

Version 3.1	Course Academic Plan	Course Code and Name: EEC401 Applied Mathematics IV
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The academic resources available in PHCET, Rasayani

PHCET AMS	Evaluation and Assessment	PHCET Library	Value added courses and MOOC courses
Institute & Department Vision and Mission	Former IA question papers and solutions (prepared by faculty)	Former IA question papers solutions - hardcopy	Value Added Courses (VAC) are conducted throughout the semester & in the semester break
Lesson Plan, Practical plan, Content delivery (Planned and Actual)	MU end semester examination question papers and solutions (prepared by faculty)	MU end semester exam question paper & solutions - by faculty, hardcopy	Online courses from NPTEL, Coursera etc. are pursued throughout the semester
Student attendance and performance	Class notes and Digital Content for the subject	All text books, reference books, e-books mentioned in the syllabus & AAP	Video recording of Lectures captured in Light board studio at PHCET is made available.
Student details	Comprehensive question bank, MCQ, GA, PPT, Class Test papers	Technical journals and magazines for reference	Interactive smart board facility is available and lectures are recorded.
Departmental Academic plan	Academic Administration Plan & Beyond Syllabus Activity report	PHCET library is member of IIT Bombay Library	Expert lectures by Industry/Academia

1.a Course Objectives (As per Blooms Taxonomy)

Sr. No	Course Objectives
1	To understand line and contour integrals and expansion of complex valued function in a power series.
2	To understand the basic techniques of statistics for data analysis, machine learning and AI.
3	To understand probability distribution and expectations.
4	To understand the concepts of vector spaces used in the field of machine learning and engineering problems.
5	To understand the concepts of Quadratic forms and singular value decomposition.
6	To understand the concepts of calculus of variations.

1.b Course Outcome (CO) Mapping with Modules

Sr. No	COs	Related Modules
CO1	Use the concepts of Complex Integration for evaluating integrals, computing residues and evaluate various contour integrals.	Complex Integration
CO2	Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning and AI.	Statistical Techniques
CO3	Apply the concept of probability and expectation for getting the spread of the data and distribution of probabilities.	Probability Distributions
CO4	Apply the concept of vector spaces and orthogonalization process in Engineering Problems.	Vector Spaces
CO5	Use the concept of Quadratic forms and singular value decomposition which are very useful tools in various Engineering applications.	Linear Algebra – Quadratic Forms
CO6	Find the extremals of the functional using the concept of Calculus of variation.	Calculus of Variations

1.c Mapping of COs with POs (mark 3: Strong, 2: Moderate, 1: Weak,)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1			1	1				1	2	
CO2	2	2	1	1	2	1	2			1	1	1
CO3	3	2	2	1	1	2	1	2	2	1	2	1

CO4	3	2	3	2	1	2	2	2	2	2	3	2
CO5	1	1	1	1	2						1	1
CO6	2	2	2	2	1		2		1	1	1	2

1.d Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1
CO2	1	1	1	1
CO3	2	2	1	2
CO4	3	2	2	3
CO5	1	1	1	1
CO6	2	1	2	1

1.e Core Competency of the course

Categories	Mathematics	Basic Science & General Engg	Humanities & Soft Skill	Core Engg./ Technology - Design & Analysis	Multidisciplinary
Tick where applicable					

2.a Teaching Scheme (As specified by the University)

Course Name	Theory	Practical	Tutorial
Engineering Mathematics I	4 hr	--	1 hr

2.b Module Wise Teaching Hours and % Weightage in University Question Paper

Module No.	Module Title and Brief Details	Teaching Hrs. for each module	% Weightage in University Question Papers
1	Calculus of Variations	6	20 M
2	Vector Spaces	6	20 M
3	Matrix Theory	6	20 M
4	Probability	6	20 M
5	Correlation	6	20 M
6	Complex Integration	6	20 M

2.c Prerequisite Courses

Sr. No.	Semester	Name of the course	Topics covered
1	I	AM I	Revision of Complex Number, Matrices, Differentiation
2	II	AM-II	Solving differential equations, double integration
3	III	AM-III	Line integrals, complex variables

2.d Relevance to Future Courses

1	Solving Complex Engineering Problems
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2.e Industry Application of the course

Sr. No	Application
1	In the engineering field, matrices is usually applied in the magnetic fields vectors. It is also used in linear algebra which is one of the units of all the engineering courses. Matrices are a vital mathematical tool for calculating forces, vectors, tensions, masses, loads and a myriad of other factors that must be accounted for in engineering to ensure a safe and resource-efficient structure.

2	Vector calculus plays an important role in differential geometry and in the study of partial differential equations. It is used extensively in physics and engineering, especially in the description of electromagnetic fields, gravitational fields and fluid flow.
3	Probability in any many engineering fields are applicable to the testing and reliability assessment of engineered systems

3.a Past Results –

Year	Division		Division		Division	
	Initials of Teacher	% Result	Initials of Teacher	% Result	Initials of Teacher	% Result

Topics which affect results negatively	Module Number	Recommendations to overcome these issues & improve result in future
Calculus of variation	6	Student should solve more number of problems with variety.
Vector Spaces	4	Student should solve more number of problems with variety.
Complex Integration	1	Student should able to recall the correct formulas and accordingly apply while solving the examples.

4.a Learning Resources – Books and E-Resources

4.b List of Text Books

Sr. No.	Text book titles	Authors	Publisher	Edition	Module No
1	Applied Mathematics IV	G V Kumbhojkar	C Jamnadas	3 rd	1-6

4.c List of Reference Books

Sr. No.	Referencebook titles	Authors	Publisher	Edition	Module No
1	A Text book of Applied Mathematics	P N Wartikar & J N Wartikar	Vidarthi Graha	8 th	1 to 6
2	Advanced Engg Mathematics	Erwin Kryszig	Wiley Eastern Limited	9 th	1 to 6

4.dList of E – Books

Sr. No.	E book titles	Authors	Publisher	Edition	Module No
1	Introduction to Complex Number	<u>Christopher C. Tisdell</u>	Bookboon	I	1

4.eWeb Links and Names of Magazines, Journals, E-journals

Sr. No.	Web-Links and Names of Journals and E-Journals Recommended	Web-Links and Names of Magazines Recommended	Module Nos.
1	Matrix Theory	1) https://youtu.be/uc4BeCo2mX 2) https://youtu.be/rSP62CNQ0xI 3) https://youtu.be/2R5SH7RemYE	3
2	Complex integration	1) https://youtu.be/OZAZImytcXE 2) https://youtu.be/4yC4IXcMKIj	6

5. Concept Inventory

S. No.	Module	Topic Name	Specific Concepts Covered in this Topic	Recommended Text Book for this Topic	Starting Page	Ending Page	No. of Pages	Estimated Time in Hrs for Topic Completion	Approximate Weightage (Marks)
1	1	Complex Integration	Complex integration:	B1	10.1	10.12	12	1	20
			Cauchy's theorem		11.1	11.25	25	1	

			Taylor's and Laurent series		12.1	12.25	25	2	
			Zeros, singularities and poles, Residue theorem		13.1	13.60	60	2	
2	2	Statistical Techniques	Karl Pearson's coefficient of correlation	B1	8.1	8.11	11	2	20
			spearman's Rank correlation		8.12	8.21	9	2	
			Regression		9.1	9.23	23	2	
3	3	Probability Distributions	Baye's Theorem	B1	5.1	5.20	20	1	20
			Random Variables		5.21	5.41	21	1	
			Expectation, mean and variance		6.1	6.35	35	2	
			probability Distributions		7.1	7.63	63	2	
4	4	Linear Algebra – Vector Spaces	vectors in n-dimensional vector space properties	B1	2-1	2-25	25	1	
			vector space, Axioms, Linear Combination of vectors		3-1	3.25	25	1	
			Basis and dimension, to find Basis for Space		3.26	3.45	20	2	
			Norms and norms vector Spaces, Inner Products and Inner product Spaces, The Cauchy-Schwartz inequality, Gram-Schmidt process		3.46	3.63	17	2	
5	5	Linear Algebra – Quadratic Forms	Quadratic forms over real field	B1	4.1	4.36	36	1	20
			Rank, index and signature		4.40	4.49	10	1	
			Value class of quadratic form		4.52	4.73	21	1	
			Reduction to canonical form		4.75	4.86	11	1	
			Singular value decomposition		4.87	4.92	6	2	
6	6	Calculus of Variations	Euler's-Lagrange's equation, Solution of Euler's-Lagrange's equation Independent of variables	B1	1.01	1.10	10	2	20
			Isoperimetric problems		1.11	1.27	17	2	
			Functions involving higher order derivatives: Rayleigh-Ritz Method		1.28	1-34	20	2	

6.0 Web Links for Online Notes/YouTube/ Digital Content/Lecture Capture/NPTEL Videos

Sr. No.	Websites/ Links	Module No
1	https://www.youtube.com/watch?v=YpC8xZ1pViw	1
2	https://www.youtube.com/watch?v=YXmeH1yevkk	4

7. Recommended MOOC Courses like Coursera / NPTEL / Swayam/ edX etc.

Sr. No.	MOOC course link	Resource Person	Course duration	Certificate (Y/N)
1	Basic linear algebra	Dr. I.K.Rana	8 w	-

8. Study Material Distributed among Students

GA	Notes (Hand Written)	Digital content	PPT	MCQ	Other

9. Lesson Plan

Lec No	Mod No	Planned Contents	Mapping with co's	Executed Date	Chapter No. / Page Nos./ Books/ Web Site	Recommended Prior Viewing / Reading Lecture No. (on LMS)
1	5	Quadratic forms over real field	CO3			
2	5	Reduction of quadratic form diagonal form using congruent transformation				
3	5	Rank, index, signature and value class of quadratic form				
4	5	Reduction of quadratic form to canonical form				
5	5	Singular value decomposition				
6	5	Singular value decomposition				
7	1	Line integral	CO6			
8	1	Cauchy's theorem				
9	1	Taylor's and laurent's series				
10	1	Taylor's and laurent's series				
11	1	Zeroes, singularities and residue				
12	1	Cauchy's residue theorem				
13	3	Bayes' theorem	CO4			
14	3	Discrete and random variable				
15	3	Continuous random variable				
16	3	Expectation, variance				
17	3	Poisson distribution				
18	3	Normal distribution				
19	2	Karl Pearson's coefficient of correlation	CO5			
20	2	Spearman's rank correlation				
21	2	Lines of regression				

22	2	Lines of regression				
23	2	Curve fitting				
24	2	Curve fitting				
25	6	Euler's-Lagrange equation	CO1			
26	6	Independent of a variable and another variable				
27	6	Independent of differentiation of a variable				
28	6	Isometric problems				
29	6	Several dependent variables				
30	6	Rayleigh-Ritz method				
31	4	Basics of vector	CO2			
32	4	Vector spaces over real field and it's properties				
33	4	subspaces				
34	4	Cauchy-Schwartz inequality				
35	4	Orthogonal subspaces				
36	4	Gram-Schmidt process				

10. Rubric for Grading and Marking of Term Work

Lecture + Practical (% Attendance) & Marks	Assignments	Tutorial	Lab / Practical Performance	Lab Journal Assessment	Mooc Course	Total

11. Practical/Assignment Plan

Practical/Assignment No.	Module no.	Title of experiment/assignment			Mapping with Cos

12. Beyond Syllabus Activities for Gap Mitigation

No	Type of the Activity	Activities	Details – no of attendees, guest, feedback, mark sheet,

			report

Academic Plan prepared by

Name of Faculty: Harshada Pratham
Sign:

Domain Co-ordinator	SIG Coordinator	HOD