, ROS Message Types, Creating ROS Packages, Building ROS Packages with catkin, Writing Simple ROS Nodes (Publisher and Subscriber) in Python and/or C++.	12	25B11CI615.2
3.	ROS Communication	ROS Topics: Understanding Topics, Publishing and Subscribing to Topics, Message Filtering, Rate Limiting, Defining Custom Messages. ROS Services: Understanding Services, Defining Services, Creating Service Servers and Clients. ROS Actions: Understanding Actions, Defining Actions, Creating Action Servers and Clients, Using Actionlib.	12	25B11CI615.3
4.	Robot Simulation and Visualization	Introduction to Gazebo Simulator: Installing and Using Gazebo, Creating Simple Robot Models in URDF (Unified Robot Description Format), Simulating Sensors (Lidar, Camera, IMU), Controlling Robots in Gazebo. Introduction to RViz: Visualizing Robot Models, Sensor Data, and Robot State, Using RViz Plugins.	9	25B11CI615.4
5.	ROS Applications and Advanced Concepts	Robot Navigation: Understanding ROS Navigation Stack, Configuring Navigation Parameters, Implementing Simple Navigation Behaviors (e.g., move_base). Robot Manipulation: Introduction to ROS Control, Controlling Robot Arms, Inverse Kinematics (Basic Concepts), Pick and Place Applications (Basic Concepts). Introduction to ROS 2.	6	25B11CI615.5
Total number of Lectures			**45**	

Evaluation Criteria		
Components	**Maximum Marks**	
T1	20	
T2	20	
End Semester Examination	35	
TA	25	(Attendance = 5, Class Test/Quiz = 10, Assignments = 10, Internal Assessment = 05)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	Lentin, Jason M., Programming Robots with ROS: A Practical Introduction, O'Reilly Media, 2012
2.	Koubaa, Anis, Robot Operating System (ROS): The Complete Reference (Volume 1), Springer, 2016
3.	Quigley, Morgan; Gerkey, Brian; Smart, William D., Programming Robots with ROS: A Practical Introduction, O'Reilly Media, 2015 (Earlier Edition - still relevant)
4.	Foote, Tully; Gerkey, Brian; Riek, Chad C.; Quigley, Morgan; Ng, Andrew Y., ROS: an open-source Robot Operating System, ICRA, 2003 (Foundational Paper)
5.	Joseph, Lentin, ROS Robotics By Example, Packt Publishing, 2016

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Course Description

Course Code	25B11EE611	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Electronics
			Session: 2025-26
Course Name	Digital signal Processing and Embedded System		
Credits	3	**Contact Hours (L-T-P)**	3-0-0
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B11EE611.1	Explain the basic concepts of digital signals and signal processing techniques.	Understand (Level 2)
25B11EE611.2	Perform basic DSP operations such as convolution and Fourier analysis.	Understand (Level 2)
25B11EE611.3	Describe the architecture and features of the 8051 microcontroller.	Apply (Level 3)
25B11EE611.4	Interface sensors and actuators using 8051 for real-time DSP applications.	Evaluating (Level 5)
25B11EE611.5	Design simple embedded systems integrating basic DSP concepts.	Apply (Level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**	**CO Mapping**
1	Introduction to Digital Signal Processing	Concept of signals and systems in the digital domain. discrete-time signals, sampling, quantization, and types of systems. Basic signal operations such as time-shifting and scaling are discussed. The importance of DSP in real-world applications like audio, biomedical, and communication systems is highlighted.	10	25B11EE611.1 25B11EE611.2

2	Fundamental DSP Operations and Transforms	Elementary operations including linear convolution, circular convolution, and correlation. Discrete Fourier Transform (DFT) and the Fast Fourier Transform (FFT) at a conceptual level without heavy mathematical derivations. Simple frequency domain interpretation of signals and systems is discussed with application relevance.	8	25B11EE611.2 25B11EE611.3
3	Introduction to Embedded Systems and 8051 Architecture	Overview of embedded systems and real-time signal processing requirements. 8051 architecture, memory organization, special function registers, and addressing modes. Instruction set classification and assembly/C programming for 8051-based applications.	10	25B11EE611.3 25B11EE611.4
4	Interfacing and Embedded I/O Applications	Interfacing of 8051 with LEDs, switches, displays, sensors, and actuators. Timer and counter programming, interrupt handling, and real-time signal control applications. Signal generation, measurement, and sampling routines using 8051.	9	25B11EE611.3 25B11EE611.4
5	Embedded DSP Applications and Case Studies	Integration of DSP concepts into embedded systems. Real-time filtering, waveform generation, signal monitoring, and basic control tasks using 8051. Case studies involving DSP-embedded co-design, power-efficient processing, and simple robotic or IoT-based signal processing applications.	8	25B11EE611.4 25B11EE611.5
		Total number of lectures	45	

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)	
Text Books:	
1.	John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Pearson
2.	Kenneth J. Ayala, The 8051 Microcontroller, Cengage Learning
3.	Sanjay K. Bose, Digital Signal and Image Processing, Wiley
Reference Books:	
1.	*Raj Kamal,* Embedded Systems: Architecture, Programming and Design*, McGraw Hill*
2.	*M.A. Mazidi, J.G. Mazidi and R.D. McKinlay, The 8051 Microcontroller and Embedded Systems, Pearson*

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Course Description

Course Code	25B17ME671	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** ME
			Session: 2025-26
Course Name	Dynamics of Robotics Lab		
Credits	1	**Contact Hours (L-T-P)**	0-0-2
Course Coordinator			

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17ME671.1	Use simulation tools to analyze robot dynamics	Apply (Level 3)
25B17ME671.2	Model robotic manipulators including dynamic parameters	Understand (Level 2) Apply (Level 3)
25B17ME671.3	Compute inverse dynamics and simulate torque requirements	Apply (Level 3) Analyze (Level 4)
25B17ME671.4	Implement basic dynamic control strategies like PID and force control	Apply (Level 3) Evaluate(Level 5)
25B17ME671.5	Interpret dynamic response data and optimize system performance	Analyze (Level 4) Evaluate(Level 5)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lab hours for the module**	**CO Mapping**
1.	Introduction	Introduction to Robotics Dynamics Simulation Tools (e.g., MATLAB Simulink, ROS + Gazebo, CoppeliaSim)	2	25B17ME671.1
2.	Modeling of Single-Link	Modeling of Single-Link Robotic Arm Dynamics	2	25B17ME671.1
3	Links and Joints of a Manipulator	Simulation of Double-Link Manipulator with Inertia and Gravity Effects	2	25B17ME671.2
4	Estimation of Dynamics Parameter	Dynamic Parameter Estimation: Mass, Inertia, and Center of Gravity	2	25B17ME671.2
5	Inverse Dynamics	Inverse Dynamics Using Newton-Euler and Lagrangian Methods	2	25B17ME671.3
6	Torque Computation	Joint Torque Computation under Various Payloads	4	25B17ME671.3

7	Damping Effect	Effect of Friction and Damping on Robot Dynamics	2	25B17ME671.3
8	Force Control analysis	Simulating Force Control and Compliance	4	25B17ME671.4
9	Tracking of Trajectory	Trajectory Tracking with PID Control under Dynamic Conditions	4	25B17ME671.5
10	Vibrations in Manipulators	Simulating and Observing Resonance and Vibrations in Manipulators	4	25B17ME671.5
11	Energy analysis	Verification of Energy Conservation in Robotic Systems	2	25B17ME671.5
Total number of Lab Hours			30	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, File work = 10, Experimental work = 30, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Mark W. Spong, Seth Hutchinson, M. Vidyasagar , Robot Modeling and Control by
2.	John J. Craig , Introduction to Robotics: Mechanics and Control
3.	Sciavicco & Siciliano , Modeling and Control of Robot Manipulators
4.	S.S. Rattan, Theory of Machines, Tata McGraw-Hill Education

Reference Books:

1.	Robert J. Schilling, Fundamentals of Robotics: Analysis and Control, 1st Edition, Prentice Hall, 1990
2.	Robert L. Norton, Kinematics and Dynamics of Machinery, 3rd Edition, McGraw-Hill Education, 2017

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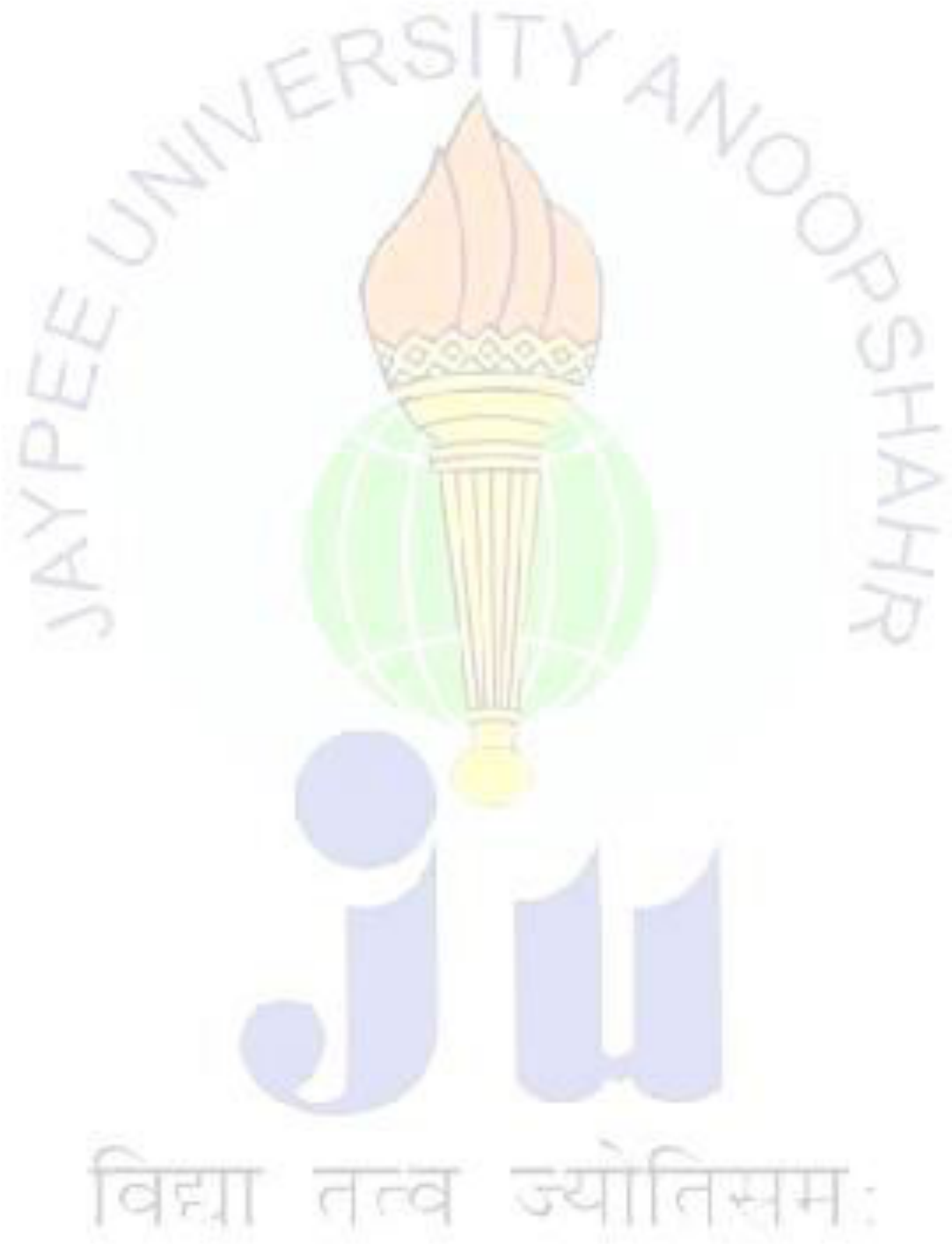
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Course Description

Course Code	25B17CI674	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** CSE
			Session: 2025-26
Course Name	Reinforcement Learning Lab		
Credits	0 (Qualifying)	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17CI674.1	Implement fundamental reinforcement learning algorithms.	Applying (3)
25B17CI674.2	Apply dynamic programming methods to solve simple MDPs.	Applying (3)
25B17CI674.3	Implement temporal difference learning algorithms.	Applying (3)
25B17CI674.4	Implement policy gradient methods.	Applying (3)
25B17CI674.5	Evaluate and compare the performance of different reinforcement learning algorithms.	Analyzing (4)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1-2	Introduction to a Reinforcement Learning Environment (e.g., OpenAI Gym): Setting up the environment, understanding basic environments, interacting with the environment.	4	25B17CI674.1
3-4	Implementing Dynamic Programming: Solving a simple MDP using Policy Iteration and Value Iteration.	4	25B17CI674.2
5-6	Implementing Temporal Difference Learning (TD(0)): Applying TD(0) for prediction in a given environment.	4	25B17CI674.3
7-8	Implementing Q-learning: Solving a control problem using Q-learning.	4	25B17CI674.3
9-10	Implementing Sarsa: Solving a control problem using Sarsa.	4	25B17CI674.3

11-12	Implementing Policy Gradient (REINFORCE): Implementing the REINFORCE algorithm for a simple problem.	4	25B17CI674.4
13-14	Implementing Actor-Critic Methods: Implementing a basic Actor-Critic algorithm.	4	25B17CI674.4
15	Comparing RL Algorithms: Comparing the performance of different RL algorithms (e.g., Q-learning, Sarsa, Policy Gradient) on a specific task.	2	25B17CI674.5
Total number of labs 15		30	

Evaluation Criteria

Components	**Maximum Marks**	
Practical Exam-I	20	
Practical Exam-II	20	
Day to Day Evaluation	60	(Attendance = 10, Quiz = 10, Projects = 10, Viva-Voce = 10)
Total	**100**	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	Sutton, Richard S.; Barto, Andrew G., Reinforcement Learning: An Introduction, MIT Press, 2018, Hardcover (2nd Edition)
2.	Huang, Jane; Isaacs, Adam; Jiang, Zheng; Kulkarni, Vikrant; Arulkumaran, Kai, Deep Reinforcement Learning in Action, Manning Publications, 2020, Paperback
3.	François-Lavet, Vincent; Henderson, Peter; Islam, Riashat; Bellemare, Marc G.; Pineau, Joelle, An Introduction to Deep Reinforcement Learning, Foundations and Trends® in Machine Learning, 2018, eBook
4.	Liu, Yuxi, Advanced Deep Learning with Python, Packt Publishing, 2019, Paperback

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Course Description

Course Code	25B17EE671	**Offered to Program:** UG **(specify UG/PG)**	**Offered Department:** Electronics **Session:** 2025-26
Course Name	Digital signal Processing and Embedded System Lab		
Credits	0 (Qualifying)	**Contact Hours (L-T-P)**	0-0-2

COURSE OUTCOMES: After completing the course, students will be able to:		**COGNITIVE LEVELS**
25B17EE671.1	Explain the basic concepts of digital signals and signal processing techniques.	Understand (Level 2)
25B17EE671.2	Perform basic DSP operations such as convolution and Fourier analysis.	Understand (Level 2)
25B17EE671.3	Describe the architecture and features of the 8051 microcontroller.	Apply (Level 3)
25B17EE671.4	Interface sensors and actuators using 8051 for real-time DSP applications.	Evaluating (Level 5)
25B17EE671.5	Design simple embedded systems integrating basic DSP concepts.	Apply (Level 3)

Sr. No	**List of Experiments**	**No. of labs hrs. required**	**CO Mapping**
1.	Generate and plot discrete-time signals such as unit step, unit impulse, ramp, exponential, and sinusoidal using MATLAB/Octave/Scilab.	4	25B17EE671.1 25B17EE671.2
2.	Perform linear and circular convolution between two sequences using simulation tools. Observe and compare the results graphically.	2	25B17EE671.1 25B17EE671.2
3.	Compute the Discrete Fourier Transform (DFT) of a signal and implement the Fast Fourier Transform (FFT) to analyze signal frequency components.	4	25B17EE671.1 25B17EE671.2
4.	Design simple FIR and IIR filters using built-in functions. Plot and interpret their magnitude and phase response.	4	25B17EE671.1 25B17EE671.2
5.	Write basic 8051 programs using assembly or embedded C to perform arithmetic operations, data transfer, and simple delay generation.	2	25B17EE671.2 25B17EE671.3
6.	Interface LEDs with 8051 microcontroller. Create time delays using internal timers to blink LEDs at various intervals.	4	25B17EE671.3 25B17EE671.4

7.	Interface analog sensors such as temperature or IR sensors using ADC with 8051. Display sensor output on serial monitor or LCD.	4	25B17EE671.3 25B17EE671.4
8.	Generate standard waveforms (sine, square, triangle) using DAC interfaced with 8051. Use lookup tables and timers to simulate continuous signals.	4	25B17EE671.3 25B17EE671.4
9.	**Mini Project: Real-Time Signal Processing using 8051** Develop a small embedded DSP application like a sound-reactive LED display, basic digital equalizer, tone generator, or a vibration alert system, integrating both DSP concepts and 8051 programming.	4	25B17EE671.3 25B17EE671.4
Total number of Lectures		30	

Evaluation Criteria

Components	**Maximum Marks**
Practical Exam-I	20
Practical Exam-II	20
Day to Day Evaluation	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication, etc. (Textbooks, Reference Books, Journals, Reports, Websites, etc)

Text Books:

1.	John G. Proakis and Dimitris G. Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, Pearson
2.	Kenneth J. Ayala, *The 8051 Microcontroller*, Cengage Learning
3.	Sanjay K. Bose, *Digital Signal and Image Processing*, Wiley

Reference Books:

1.	Raj Kamal, *Embedded Systems: Architecture, Programming and Design*, McGraw Hill
2.	M.A. Mazidi, J.G. Mazidi and R.D. McKinlay, *The 8051 Microcontroller and Embedded Systems*, Pearson

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