SAVEETHA ENGINEERING COLLEGE

AUTONOMOUS

NAAC A GRADE

Affiliated to Anna University | Approved by AICTE

Autonomous Syllabus & Curriculum

OFFERED BY

Department of Mathematics

S. No	Sub. Code	Sub. Title	Departments	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA201	Calculus and Matrix Algebra	Chemical / CIVIL / MECH / CSE / IT / AGRI **(for AGRI only in 2019-20)**	BS	3	1	0	4	2-2	-
2	19MA202	Calculus and Laplace Transforms	ECE / Bio-MED / MED-ELEC/ EEE / EIE	BS	3	1	0	4	2-2	-
3	19MA208	Calculus and Matrices (Only for AGRI) **(from Acad. Year 2020-21) (Theory cum Practical)**	AGRI	BS	2	0	2	3	2-2	• **Theory C- 2** • **Practical C – 1** • No Observation • Only record
4	19MA203	Complex Variables and Differential Equations **(Theory cum Practical)**	AGRI	BS	2	0	2	3	2-2	19MA201/ 19MA208 • **Theory C- 2** • **Practical C – 1** • No Observation • Only record
5	19MA204	Complex Variables and Ordinary Differential Equations	ECE / Bio-MED / MED-ELEC	BS	3	1	0	4	2-2	19MA202
6	19MA205	Differential Equations and Laplace Transforms	Chemical / CIVIL / MECH	BS	3	1	0	4	2-2	19MA201

7	19MA206	Logic and Combinatorics	CSE / IT	BS	3	1	0	4	2-2	19MA201
8	19MA207	Numerical Methods and Partial Differential Equations	EEE / EIE	BS	3	1	0	4	2-2	19MA202
9	19MA209	Numerical Methods	Chemical	BS	3	1	0	4	2-2	19MA201
10	19MA210	Transforms and Partial Differential Equations	Bio-MED	BS	3	1	0	4	2-2	19MA202
11	19MA211	Statistics and Numerical Methods **(Theory cum Practical)**	CIVIL / MECH	BS	3	0	2	4	2-1-2	19MA201 • **Theory C- 2** • **Practical C – 1** • No Observation • Only record
12	19MA212	Algebra and Number Theory	CSE / IT	BS	3	1	0	4	2-2	19MA201
13	19MA213	Linear Algebra and Numerical Methods	ECE / MED-ELEC	BS	3	1	0	4	2-2	19MA202
14	19MA214	Series and Transforms	EEE / EIE	BS	3	1	0	4	2-2	19MA202
15	19MA215	Numerical Analysis and Laplace Transformation **(Theory cum Practical)**	AGRI	BS	2	0	2	3	2-2	19MA201/19MA208 • **Theory C- 2** • **Practical C – 1** • No Observation • Only record
16	19MA217	Random Processes and Statistics	ECE / Bio-MED / MED-ELEC	BS	3	1	0	4	2-2	19MA202

17	19MA218	Probability and Queueing Theory	CSE / IT	BS	3	1	0	4	2-2	19MA201
UG Open Electives										
18	19MA601	Resource Management Techniques	Common to All	OE	3	0	0	3	2-1	-
19	19MA602	Statistics for Engineers	Common to All	OE	3	0	0	3	2-1	-

PG PAPERS										
20	19MMA01	Applied Mathematics for Electronics Engineers	ME (AE & VLSI)	BS	3	1	0	4	2-2	-
21	19MMA02	Applied Mathematics for Communication Engineers	ME (CN)	BS	3	1	0	4	2-2	-
22	19MMA03	Applied Mathematics for Engineers	ME (CAD / CAM)	BS	3	1	0	4	2-2	-
23	19MMA04	Applied Probability and Statistics	ME (CSE & SE)	BS	3	1	0	4	2-2	-
24	19MMA06	Applied Mathematics for Electrical Engineers	ME (EST)	BS	3	1	0	4	2-2	-
25	19MMA05	Linear Algebra and Number Theory	ME (CSE)	OE	3	1	0	4	2-2	-

PROGRAM OUTCOMES (POs)

1) **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2) **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3) **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4) **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5) **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6) **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7) **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9) **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11) **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12) **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Updated Program Specific Outcomes (PSOs) of All Departments (as on Jan 2020)

1	ECE	1) Design and develop electronic circuits, equipment and systems 2) Apply hardware and software programming skills for implementing Electronics and Communication Systems 3) Provide real time solutions using existing and emerging technologies in the field of Electronics and Communication Engineering
2	BIO MED	1) Design and Develop diagnostic and therapeutic devices. 2) Develop and implement Computation Program for solving healthcare related problems. 3) Develop a Prosthetic device.
3	MED ELEC	1) To design and develop Medical devices by relating Medical science and Evolving Engineering. 2) To apply Interdisciplinary Approaches for Healthcare Solutions.
4	CSE	1) Design and Compute computer programs using appropriate algorithm, programming language and principles of mathematics. 2) Apply standard engineering and management practices in computer based systems to provide solutions to complex engineering problems. 3) Create innovative solutions for web and mobile based applications using recent technologies.
5	IT	1) Acquire knowledge to analyze, design and implement IT solutions to real-time Challenges using current technologies. 2) Apply computational IT skills in Real world environment to enhance entrepreneurship and employability requirements.
6	MECH	1) To develop product/process design for mechanical systems. 2) To evaluate the mass and energy flow in thermal systems. 3) To select suitable manufacturing process to meet industrial requirements.

7	CIVIL	1) To Plan, Analyse and Design Civil Structures. 2) To Execute Civil Engineering Projects by taking into account the economical, environmental, societal, health and safety factors involved in infrastructural development
8	AGRI	1) To develop expertise in design and engineering problem solving approach in agriculture with proper training and knowledge 2) To enhance students ability to formulate solutions to real-world problems pertaining to sustained agricultural productivity using modern technologies and management of agricultural products through value-addition and preservation 3) To inculcate entrepreneurial skills through strong Industry-Institution linkage
9	EEE	1) Employ fundamental knowledge of electrical and electronics engineering to formulate, analyse and design smart and sustainable electrical systems. 2) Demonstrate proficiency in use of modern software tools to analyse, simulate and design electrical and electronics systems.
10	EIE	1) Acquire technical skills to solve problems and challenges in the field of instrumentation with robust control tools. 2) Apply the concepts of measurement and control techniques to setup and monitor instruments in process industries.
11	CHEM	1) Analyze process calculations, material & energy balances, thermodynamics, unit operations & process control and evaluate chemical reaction engineering and transport processes. 2) Analyze process economics, project engineering safety and environment aspects and sustainable development to work in traditional and emerging chemical engineering areas. 3) Design equipment for chemical processing and analyze innovative chemical processes.

Department of Agricultural Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA201*	Calculus and Matrix Algebra **Only in 2019-2020)**	BS	3	1	0	4	2-2	-
2	19MA208*	Calculus and Matrices **(from Acad. Year 2020)**	BS	2	0	2	3	2-2	-
3	19MA203*	Complex Variables and Differential Equations	BS	2	0	2	3	2-2	19MA201/ 19MA208
4	19MA215	Numerical Analysis and Laplace Transformation	BS	2	0	2	3	2-2	19MA201/ 19MA208

Note:

*Exempted for Lateral Entry Students

All papers are Lab cum Theory

No Observation; Only Record for Practical

Theory Credit – 2; Lab Credit – 1

19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

(COMMON TO AGRI, CHEMICAL, CIVIL, CSE, IT & MECH)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Prerequisite: NIL

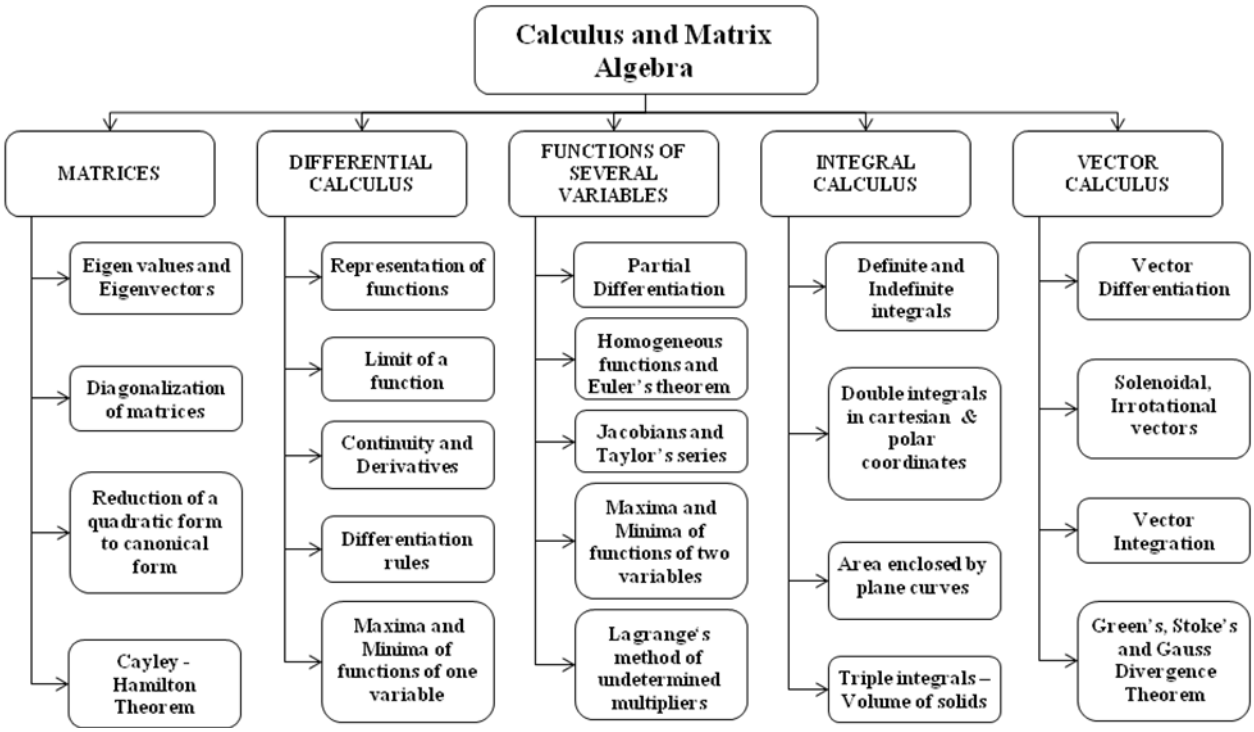
Course Outcomes: At the end of the course learners will be able to:

CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** line and surface integrals in vector fields.	**Evaluate**

Mapping with PO and PSOs

AGRI															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	2	2	1
CO2	3	2	2	1	-	-	-	-	-	-	-	1	2	1	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1	-
CO4	3	3	1	-	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	2	1	-	-	-	-	-	-	-	-	1	-	2

Concept Map:



19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.		
UNIT V	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2) James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
3) Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015

REFERENCES :

1) Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2) Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3) Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4) Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5) Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, NewDelhi, 5th edition, 2013.

Course Designers:

1 Ms. N. Jegajothi jegajothi@saveetha.ac.in

2 Ms. P. S. Narmathadevi narmathadevi@saveetha.ac.in

19MA208	Calculus and Matrices (Theory 2C and Lab 1C)	L T P C 2 0 2 3

(ONLY TO AGRI from Academic Year 2020-21 instead of 19MA201)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Prerequisite: NIL

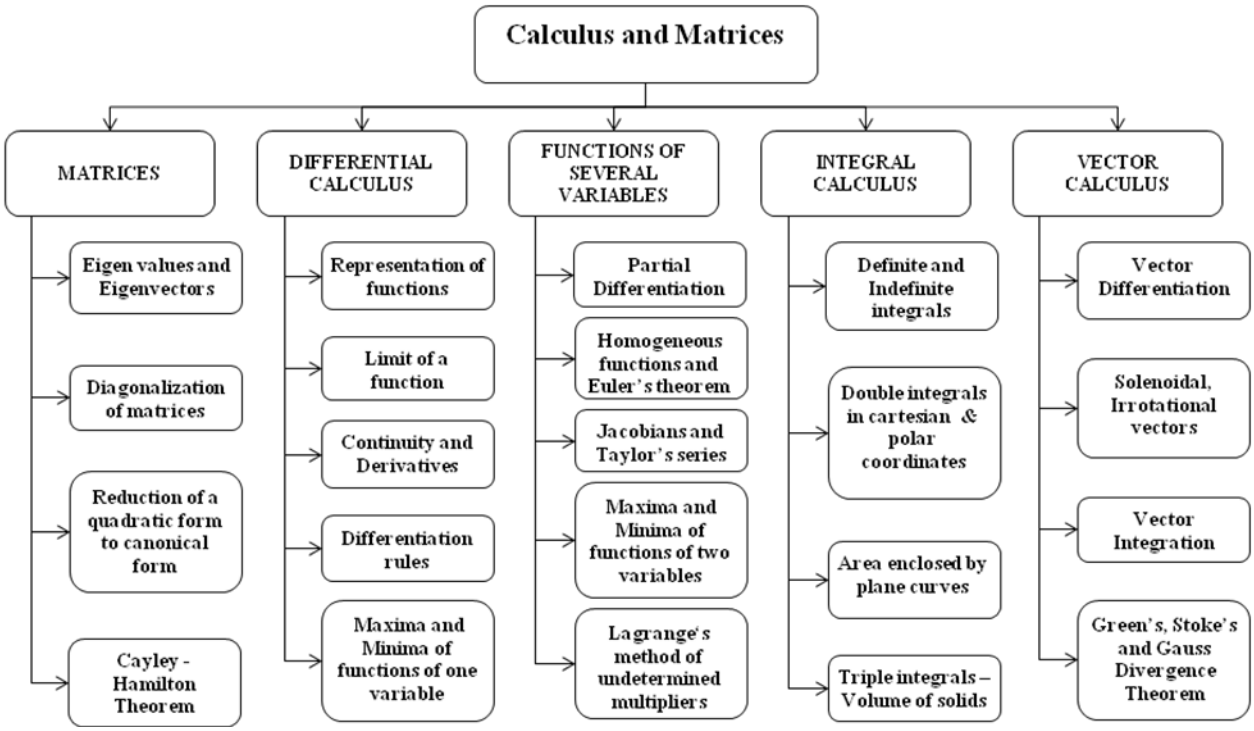
Course Outcomes: At the end of the course learners will be able to:

CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** line and surface integrals in vector fields.	**Evaluate**

Mapping with PO and PSOs

AGRI															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	2	2	1
CO2	3	2	2	1	-	-	-	-	-	-	-	1	2	1	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1	-
CO4	3	3	1	-	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	2	1	-	-	-	-	-	-	-	-	1	-	2

Concept Map:



19MA208	Calculus and Matrices	L T P C 2 0 2 3

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.		
UNIT V	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2) James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
3) Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015

REFERENCES :

1) Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2) Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3) Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4) Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5) Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, NewDelhi, 5th edition, 2013.

Course Designers:

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2 Ms. P. S. Narmathadevi narmathadevi@saveetha.ac.in

19MA203	Complex Variables and Differential Equations (Theory 2C and Lab 1C)	L	T	P	C
		2	0	2	3

(ONLY FOR AGRI)

Preamble:

This course is designed to cover the topics such as complex variables, Fourier series and Differential equations. Fourier series are widely used in signal analysis and the syllabus includes various techniques to solve ordinary and partial differential equations which are essential to handle practical problems arising in the field of engineering.

Prerequisite :

19MA201 - Calculus and Matrix Algebra (2019-2020) (OR)

19MA208 - Calculus and Matrices (2020-2021)

Course Outcomes: At the end of the course learners will be able to

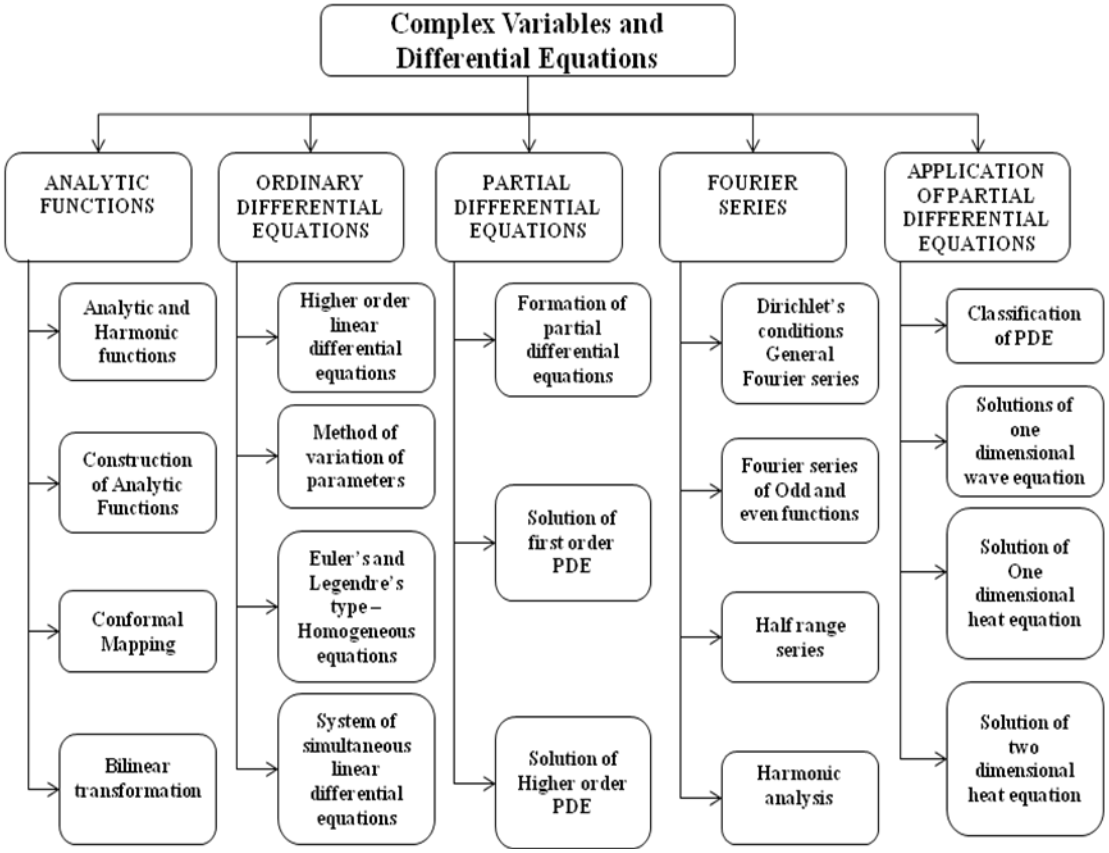
CO1	**Analyze** the suitable techniques for solving second and higher order differential equations	**Analyze**
CO2	**Evaluate** differential equations using Bessel's and Legendre and to construct analytic functions	**Evaluate**
CO3	**Evaluate** Fourier Series for standard periodic waveforms	**Evaluate**
CO4	**Apply** suitable concepts in solving first and higher order partial differential equations with constant coefficients.	**Apply**
CO5	**Analyze** and obtain the solutions of wave and heat equations using Fourier series.	**Analyze**

Mapping with PO and PSOs

AGRI															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2	2	-	-	-	-	-	-	-	1	1	2	1
CO2	2	3	2	2	-	-	-	-	-	-	-	1	1	2	-
CO3	3	3	2	2	-	-	1	-	-	-	-	1	2	3	1
CO4	2	2	2	3	-	-	1	-	-	-	-	1	2	3	1
CO5	3	3	2	2	-	-	1	-	-	-	-	1	2	3	1

3 – Strong; 2– Medium; 1-Low

Concept Map:



19MA203	Complex Variables and Differential Equations (Theory 2C and Lab 1C)	L T P C 2 0 2 3

SYLLABUS

UNIT I	ANALYTIC FUNCTIONS	12
Functions of a complex variable - Limit-continuity and analytic functions-Cauchy-Riemann equations-Harmonic functions – Construction of analytic function by Milne Thomson method.		
UNIT II	**ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Exact and Bernoulli's differential equations – equations reducible to exact form by integrating factors-equations of first order and higher degree-Clairaut's equation-Differential equations of higher orders-method of finding complementary functions and particular integrals-method of variations of parameters-Cauchy and Legendre's linear equations-Simultaneous linear differential equations with constant coefficients- Series solution techniques – Bessel's and Legendre's differential equations		
UNIT III	**FOURIER SERIES**	**12**
Periodic functions-Fourier series-Euler's formulae- Dirichlet's conditions-Functions having arbitrary period –Fourier series for function having period 2L - Even and odd functions – Half-range series-Fourier Sine and Cosine series - Harmonic analysis.		
UNIT IV	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations using elimination of arbitrary constants and arbitrary functions – Higher order linear partial differential equations with constant coefficients – Solution of non-linear partial differential equations – Charpit's method.		
UNIT V	**APPLICATION OF PDE**	**12**
Classification of PDE – Solutions on one dimensional wave equation – One dimensional heat flow equations –Steady state solution of two dimensional heat flow equations - Laplace Equation (excluding insulated edges)		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Grewal B.S 2004, "Higher Engineering Mathematics , Khanna Publishers, New Delhi 43rd Edition,2014.
2) Ramana B.V2008, "Engineering Mathematics" , Tata McGraw Hill, New Delhi.

REFERENCES :

1) Bali N ,Goyal M and Watkins C, "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt Ltd) New Delhi , 7th Edition 2009.
2) Bali N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Lakshmi Publications Pvt Ltd, New Delhi 2014.
3) Shanti Narayan, 2004 "A Textbook of Matrices.,S.Chand and Co. Ltd., New Delhi.
4) Veerarajan T., "Transforms and Partial differential equations", Second reprint, Tata McGraw Hill Education Pvt Ltd, New Delhi 2012.

Course Designers:

1) Ms. H.Mary Henrietta maryhenrietta@saveetha.ac.in
2) Ms. K.Ashwini ashwini.k@saveetha.ac.in

19MA215	Numerical Analysis and Laplace Transformation (Theory 2C and Lab 1C)	L T P C 2 0 2 3

(ONLY FOR AGRI)

Preamble:

The course is designed to acquaint the students about the various techniques of numerical analysis such as solution of linear system of equations, interpolation and approximation, numerical differentiation and integration, numerical solution of differential equations. The syllabus also includes Laplace transforms in which various methods can be applied to transform the time domain circuits into frequency domain to simplify the solution of differential equations. It helps to understand the concept of testing the hypothesis in small and large samples in real life problems in addition to correlation and regression between random variables.

Prerequisite:

19MA201 - Calculus and Matrix Algebra (OR)

19MA208 – Calculus and Matrices

Course Outcomes: At the end of the course learners will be able to

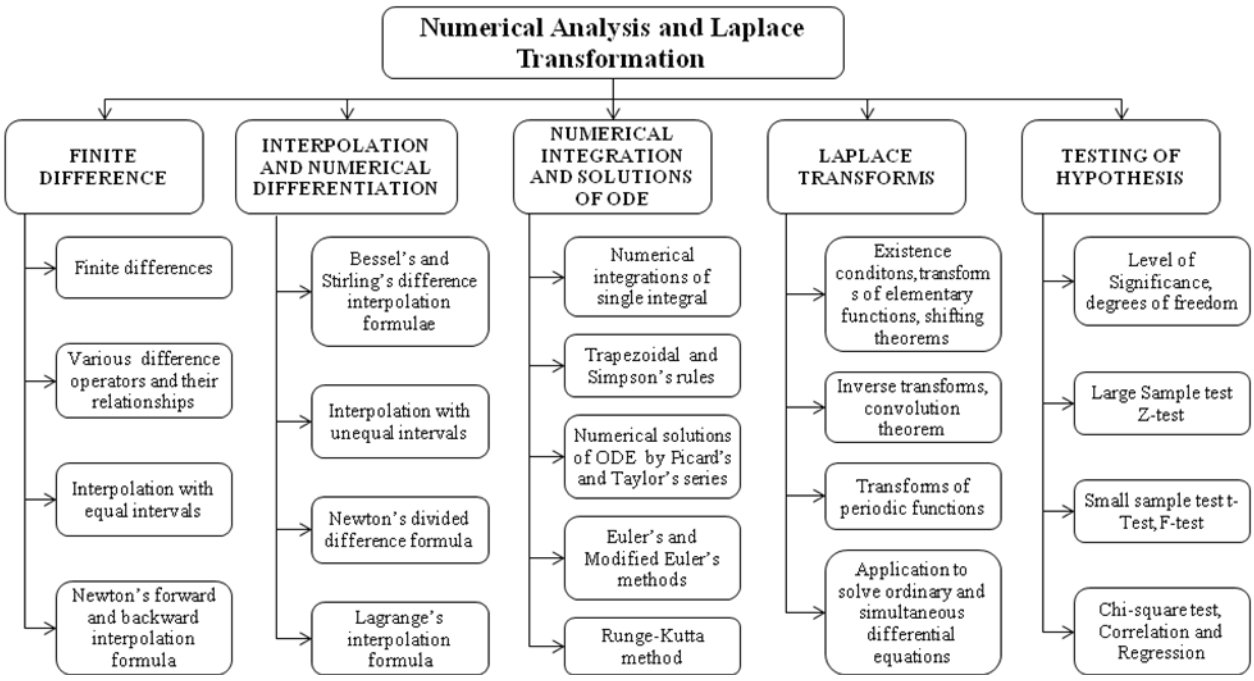
CO1	**Analyzing** the finite differences using Newton's forward and backward interpolation	**Analyze**
CO2	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values.	**Apply**
CO3	**Applying** Simpson's and Trapezoidal rule in solving numerical integration	**Apply**
CO4	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**
CO5	**Understand** the various applications of t and F distributions in statistics and correlation and between random variables	**Understand**

Mapping with PO and PSOs

AGRI															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2	2	-	-	-	-	-	-	-	1	1	2	1
CO2	2	3	2	2	-	-	-	-	-	-	-	1	1	2	-
CO3	3	3	2	2	-	-	1	-	-	-	-	1	2	3	1
CO4	2	2	2	3	-	-	1	-	-	-	-	1	2	3	1
CO5	3	3	2	2	-	-	1	-	-	-	-	1	2	3	1

3 – Strong; 2– Medium; 1-Low

Concept Map



19MA215	Numerical Analysis and Laplace Transformation (Theory 2C and Lab 1C)	L T P C 2 0 2 3

(SYLLABUS)

UNIT I	FINITE DIFFERENCE	12
Finite difference-various difference operators and their relationships-interpolation with equal intervals-Newton's forward and backward interpolation formula. Numerical differentiations using Newton's forward and backward interpolation.		
UNIT II	**INTERPOLATION AND NUMERICAL DIFFERENTIATION**	**12**
Bessel's and Stirling's difference interpolation formulae-Interpolation with unequal intervals-Newton's divided difference formula - Lagrange's interpolation formula.		
UNIT III	**NUMERICAL INTEGRATION AND SOLUTIONS OF ODE**	**12**
Numerical integrations of single integrals using Trapezoidal and Simpson's rules-Numerical solutions of ordinary differential equations by Picard's and Taylor's series-Euler's and Modified Euler's methods-Runge-Kutta method		
UNIT IV	**LAPLACE TRANSFORMS**	**12**
Existence conditions-Transforms of elementary functions-basic properties-shifting theorems-Inverse transforms-Convolution theorem-Transform of periodic functions-Application to solution of linear second order ordinary and simultaneous differential equations		
UNIT V	**TESTING OF HYPOTHESIS**	**12**
Level of significance-Degrees of freedom-Statistical errors-Large sample test(Z-test) – Small sample test t-test (One-tailed, two-tailed and Paired tests) – Testing of significance through variance (F-test)-Chi-square test – contingency table-Correlation, Regression		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S and Grewal J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi 2015.
2) NageswaraRaoG.,Statistics for Agricultural Sciences, BS Publications.

REFERENCES :

1) Gerald C.F and Wheatley P.O., "Applied Numerical Analysis", Pearson Education, Asia 6th Edition, New Delhi 2006.
2) SankaraRao K "Numerical methods for Scientists and Engineers" , Prentice Hall of India Private Ltd, 3rd Edition, New Delhi 2007.
3) Rangaswamy R., "A textbook of Agricultural Statistics", New Age Int. Publications Ltd.
4) Agarwal B.L., "Basic Statistics", Wiley Eastern Ltd, New Age International Ltd.

Course Designers:

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2) Ms. K.Ashwini ashwini.k@saveetha.ac.in

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AUTONOMOUS
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NAAC A GRADE

Department of Biomedical Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA202	Calculus and Laplace Transforms*	BS	3	1	0	4	2-2	-
2	19MA204	Complex Variables and Ordinary Differential Equations*	BS	3	1	0	4	2-2	19MA202
3	19MA210	Transforms and Partial Differential Equations	BS	3	1	0	4	2-2	19MA202
4	19MA217	Random Processes and Statistics	BS	3	1	0	4	2-2	19MA202

Note:

*Exempted for Lateral Entry Students

19MA202	Calculus and Laplace Transforms	L T P C
		3 1 0 4

(COMMON TO BIO MED, ECE, EEE, EIE & MED ELEC)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines. The syllabus also includes Laplace transforms in which various methods can be used to transform the time domain circuits to frequency domain to simplify the solution of differential equations.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

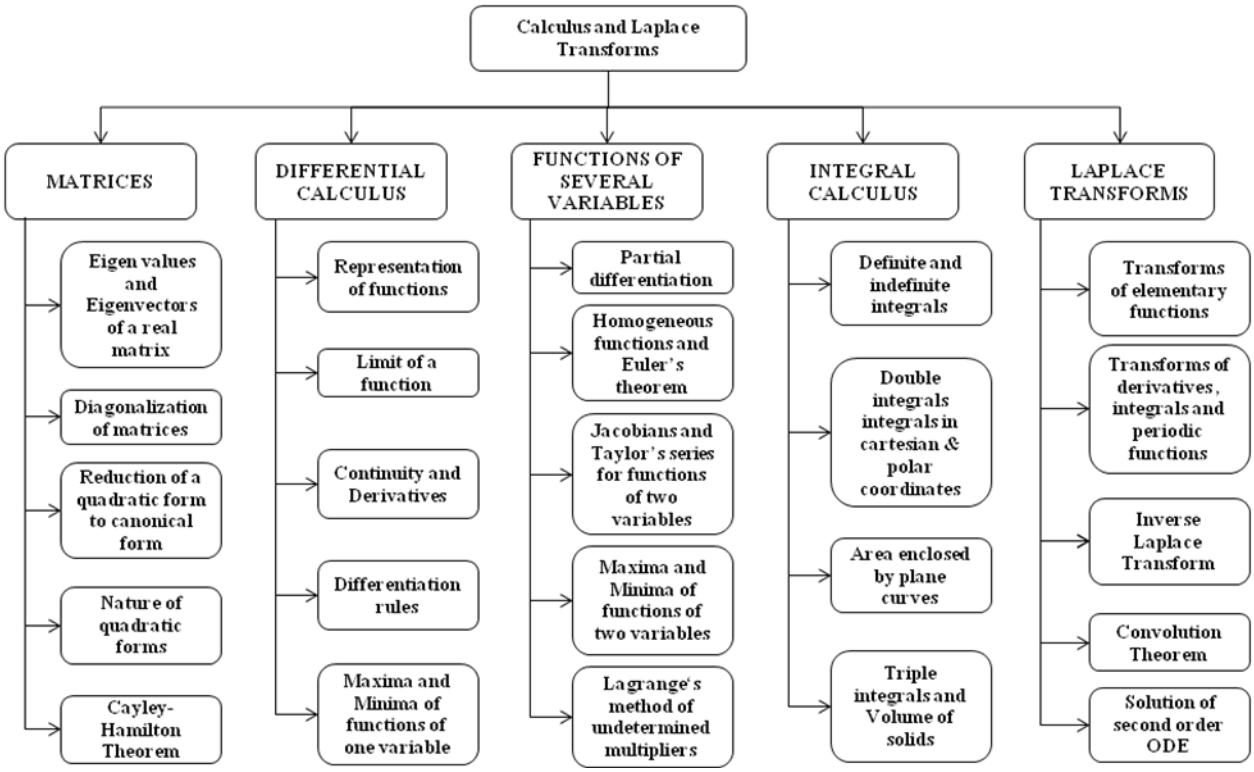
CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**

Mapping with PO and PSOs

BIO MED															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	-	-	-	-	-	-	-	1	3	2	2
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1	-
CO4	3	3	2	1	-	-	-	-	-	-	-	1	3	-	2
CO5	2	3	2	1	-	-	-	-	-	-	-	-	3	1	3

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA202	Calculus and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules -Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solid		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1. Grewal B.S., ―Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015.
3. Sanjay Mishra, Fundamentals of Mathematics Differential Calculus, Pearson Education India, June 2016.

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3. Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4. Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5. Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, 5th edition, 2013.

Course Designers:

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19MA204	Complex Variables and Ordinary Differential Equations	L T P C
		3 1 0 4

(COMMON TO ECE , BME & MED ELEC)

Preamble:

This course is designed to cover topics such as Vector Calculus, Complex Analysis, Sequences and series. Vector calculus and differential equations can be widely used for modeling the various laws of physics. The syllabus includes concepts of analytic functions which are applied to evaluate Contour Integrals.

Prerequisite:

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

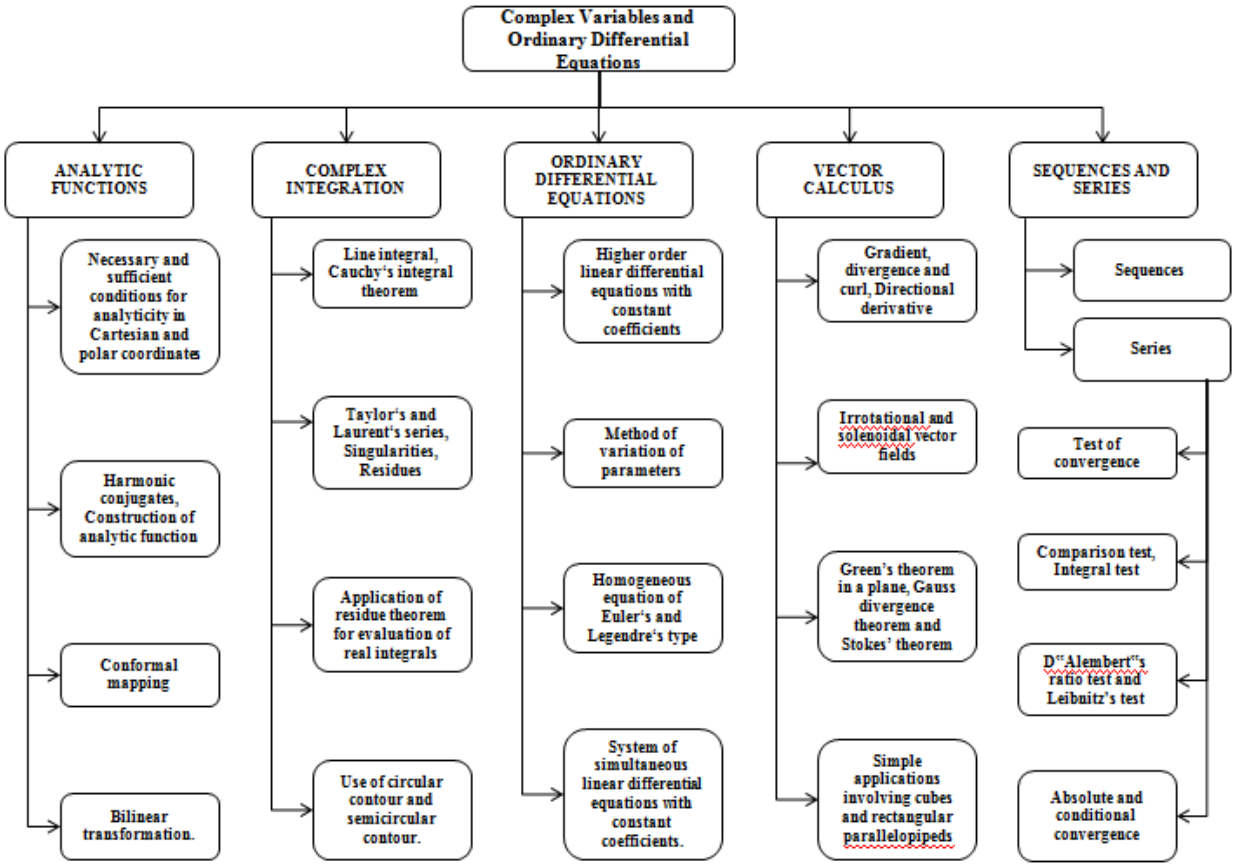
CO1	**Identify** and construct analytic functions and conformal mapping.	**Apply**
CO2	Understand the fundamental concepts of complex analysis and **apply** them to evaluate contour integrals.	**Apply**
CO3	**Analyze** various techniques in solving ordinary differential equations.	**Analyze**
CO4	**Determine** the vector differentiation and vector integration.	**Evaluate**
CO5	**Test** the convergence of infinite series and evaluate the limits.	**Evaluate**

Mapping with PO and PSOs

BIO MED															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	2	2
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	1	2
CO4	3	3	1	1	-	-	-	-	-	-	-	-	2	-	1
CO5	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA204	Complex Variables and Ordinary Differential Equations	L T P C 3 1 0 4

SYLLABUS

UNIT I	ANALYTIC FUNCTIONS	12
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – $w = z + c, cz, \frac{1}{z}, z^2$, Bilinear transformation.		
UNIT II	**COMPLEX INTEGRATION**	**12**
Line integral - Cauchy‘s integral theorem – Cauchy‘s integral formula – Taylor‘s and Laurent‘s series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.		
UNIT III	**ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler‘s and Legendre‘s type – System of simultaneous linear differential equations with constant coefficients.		
UNIT IV	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.		
UNIT V	**SEQUENCES AND SERIES**	**12**
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D’Alembert’s ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, Nineth Edition, Laxmi Publications Pvt Ltd., 201
2) Grewal. B.S, “Higher Engineering Mathematics”, 43rd Edition, Khanna Publications, Delhi, 2014.

REFERENCES :

1) Dass, H.K., and Er. Rajnish Verma,” Higher Engineering Mathematics”, S. Chand Private Ltd., 2011
2) Peter V. O‟Neil,” Advanced Engineering Mathematics”, 7th Edition, Cengage learning, 2012.
3) Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi,1st Edition ,2017.
4) Sivarama Krishna Das P. and C.Vijayakumari, “Engineering Mathematics” , First Edition, Pearson Publishing 2017

Course Designers:

1. Dr.Kalyanasundaram.M kalyanasundaram@saveetha.ac.in
2. Ms.M.Gayathrilakshmi gayathrilakshmi@saveetha.ac.in

19MA210	Transforms and Partial Differential Equations	L T P C
		3 1 0 4

(ONLY FOR BIO MED)

Preamble :

The aim of this course is to develop an understanding of Fourier series analysis which is central to many applications in engineering. The syllabus is designed to study and understand the behavior of transforms such as Fourier Transform and Z Transform which are widely used in Signal Processing. The course provides effective mathematical tools for the solution of partial differential equations that model several physical processes.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

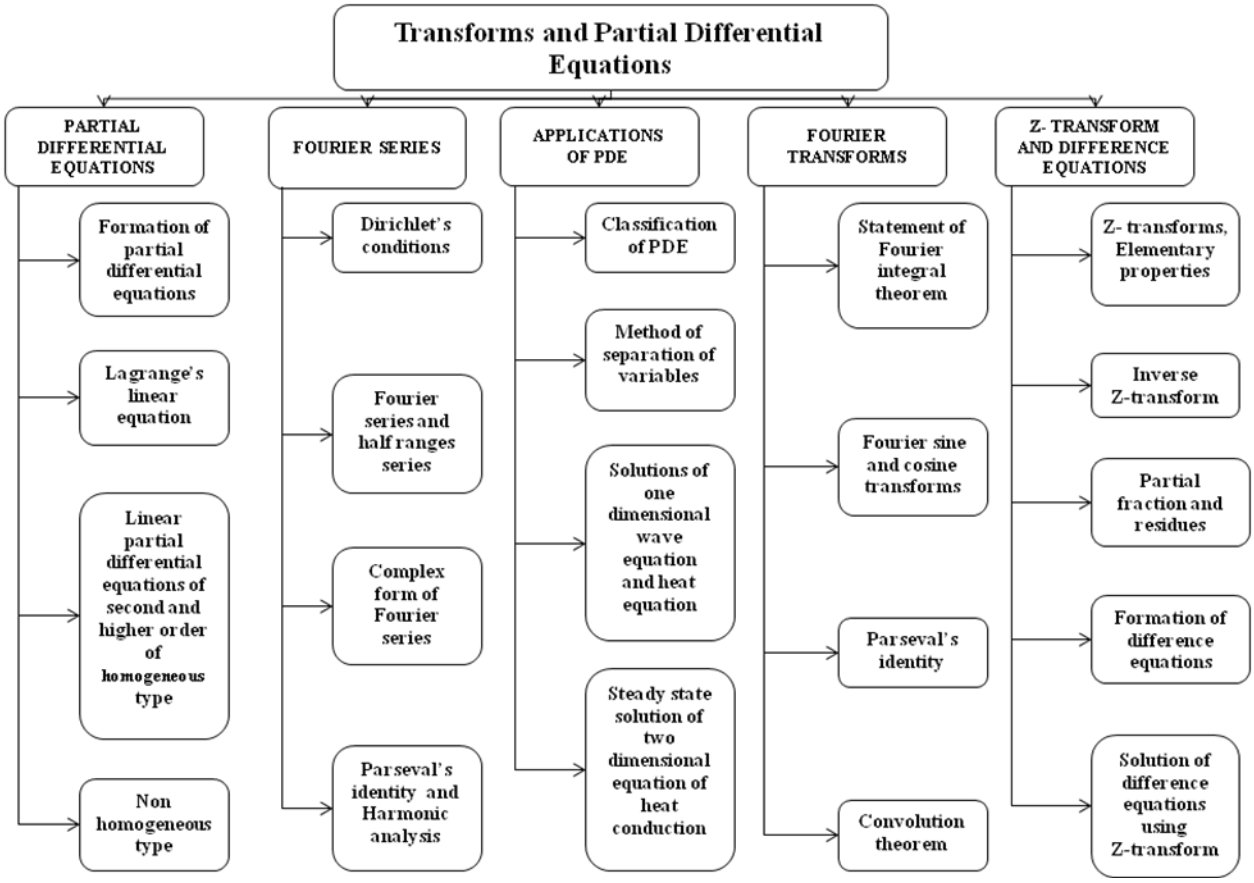
Course Outcomes: At the end of the course learners will be able to:

CO1	**Apply** suitable concepts in solving first order and higher order partial differential equations with constant coefficients.	**Apply**
CO2	**Evaluate** the Fourier series for standard periodic waveforms.	**Evaluate**
CO3	**Evaluate** the solutions of wave and heat equations using Fourier series.	**Evaluate**
CO4	**Understand** the properties and techniques of Fourier transforms.	**Understand**
CO5	Find Z transform of elementary functions and **apply** the necessary Z transform techniques to solve the difference equations.	**Apply**

Mapping with PO and PSOs

BIO MED															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	-	-	-	-	-	-	-	-	-	2	3	2
CO2	3	2	2	-	1	-	-	-	-	-	-	-	2	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	1	2	3	2
CO4	3	2	2	-	1	-	-	-	-	-	-	-	3	1	2
CO5	3	2	3	2	-	-	-	-	-	-	-	1	3	1	2

Concept Map:



19MA210	Transforms and Partial Differential Equations	L T P C 3 1 0 4

SYLLABUS

UNIT I	PARTIAL DIFFERENTIAL EQUATIONS	12
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations – Lagrange's linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types		
UNIT II	**FOURIER SERIES**	**12**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis		
UNIT III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).		
UNIT IV	**FOURIER TRANSFORMS**	**12**
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity		
UNIT V	**Z TRANSFORMS AND DIFFERENCE EQUATIONS**	**12**
Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z – transform		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
2) Grewal. B.S., "Higher Engineering Mathematics", 43nd Edition, Khanna Publishers, Delhi, 2014.
3) Narayanan.S., ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol.II&volIII, S.Viswanathan Publishers Pvt Ltd 2014

REFERENCES :

1) Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications PvtLtd , 2007.
2) Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2008.
3) Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4) Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
5) Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Sixth Edition, Tata McGraw Hill Education Pvt Ltd, New Delhi, 2012

Course Designers:

1. Dr.Kalyanasundaram.M kalyanasundaram@saveetha.ac.in
2. Ms.M.Gayathrilakshmi gayathrilakshmi@saveetha.ac.in

19MA217	Random Processes and Statistics	L T P C
		3 1 0 4

(COMMON TO ECE, BIO-MED & MED-ELEC)

Preamble :

This course is designed to cover the concepts of probability distributions, random processes and spectral densities for applications such as random signals, digital signal processing etc in communication engineering. The syllabus also covers the techniques of hypothesis testing for small and large samples which plays an important role in real life problems.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

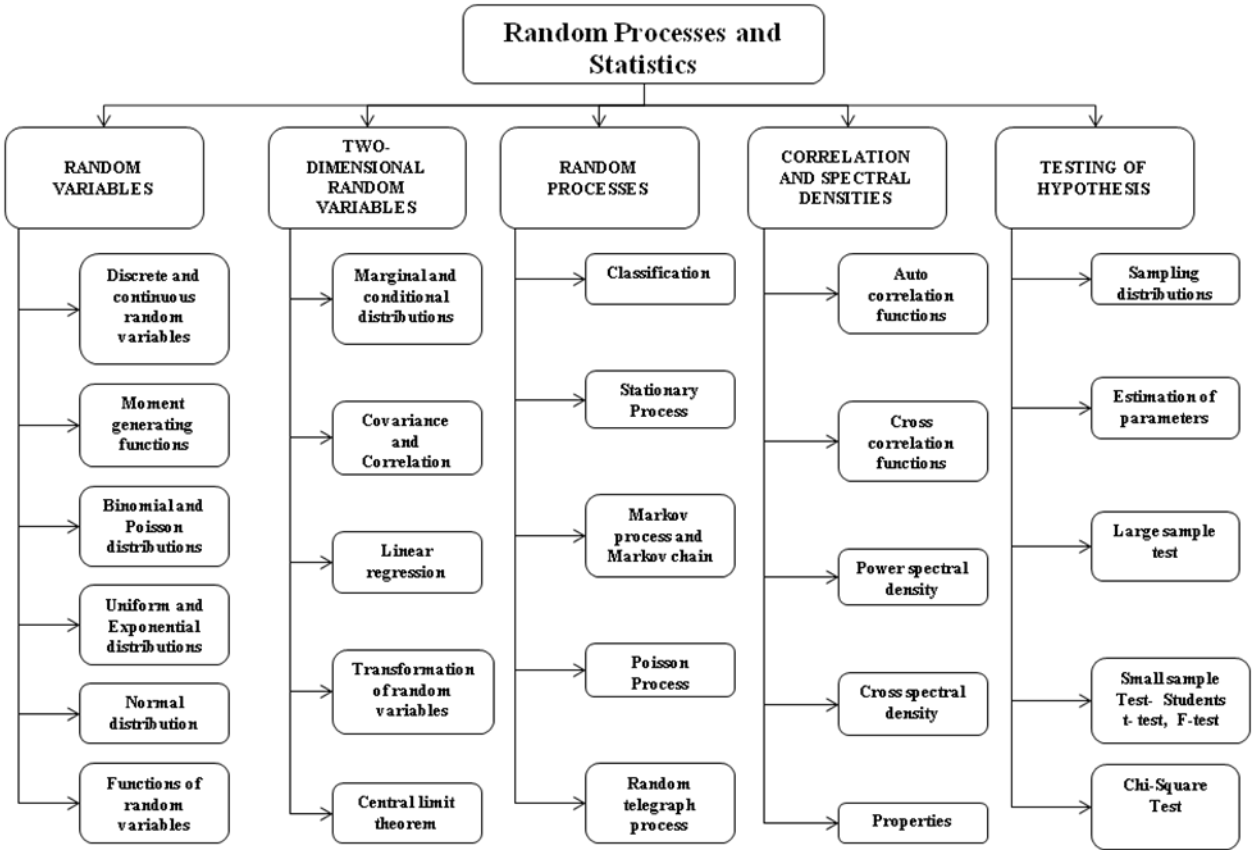
CO1	**Understand** the fundamental concepts of probability and acquire knowledge of standard distributions which can describe real life phenomena.	**Understand**
CO2	**Identify** various distribution functions and acquire skills in handling situations involving more than one variable.	**Apply**
CO3	**Analyze** the various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	**Analyze**
CO4	**Evaluate** functional relationship between random inputs and outputs with the use of Random Process Techniques.	**Evaluate**
CO5	**Apply** the concept of testing of hypothesis for small and large samples in real life problems**.**	**Apply**

Mapping with PO and PSOs

BIO MED															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	3	2	2
CO3	3	2	-	-	-	-	-	-	-	-	-	1	3	2	2
CO4	3	3	2	1	-	-	-	-	-	-	-	1	3	1	2
CO5	3	2	1	1	2	1	-	-	-	-	-	2	3	1	2

3 – Strong; 2– Medium; 1-Low

Concept Map:



19MA217	Random Processes and Statistics	L T P C 3 1 0 4

SYLLABUS

UNIT I	RANDOM VARIABLES	12
Random variables - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions- Functions of random variables.		
UNIT II	**TWO - DIMENSIONAL RANDOM VARIABLES**	**12**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).		
UNIT III	**RANDOM PROCESSES**	**12**
Classification – Stationary process – Markov process - Markov chain - Poisson process – Random telegraph process.		
UNIT IV	**CORRELATION AND SPECTRAL DENSITIES**	**12**
Auto correlation functions – Cross correlation functions – Properties – Power spectral density –Cross spectral density – Properties.		
UNIT V	**TESTING OF HYPOTHESIS**	**12**
Sampling distributions – Estimation of parameters – Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t and F distributions for testing means, variances and proportion – Chi-square test- Contingency table (Test for Independency)		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.
2. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8 th Edition, 2015.

REFERENCES :

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
2. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata Mc Graw Hill Edition, New Delhi, 9th Reprint, 2010.
4. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8 th Edition, 2007.

Course Designers:

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2. Ms. V. Kavitha kavithav@saveetha.ac.in

SAVEETHA ENGINEERING COLLEGE
AUTONOMOUS
Affiliated to Anna University | Approved by AICTE
NAAC A GRADE

Department of Civil Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA201	Calculus and Matrix Algebra*	BS	3	1	0	4	2-2	-
2	19MA205	Differential Equations and Laplace Transforms*	BS	3	1	0	4	2-2	19MA201
3	19MA211	Statistics and Numerical Methods	BS	3	0	2	4	2-1-2	19MA201 • **Theory C- 2** • **Practical C – 1** • No Observation • Only record

Note:

*Exempted for Lateral Entry Students

19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

(COMMON TO AGRI, CHEMICAL, CIVIL, CSE, IT & MECH)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Prerequisite: NIL

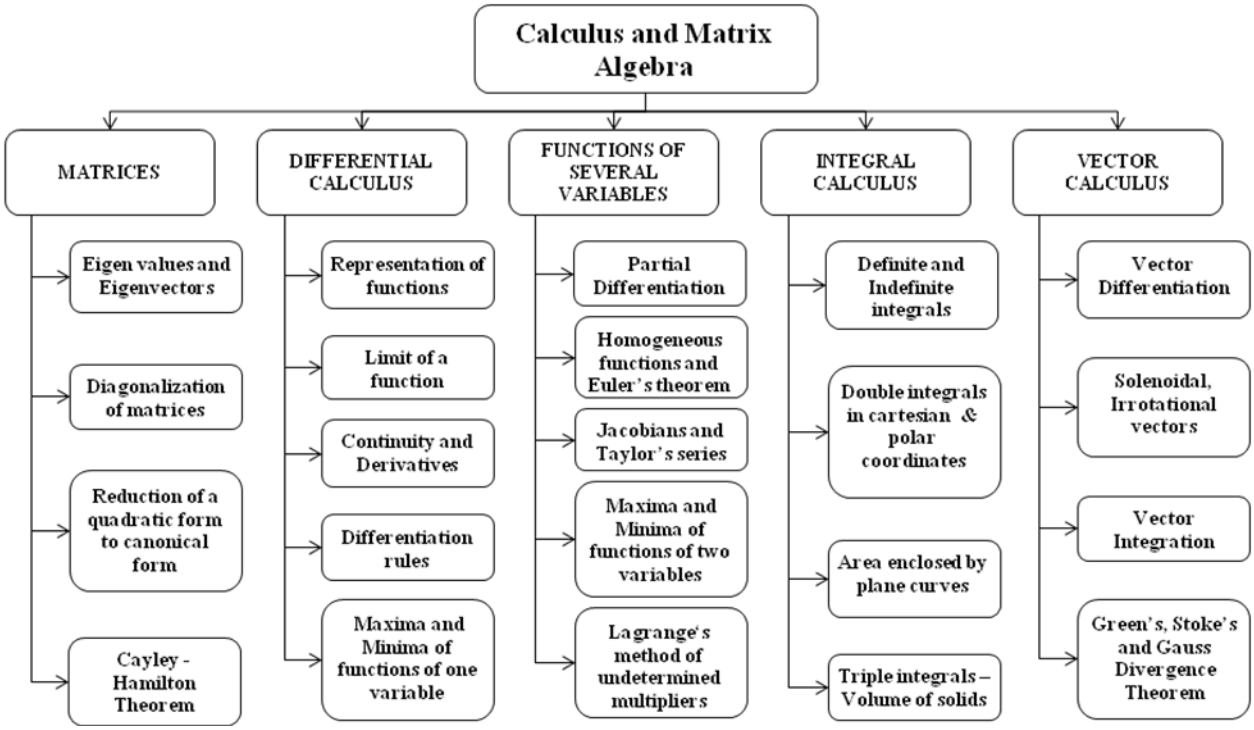
Course Outcomes: At the end of the course learners will be able to:

CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** line and surface integrals in vector fields.	**Evaluate**

Mapping with PO and PSOs

CIVIL														
Course Outcomes	Program Outcomes												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	-	-	1	2	2
CO2	3	2	2	1	-	-	-	-	-	-	-	1	3	2
CO3	3	2	2	-	-	-	-	-	-	-	-	1	3	1
CO4	3	3	1	-	-	-	-	-	-	-	-	-	2	3
CO5	3	2	2	1	-	-	-	-	-	-	-	-	3	2

Concept Map:



19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.		
UNIT V	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2) James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
3) Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015

REFERENCES :

1) Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2) Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3) Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4) Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5) Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, NewDelhi, 5th edition, 2013.

Course Designers:

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19MA205	Differential Equations and Laplace Transforms	L T P C 3 1 0 4

(COMMON TO CHEMICAL, CIVIL & MECHANICAL)

Preamble :

This course is designed to cover topics such as Fourier series, Differential equations and Laplace Transforms. The syllabus includes various techniques to solve differential equations which are essential to handle practical problems arising in the field of engineering. Fourier series are widely used in signal analysis to find strength and vibrations of buildings. The course includes Laplace transforms in which various methods can be used to transform the time domain functions to frequency domain.

Prerequisite:

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

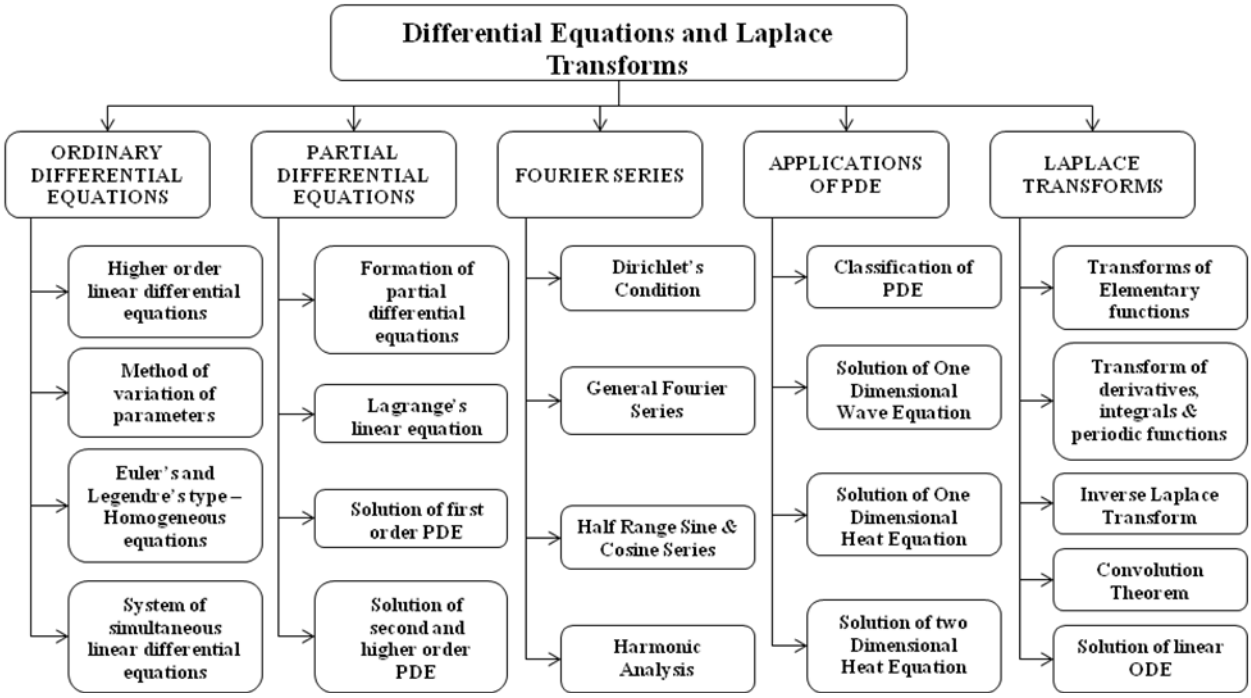
CO1	**Analyze** the suitable techniques for solving second and higher order differential equations.	**Analyze**
CO2	**Apply** suitable concepts in solving first order and higher order partial differential equations with constant coefficients.	**Apply**
CO3	**Evaluate** the Fourier series for standard periodic waveforms.	**Evaluate**
CO4	**Apply** the Fourier series techniques to solve wave and heat equations.	**Apply**
CO5	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**

Mapping with PO and PSOs

CIVIL														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	2	1	-	-	-	-	-	-	-	1	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	1	2	1
CO3	3	2	3	1	-	-	-	-	-	-	-	-	2	1
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	2
CO5	3	3	2	1	-	-	-	-	-	-	-	-	2	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA205	Differential Equations and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	ORDINARY DIFFERENTIAL EQUATIONS	12
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients		
UNIT II	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations – Lagrange's linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and Non-homogeneous types.		
UNIT III	**FOURIER SERIES**	**12**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series-Harmonic Analysis.		
UNIT IV	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Basic properties –Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms –Transform of periodic functions – Convolution Theorem - Application to solution of linear second order ordinary differential equations with constant coefficients.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2) Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1) Bali N., Goyal M. and Watkins C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2) Jain R.K. and Iyengar S.R.K., ― Advanced Engineering Mathematics ‖, Narosa Publications, New Delhi , 3rd Edition, 2007.
3) O'Neil, P.V. ―Advanced Engineering Mathematics‖, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4) Sastry, S.S, ―Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5) Wylie, R.C. and Barrett, L.C., ―Advanced Engineering Mathematics ―Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

Course Designers:

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2. Ms. P. S. Narmathadevi narmathadevi@saveetha.ac.in

19MA211	Statistics and Numerical Methods	L T P C
		3 0 2 4

(COMMON TO CIVIL & MECHANICAL)

Preamble:

The goal of the course is to provide a sound knowledge in testing of hypothesis for small and large samples which plays an important role in real time engineering problems. The syllabus deals with the basic concepts of design of experiments which are essential in the field of agriculture and statistical quality control. This course aims to impart knowledge in Numerical methods for solution of system of equations, interpolation, differentiation and integration. The syllabus also provides the solution for some of these methods using PYTHON techniques.

Prerequisite:

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

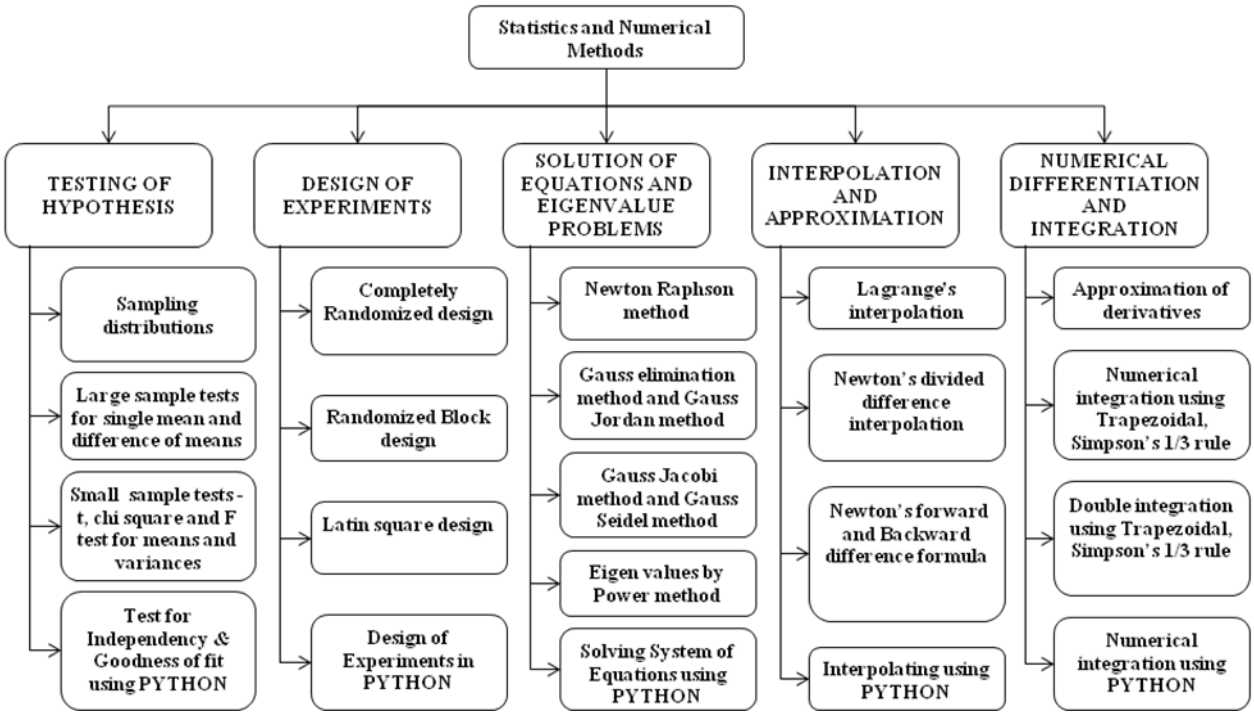
CO1	**Apply** the concept of testing of hypothesis for small and large samples in real life problems**.**	**Apply**
CO2	**Apply** the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.	**Apply**
CO3	**Obtain** solutions of algebraic and transcendental equations and solve linear system of equations using suitable numerical methods.	**Understand**
CO4	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values.	**Apply**
CO5	**Evaluate** derivatives and integrals using Numerical techniques.	**Evaluate**

Mapping with PO and PSOs

CIVIL														
Course Outcomes	Program Outcomes												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	-	-	-	-	-	-	1	3	3
CO2	3	3	2	1	-	-	-	-	-	-	-	1	3	3
CO3	3	3	2	-	-	-	-	-	-	-	-	1	3	2
CO4	3	3	3	1	-	-	-	-	-	-	-	1	3	2
CO5	3	2	1	1	-	-	-	-	-	-	-	-	3	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA211	Statistics and Numerical Methods	L T P C 3 0 2 4

SYLLABUS

UNIT I	TESTING OF HYPOTHESIS	12
Sampling distributions – Estimation of parameters – Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, chi square and F distributions for testing means, variance - Contingency table (Test for Independency)-Goodness of fit. **Testing of small samples (t, F and chi square) using Python.**		
UNIT II	**DESIGN OF EXPERIMENTS**	**12**
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design – **One way and two way classifications using Python.**		
UNIT III	**SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**	**12**
Solution of algebraic and transcendental equations – Newton Raphson method. Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method. **Newton Raphson and Gauss Seidal method using Python.**		
UNIT IV	**INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION**	**12**
Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's rule. **Interpolation and Numerical Integration using Python.**		
UNIT V	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Taylor's series method – Euler's method – Modified Eulers's method – Fourth order Runge-Kutta method for solving first and second order equations – Adams Bashforth's predictor – corrector methods for solving first order equations . **Runge-Kutta and Adams Bashforth' method using Python**.		
		TOTAL: 75 PERIODS

TEXT BOOKS:

1) Grewal. B.S., and Grewal. J.S.,"Numerical methods in Engineering and Science", Khanna Publishers, 45th Edition, New Delhi, 2017.
2) Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia,7th Edition, New Delhi, 2009
3) Gupta, S.C, and Kapoor, V.K. (2004). Fundamental of Mathematical Statistics (11th Ed),Sultan Chand & Sons, New Delhi.
4) Kent D. Lee. (2014). Python Programming Fundamentals (2nd Ed), Springer. DOI 10.1007/978-1-4471-6642-9

REFERENCES :

1. Statistics and Numerical Methods by T. Veerarajan & T Ramachandran- 29 Oct 2018.
2. SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India
3. Gerald. C. F., and Wheatley. P. O., Applied Numerical Analysis, Pearson Education, Asia,6th Edition, New Delhi, 2006.
4. Jaan Kiusalaas., Numerical Methods in Engineering with Python, Cambridge University Press The Edinburgh Building, Cambridge, UK., 2005
5. José Unpingco., Python for Probability, Statistics, and Machine Learning, Springer, DOI 10.1007/978-3-319-30717-6., 2016

Course Designers:

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2. Mr.K.Thirumalai thirumalai@saveetha.ac.in

SAVEETHA ENGINEERING COLLEGE
AUTONOMOUS
Affiliated to Anna University | Approved by AICTE
NAAC A GRADE

Department of Chemical Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA201	Calculus and Matrix Algebra*	BS	3	1	0	4	2-2	-
2	19MA205	Differential Equations and Laplace Transforms*	BS	3	1	0	4	2-2	19MA201
3	19MA209	Numerical Methods	BS	3	1	0	4	2-2	19MA201

Note:

*Exempted for Lateral Entry Students

19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

(COMMON TO AGRI, CHEMICAL, CIVIL, CSE, IT & MECH)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Prerequisite: NIL

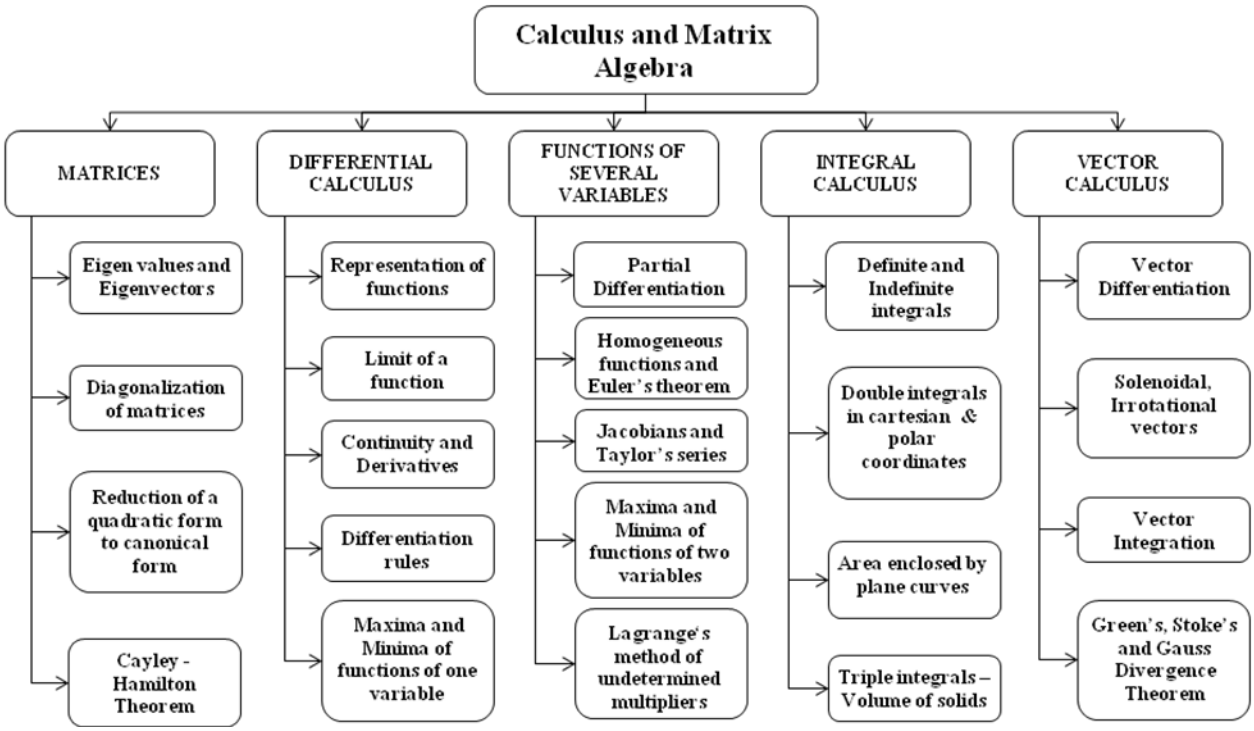
Course Outcomes: At the end of the course learners will be able to:

CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** line and surface integrals in vector fields.	**Evaluate**

Mapping with PO and PSOs

CHEMICAL															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	1	2	3
CO2	3	2	2	1	-	-	-	-	-	-	-	1	3	3	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	3	2	2
CO4	3	3	1	-	-	-	-	-	-	-	-	-	2	3	2
CO5	3	2	2	1	-	-	-	-	-	-	-	-	1	2	2

Concept Map:



19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.		
UNIT V	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2) James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
3) Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015

REFERENCES :

1) Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2) Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3) Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4) Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5) Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, NewDelhi, 5th edition, 2013.

Course Designers:

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19MA205	Differential Equations and Laplace Transforms	L T P C 3 1 0 4

(COMMON TO CHEMICAL, CIVIL & MECHANICAL)

Preamble :

This course is designed to cover topics such as Fourier Series, Differential equations and Laplace Transforms. The syllabus includes various techniques to solve differential equations which are essential to handle practical problems arising in the field of engineering. Fourier Series are widely used in signal analysis to find strength and vibrations of buildings. The course includes Laplace transforms in which various methods can be used to transform the time domain functions to frequency domain.

Prerequisite:

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

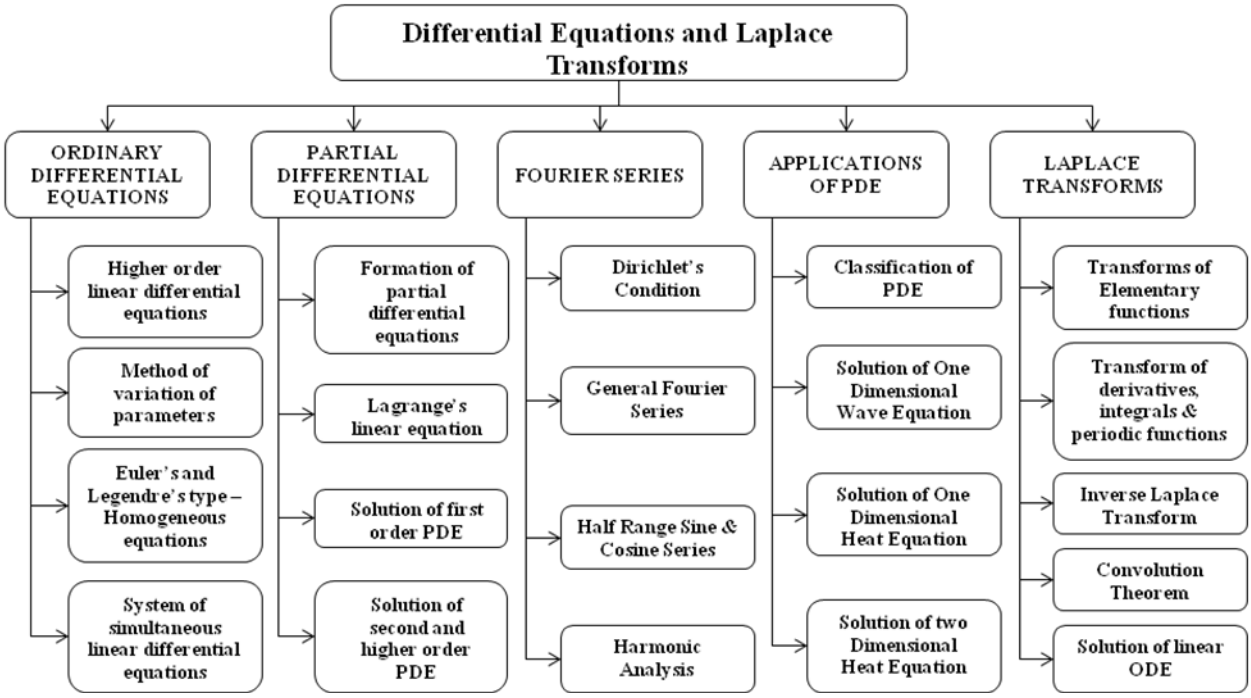
CO1	**Analyze** the suitable techniques for solving second and higher order differential equations.	**Analyze**
CO2	**Apply** suitable concepts in solving first order and higher order partial differential equations with constant coefficients.	**Apply**
CO3	**Evaluate** the Fourier series for standard periodic waveforms.	**Evaluate**
CO4	**Apply** the Fourier series techniques to solve wave and heat equations.	**Apply**
CO5	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**

Mapping with PO and PSOs

CHEMICAL															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2	1	-	-	-	-	-	-	-	1	3	1	2
CO2	3	3	2	2	-	-	-	-	-	-	-	1	2	3	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	1	3
CO5	3	3	2	1	-	-	-	-	-	-	-	-	2	2	-

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA205	Differential Equations and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	ORDINARY DIFFERENTIAL EQUATIONS	12
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients		
UNIT II	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations – Lagrange's linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and Non-homogeneous types.		
UNIT III	**FOURIER SERIES**	**12**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series-Harmonic Analysis.		
UNIT IV	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Basic properties –Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms –Transform of periodic functions – Convolution Theorem - Application to solution of linear second order ordinary differential equations with constant coefficients.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2) Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1) Bali N., Goyal M. and Watkins C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2) Jain R.K. and Iyengar S.R.K., ― Advanced Engineering Mathematics ‖, Narosa Publications, New Delhi , 3rd Edition, 2007.
3) O'Neil, P.V. ―Advanced Engineering Mathematics‖, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4) Sastry, S.S, ―Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5) Wylie, R.C. and Barrett, L.C., ―Advanced Engineering Mathematics ―Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

Course Designers:

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2. Ms. P. S. Narmathadevi narmathadevi@saveetha.ac.in

19MA209	Numerical Methods	L T P C
		3 1 0 4

(Only for CHEMICAL)

Preamble :

The course is designed to acquaint the students about various techniques of Numerical Analysis such as solution of linear system of equations, interpolation and approximation, numerical differentiation and integration, numerical solution of differential equations

Prerequisite :

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

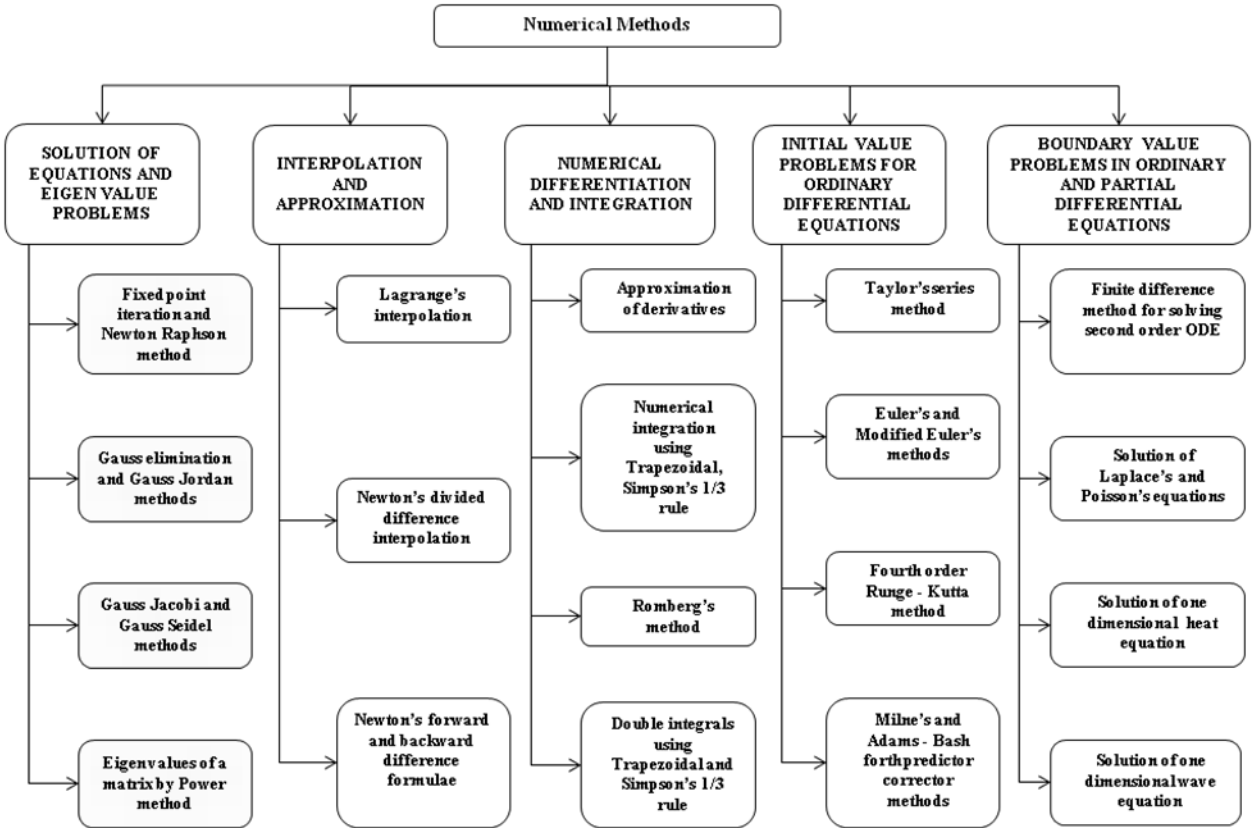
CO1	**Obtain** solutions of algebraic and transcendental equations and solve linear system of equations using suitable numerical methods.	**Understand**
CO2	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values.	**Apply**
CO3	**Evaluat**e derivatives and integrals using Numerical techniques.	**Evaluate**
CO4	**Apply** the appropriate numerical methods in finding approximate solutions to ordinary differential equations.	**Apply**
CO5	**Evaluate** the solutions of partial differential equations using finite difference approximations.	**Evaluate**

Mapping with PO and PSOs

CHEMICAL															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	-	-	-	-	-	-	1	1	3	3
CO2	3	3	3	2	-	-	-	-	-	-	-	1	3	1	-
CO3	3	3	2	-	-	-	-	-	-	-	-	1	3	1	2
CO4	3	2	3	2	-	-	-	-	-	-	-	1	2	3	-
CO5	3	3	2	1	-	-	-	-	-	-	-	1	2	2	-

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA209	Numerical Methods	L T P C 3 1 0 4

SYLLABUS

UNIT I	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	12
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method. .		
UNIT II	**INTERPOLATION AND APPROXIMATION**	**12**
Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation –Interpolation with equal intervals -Newton's forward and backward difference formulae.		
UNIT III	**NUMERICAL DIFFERENTIATION AND INTEGRATION**	**12**
Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.		
UNIT IV	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Single step methods - Taylor's series method - Euler's method - Modified Euler's method – Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.		
UNIT V	**BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Finite difference methods for solving second order two - point linear boundary value problems – Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.

2) Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1) Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006..

2) Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi, 2007.

3) SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.

4) Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill,5th Edition, New Delhi, 2007.

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2. Dr.A.Mahalakshmi mahalakshmia@saveetha.ac.in

Department of Computer Science Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA201	Calculus and Matrix Algebra*	BS	3	1	0	4	2-2	-
2	19MA206	Logic and Combinatorics*	BS	3	1	0	4	2-2	19MA201
3	19MA212	Algebra and Number Theory	BS	3	1	0	4	2-2	19MA201
4	19MA218	Probability and Queueing Theory	BS	3	1	0	4	2-2	19MA201

Note:

*Exempted for Lateral Entry Students

19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

(COMMON TO AGRI, CHEMICAL, CIVIL, CSE, IT & MECH)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Prerequisite: NIL

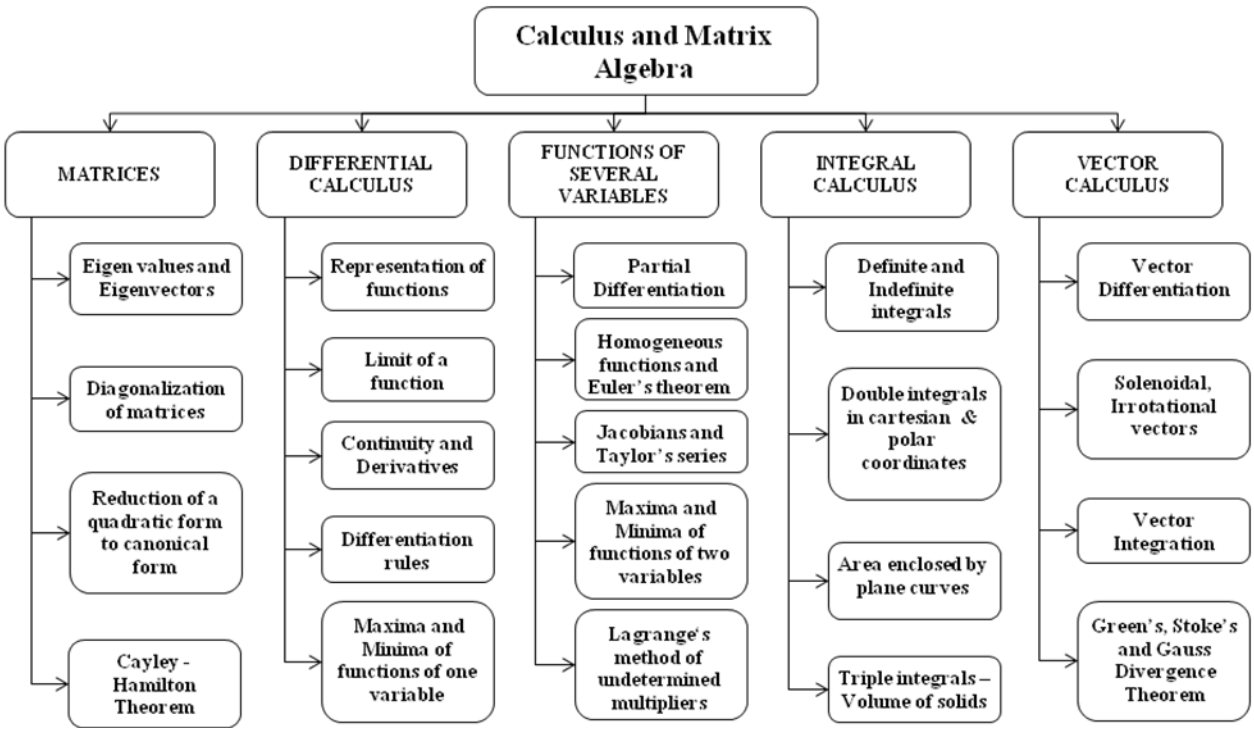
Course Outcomes: At the end of the course learners will be able to:

CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** line and surface integrals in vector fields.	**Evaluate**

Mapping with PO and PSOs

CSE															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	2	1	2
CO2	3	2	2	1	-	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1	1
CO4	3	3	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	2	1	-	-	-	-	-	-	-	-	1	1	1

Concept Map:



19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.		
UNIT V	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2) James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
3) Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015

REFERENCES :

1) Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2) Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3) Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4) Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5) Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, NewDelhi, 5th edition, 2013.

Course Designers:

1. Ms. N. Jegajothi jegajothi@saveetha.ac.in
2. Ms. P. S. Narmathadevi narmathadevi@saveetha.ac.in

19MA206	Logic and Combinatorics	L T P C 3 1 0 4

(COMMON to CSE & IT)

Preamble :

This course covers the mathematical topics most directly related to computer science. Topics includes: logic, count ability and counting arguments, proof techniques. Software engineering uses graphs, trees and other data structures. Logic is used in AI research in theorem proving and in database query systems.

Prerequisite:

19MA201- Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

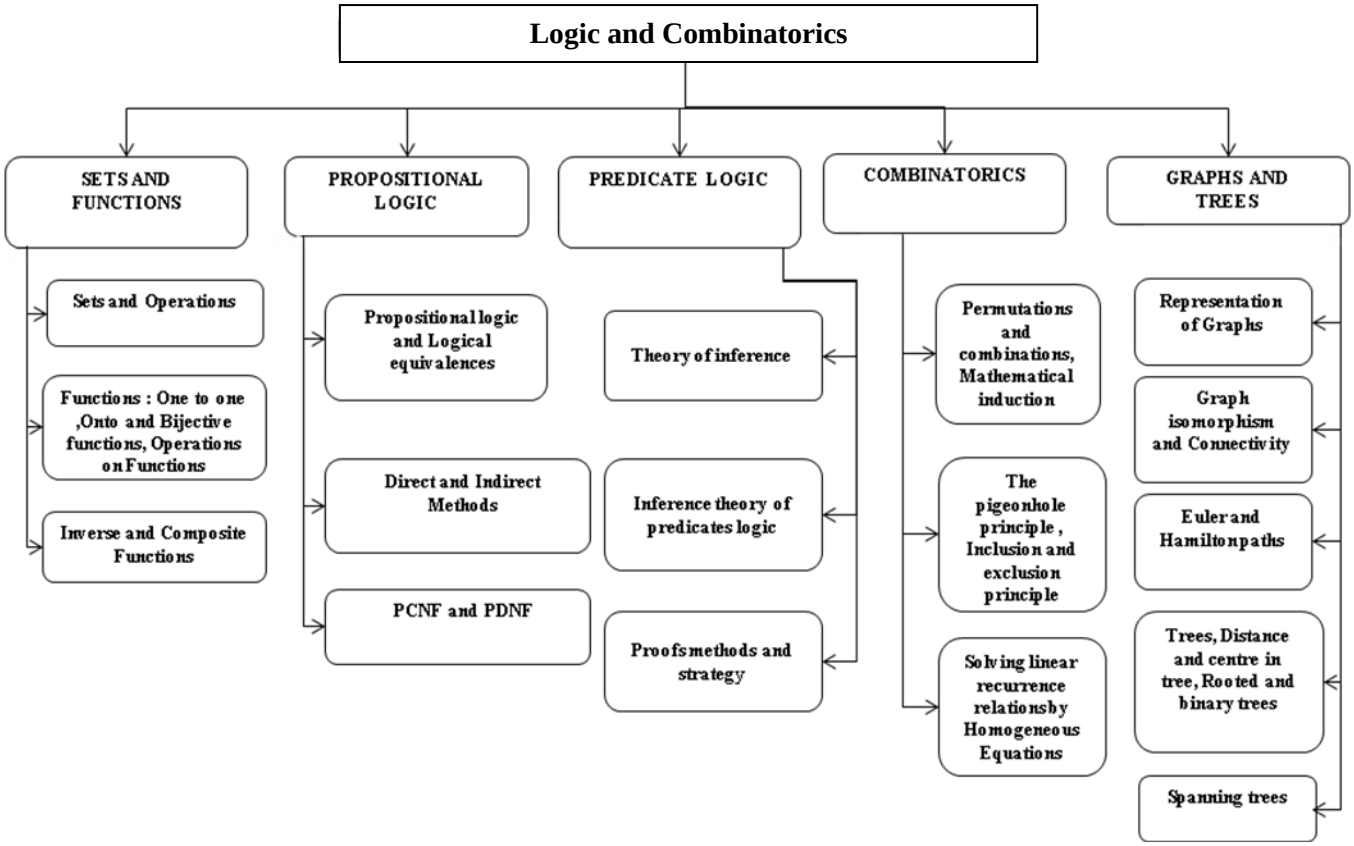
CO1	Construct the class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.	**Understand**
CO2	To extend student's logical and mathematical maturity and ability to deal with abstraction.	**Analyze**
CO3	Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.	**Evaluate**
CO4	Construct the recurrence relation for a given engineering problems and solve the recurrence equation.	**Apply**
CO5	Demonstrate different traversal methods for trees and graphs.	**Understand**

Mapping with PO and PSOs

CSE															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	1	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	-	-	1	1
CO3	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-
CO4	3	3	2	1	-	-	-	-	-	-	-	-	1	-	2
CO5	3	3	2	1	-	-	-	-	-	-	-	-	-	2	-

3 – Strong; 2 – Medium; 1-Low

Concept Map



19MA206	Logic and Combinatorics	L T P C 3 1 0 4

SYLLABUS

UNIT I	SETS AND FUNCTIONS	12
Sets and operations — Proofs of set identities — Relations — Equivalence relations –Functions : one to one, onto and bijective functions, operations on functions : Inverse and composite Functions.		
UNIT II	**PROPOSITIONAL LOGIC**	**12**
Propositional logic – Arguments – Logical laws – Logical equivalences – Direct and Indirect Methods– PCNF and PDNF (Using Truth tables and Laws).		
UNIT III	**PREDICATE LOGIC**	**12**
Theory of inference – Quantifiers— Predicate formulas—Inference theory of predicates logic. Proofs methods and strategy—Direct method of proofs and Indirect method of proofs.		
UNIT IV	**COMBINATORICS**	**12**
Counting Principles — Permutations and combinations — Mathematical induction – The pigeonhole principle — Inclusion and exclusion principle — Recurrence relations – Solving linear recurrence relations – Generating functions (Homogeneous Equations).		
UNIT V	**GRAPHS AND TREES**	**12**
Representation of graphs – Directed and indirected graphs – Graph isomorphism – Connectivity – Euler and Hamilton graphs. Trees– properties of trees– Distance and centre in tree– Rooted and binary trees–Spanning trees.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
3. J.L., Mott, A. Kandel, T.P. Baker, “Discrete Maths for Computer Scientists & Mathematics”. Second Edition, Prentice Hall of India Pvt Limited, New Delhi,2009.

REFERENCES :.

1. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum’s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
2. Ralph. P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Fourth Edition, Pearson Education Asia, Delhi, 2006.
3. Thomas Koshy, Discrete Mathematics with Applications, Elsevier Publications, 2006.
4. Seymour Lipschutz and Mark Lipson, Discrete Mathematics, Schaum’s Outlines, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, Second edition, 2011.
5. Dr. A.Singaravelu and Dr. M. P. Jeyaramam.,”Graph Theory and Applications” First Edition,2017
6. C Liu, D. Mohapatra Elements of Discrete Mathematics: A Computer Oriented Approach, 2017 .

Course Designers:

1. Mr. H.Prathab prathab@saveetha.ac.in
2. Dr. M. Ramesh Kumar rameshkumar@saveetha.ac.in

19MA212	Algebra and Number Theory	L T P C
		3 1 0 4

(COMMON to CSE and IT)

Preamble:

This course gives an integrated approach to number theory and abstract algebra, and provide a firm basis for arithmetic's in computer science field. The concepts of divisibility, prime number, GCD, LCM and modular arithmetic in number theory are used in computer programming. The concept of congruence is used in coding theory and cryptography.

Prerequisite:

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

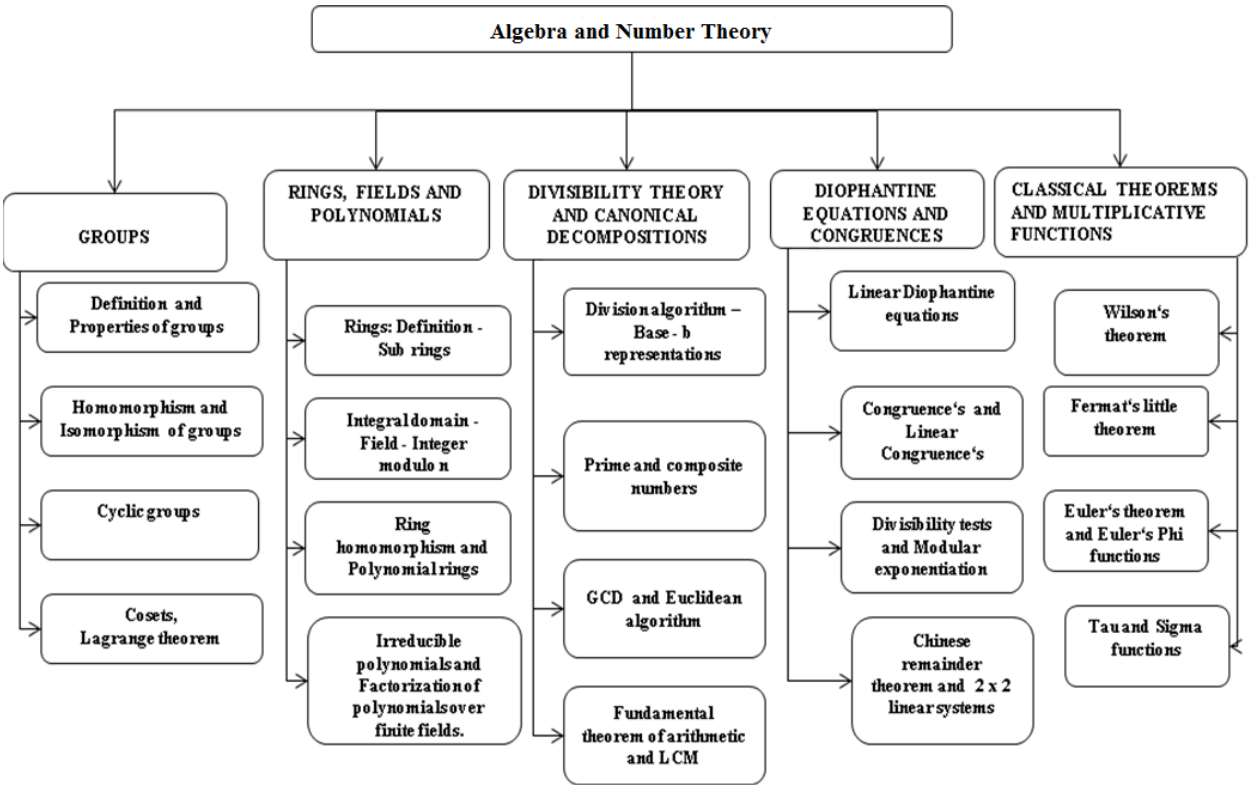
CO1	Apply the basic notions of groups which will then be used to solve related problems	**Apply**
CO2	Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.	**Understand**
CO3	Demonstrate accurate and efficient use of advanced algebraic techniques.	**Evaluate**
CO4	Demonstrate their mastery by solving non - trivial problems related to the concepts.	**Evaluate**
CO5	Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.	**Apply**

Mapping with PO and PSOs

CSE															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	-	-	-	-	-	-	-	1	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	-	-	2	2
CO3	3	3	2	1	-	-	-	-	-	-	-	-	-2	-	2
CO4	3	3	2	1	-	-	-	-	-	-	-	-	1	1	1
CO5	3	3	2	1	-	-	-	-	-	-	-	-	2	-	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA212	Algebra and Number Theory	L T P C 3 1 0 4

SYLLABUS

UNIT I	GROUPS	12
Groups : Definition - Properties - Homomorphism - Isomorphism - Cyclic groups - Cosets - Lagrange's theorem.		
UNIT II	**RINGS, FIELDS AND POLYNOMIALS**	**12**
Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n - Ring homomorphism - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.		
UNIT III	**DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS**	**12**
Division algorithm – Base - b representations –Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.		
UNIT IV	**DIOPHANTINE EQUATIONS AND CONGRUENCES**	**12**
Linear Diophantine equations – Congruence‘s – Linear Congruence‘s - Applications: Divisibility tests - Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.		
UNIT V	**CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS**	**12**
Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions – Tau and Sigma functions.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007.
2. Koshy, T., ―Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

REFERENCES :.

1. San Ling and Chaoping Xing, ―Coding Theory – A first Course, Cambridge Publications, Cambridge, 2004
2. Lidl, R. and Pitz, G, "Applied Abstract Algebra", 2nd Edition Springer Verlag, New Delhi, 2006.
3. Niven, I., Zuckerman.H.S., and Montgomery, H.L., ―An Introduction to Theory of Numbers, John Wiley and Sons , Singapore, 2004.
4. Andrews, G. E, “Number theory”, Dover publications, Newyork, 2012.
5. Herstein, I. N, “Topics in Algebra”, 2nd Edition, John Wiley and Sons, India.

Course Designers:

1. Dr. M. Ramesh Kumar rameshkumar@saveetha.ac.in

2. Mr. H.Prathab prathab@saveetha.ac.in

19MA218	Probability and Queueing Theory	L T P C 3 1 0 4

(COMMON to CSE & IT)

Preamble :

This course is designed to provide necessary basic concepts in probability, standard distributions and random processes which are widely applied in random signals, linear systems in communication engineering and IT fields. The syllabus also covers the concepts of Markovian and advanced queueing models which are essential to design and analyze computer networks.

Prerequisite :

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

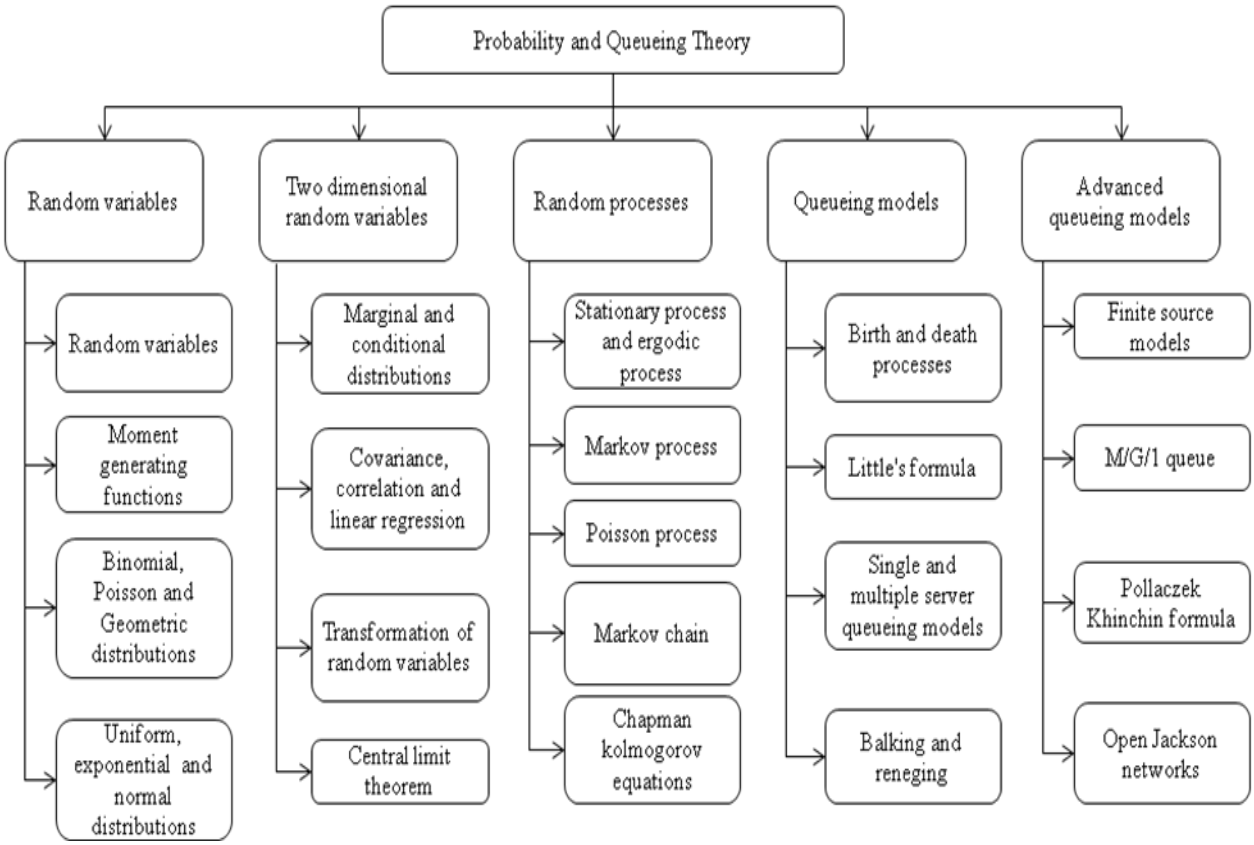
CO1	**Understand** the fundamental concepts of probability and acquire knowledge of standard distributions which can describe real life phenomena.	**Understand**
CO2	**Identify** various distribution functions and acquire skills in handling situations involving more than one variable.	**Apply**
CO3	**Analyze** the various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	**Analyze**
CO4	Understand the basic characteristic features of a queuing system and acquire skills in **analyzing** queuing models.	**Analyze**
CO5	**Analyze** a network of queues with Poisson external arrivals, exponential service requirements and independent routing.	**Analyze**

Mapping with PO and PSOs

CSE															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO 1	**PO 2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	1	-	-	-	-	-	-	1	1	1	1
CO2	3	3	2	2	1	-	-	-	-	-	-	-	1	1	1
CO3	3	3	2	2	1	-	-	-	-	-	-	1	2	2	-
CO4	3	3	2	1	1	-	-	-	-	-	-	1	1	1	1
CO5	3	3	2	1	1	-	-	-	-	-	-	1	1	1	1

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA218	Probability and Queueing Theory	L T P C 3 1 0 4

SYLLABUS

UNIT I	RANDOM VARIABLES AND DISTRIBUTIONS	12
Discrete and continuous random variables –Functions of a random variable–Moments – Moment generating functions – Binomial Poisson, Geometric, Uniform, Exponential, and Normal distributions		
UNIT II	**TWO - DIMENSIONAL RANDOM VARIABLES**	**12**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables –Central limit theorem.		
UNIT III	**RANDOM PROCESSES**	**12**
Classification – Stationary process – Ergodic process – Markov process – Poisson process – Discrete parameter Markov chain – Classification of state of a Markov Chain – Chapman Kolmogorov equations.		
UNIT IV	**QUEUEING MODELS**	**12**
Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little‟s formula - Queues with finite waiting rooms – Queues with impatient customers: Balking and reneging.		
UNIT V	**ADVANCED QUEUEING MODELS**	**12**
Finite source models - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Ibe. O.C., “Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2014.
2) Gross. D. and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student edition, 2012

REFERENCES :

1) Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2016.
2) Hwei Hsu, "Schaum‟s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2014.
3) Robertazzi, "Computer Networks and Systems: Queueing Theory and Performance Evaluation", , 3rd Edition, Springer, 2012.
4) Yates. R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
5) Taha. H.A., "Operations Research", 8th Edition, Pearson Education, Asia, 2010.

Course Designers:

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2. Mr. H. Prathab prathab@saveetha.ac.in

SAVEETHA ENGINEERING COLLEGE
AUTONOMOUS
Affiliated to Anna University | Approved by AICTE
NAAC A GRADE

Department of Electronics and Communication Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA202	Calculus and Laplace Transforms*	BS	3	1	0	4	2-2	-
2	19MA204	Complex Variables and Ordinary Differential Equations*	BS	3	1	0	4	2-2	19MA202
3	19MA213	Linear Algebra and Numerical Methods	BS	3	1	0	4	2-2	19MA202
4	19MA217	Random Processes and Statistics	BS	3	1	0	4	2-2	19MA202

Note:

*Exempted for Lateral Entry Students

19MA202	Calculus and Laplace Transforms	L T P C 3 1 0 4

(COMMON TO BIO MED, ECE, EEE, EIE & MED ELEC)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines. The syllabus also includes Laplace transforms in which various methods can be used to transform the time domain circuits to frequency domain to simplify the solution of differential equations.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

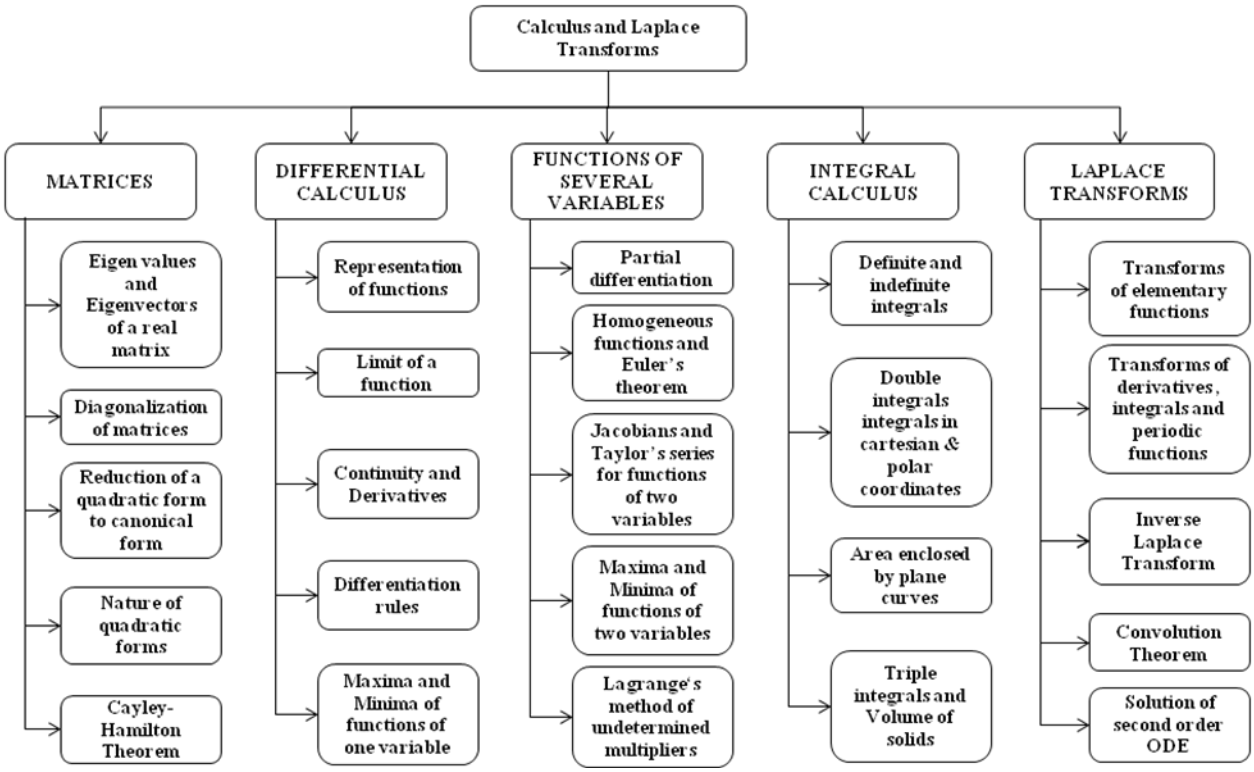
CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**

Mapping with PO and PSOs

ECE															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	-	-	-	-	-	-	-	1	3	2	2
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1	-
CO4	3	3	2	1	-	-	-	-	-	-	-	1	3	-	2
CO5	2	3	2	1	-	-	-	-	-	-	-	-	3	-	3

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA202	Calculus and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules -Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solid		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1. Grewal B.S., ―Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015.
3. Sanjay Mishra, Fundamentals of Mathematics Differential Calculus, Pearson Education India, June 2016.

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3. Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4. Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5. Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, 5th edition, 2013.

Course Designers:

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19MA204	Complex Variables and Ordinary Differential Equations	L T P C
		3 1 0 4

(COMMON to ECE , BME & MED ELEC)

Preamble:

This course is designed to cover topics such as Vector Calculus, Complex Analysis , Sequences and series. Vector calculus and differential equations can be widely used for modeling the various laws of physics. The syllabus includes concepts of analytic functions which are applied to evaluate Contour Integrals.

Prerequisite:

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

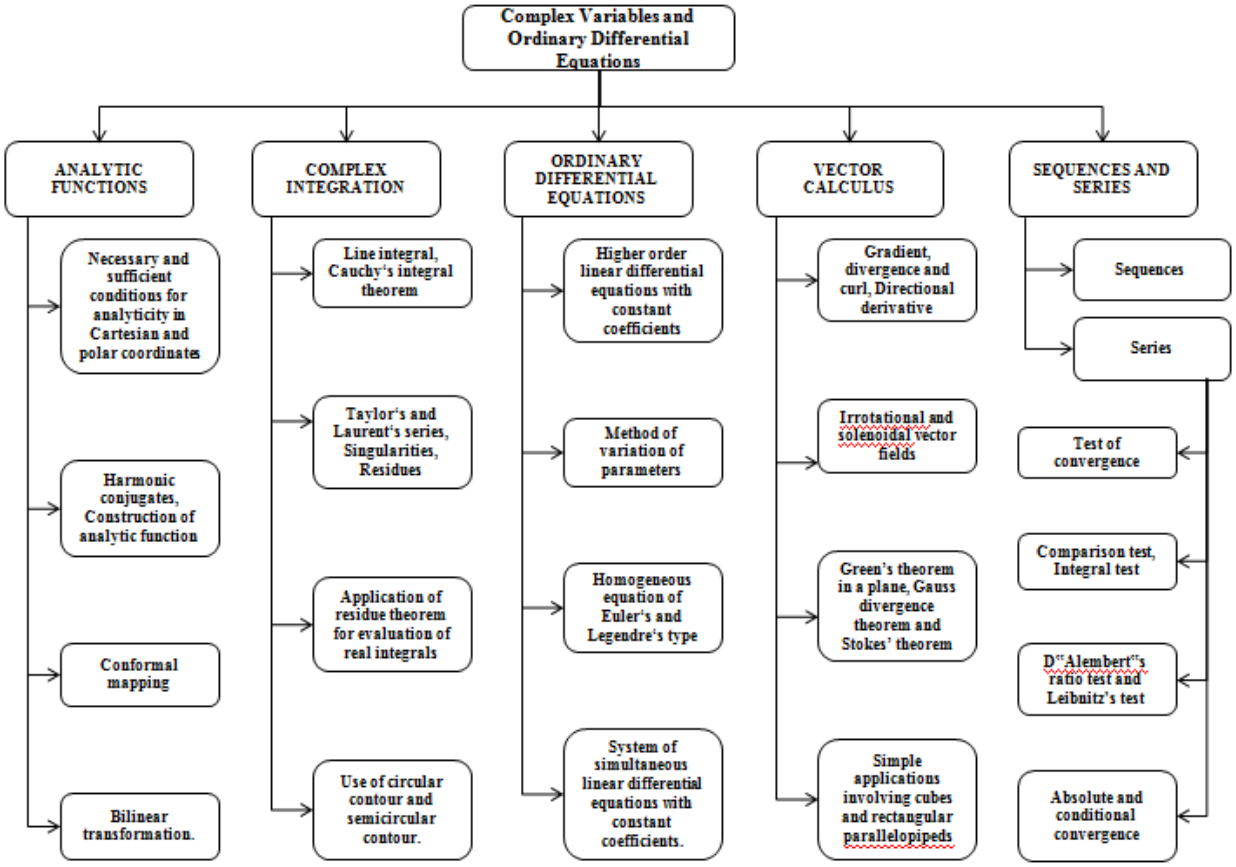
CO1	**Identify** and construct analytic functions and conformal mapping.	**Apply**
CO2	Understand the fundamental concepts of complex analysis and **apply** them to evaluate contour integrals.	**Apply**
CO3	**Analyze** various techniques in solving ordinary differential equations.	**Analyze**
CO4	**Determine** the vector differentiation and vector integration.	**Evaluate**
CO5	**Test** the convergene of infinite series and evaluate the limits.	**Evaluate**

Mapping with PO and PSOs

ECE															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	1	2
CO4	3	3	1	1	-	-	-	-	-	-	-	-	2	-	1
CO5	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA204	Complex Variables and Ordinary Differential Equations	L T P C 3 1 0 4

SYLLABUS

UNIT I	ANALYTIC FUNCTIONS	12
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – $w = z + c, cz, \frac{1}{z}, z^2$, Bilinear transformation.		
UNIT II	**COMPLEX INTEGRATION**	**12**
Line integral - Cauchy‘s integral theorem – Cauchy‘s integral formula – Taylor‘s and Laurent‘s series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.		
UNIT III	**ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler‘s and Legendre‘s type – System of simultaneous linear differential equations with constant coefficients.		
UNIT IV	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.		
UNIT V	**SEQUENCES AND SERIES**	**12**
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D‘‘Alembert‘‘s ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, Nineth Edition, Laxmi Publications Pvt Ltd., 201
2) Grewal. B.S, “Higher Engineering Mathematics”, 43rd Edition, Khanna Publications, Delhi, 2014.
3) Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi,1st Edition ,2017.

REFERENCES :

1) Dass, H.K., and Er. Rajnish Verma,” Higher Engineering Mathematics”, S. Chand Private Ltd., 2011
2) Peter V. O‘‘Neil,” Advanced Engineering Mathematics”, 7th Edition, Cengage learning, 2012.
3) Sivarama Krishna Das P. and C.Vijayakumari, “Engineering Mathematics” , First Edition, Pearson Publishing 2017

Course Designers:

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2. Ms. M. Gayathri Lakshmi gayathrilakshmi@saveetha.ac.in

19MA213	Linear Algebra and Numerical Methods	L T P C
		3 1 0 4

(COMMON to ECE & MED ELEC)

Preamble:

This course is designed to introduce the basic notions of groups, rings, fields which will then be used to solve related problems. The syllabus provides the basic concepts of vector spaces, linear transformations and inner product spaces. The course includes the concepts of numerical techniques to solve system of linear equations and to interpolate the missing data in a given range.

Prerequisite:

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

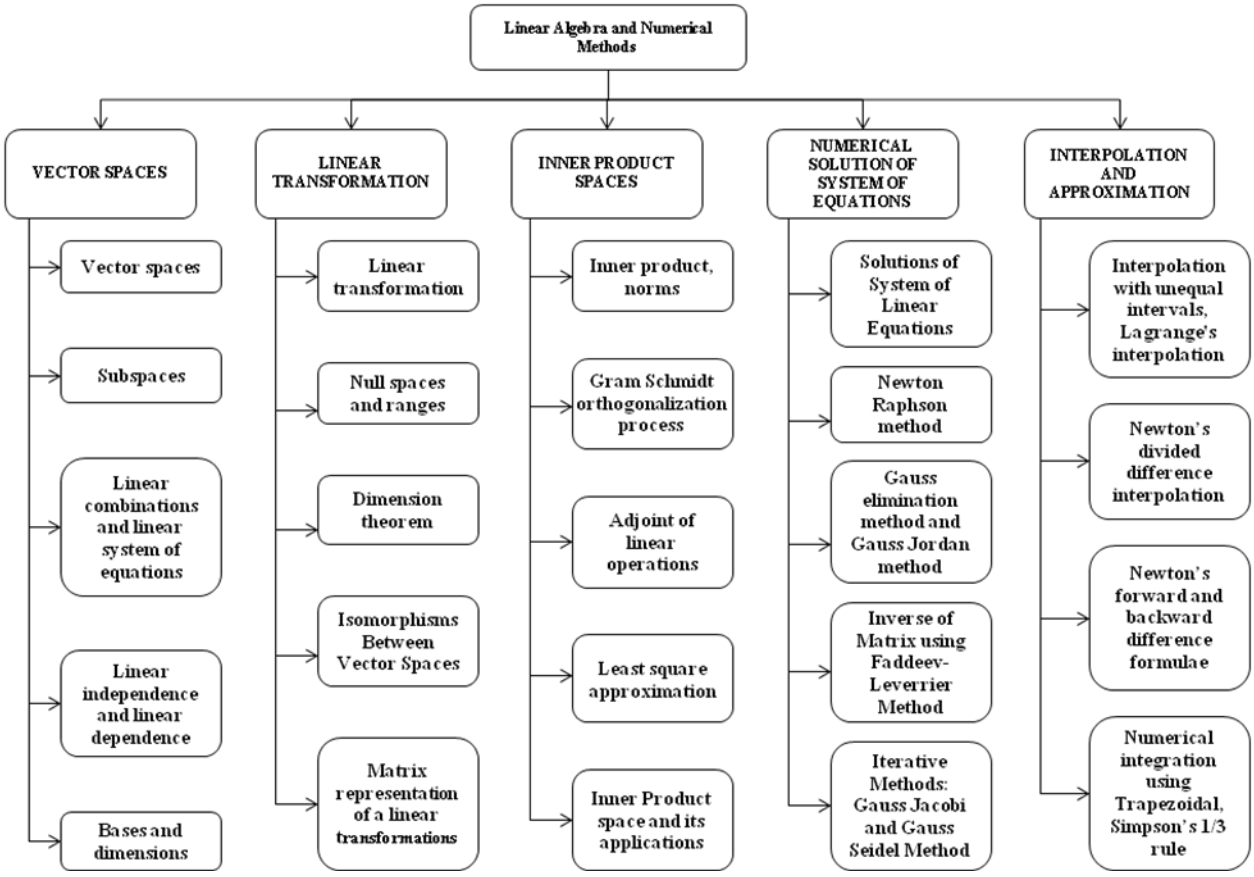
CO1	**Understand** the concepts of vector spaces.	**Understand**
CO2	**Understand** the concepts of vector space, linear transformations and diagonalization	**Understand**
CO3	**Apply** the concept of inner product spaces in orthogonalization.	A**pply**
CO4	**Analyze** suitable numerical techniques for solving system of linear equations.	**Analyze**
CO5	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values	**Apply**

Mapping with PO and PSOs

ECE															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	-	-	-	-	-	-	-	-	1	3	-	1
CO2	3	1	2	-	-	-	-	-	-	-	-	1	3	-	1
CO3	2	1	2	-	-	-	-	-	-	-	-	1	3	-	2
CO4	3	2	2	2	-	-	-	-	-	-	-	1	3	1	2
CO5	3	2	3	2	-	-	-	-	-	-	-	1	3	1	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA213	Linear Algebra and Numerical Methods	L T P C 3 1 0 4

SYLLABUS

UNIT I	VECTOR SPACES	12
Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.		
UNIT II	**LINEAR TRANSFORMATION**	**12**
Linear transformation - Null spaces and ranges - Dimension theorem - Isomorphism's Between Vector Spaces- Matrix representation of a linear transformations .		
UNIT III	**INNER PRODUCT SPACES**	12
Inner product, norms - Gram Schmidt orthogonalization process - Bessel's Inequality, Parseval's Identity - Adjoint of linear operations - Least square approximation- Inner Product space and its applications.		
UNIT IV	**NUMERICAL SOLUTION OF SYSTEM OF EQUATIONS**	**12**
Solutions of System of Linear Equations- Newton Raphson method, Solutions to linear systems -Direct method-Gauss elimination method- Pivoting - Gauss Jordan method - Inverse of Matrix using Faddeev-Leverrier Method - Iterative Method - Gauss Jacobi and Gauss Seidel Method.		
UNIT V	**INTERPOLATION AND APPROXIMATION**	**12**
Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation - Interpolation with equal intervals - Newton's forward and backward difference formulae- Numerical integration using Trapezoidal, Simpson's 1/3 rule.		

TEXT BOOKS:

1) Lay, D.C., ―Linear Algebra and its Applications‖, 5th Edition, Pearson Education, 2015.
2) SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 4th Revised Edition, New Delhi, 2017.
3) Saumyen Guha and Rajesh Srivastava, "Numerical methods for Engineering and Science", Oxford Higher Education, New Delhi, 2010.
4) Strang, G., ―Linear Algebra and its applications‖, Thomson (Brooks/Cole), New Delhi, 2005.

REFERENCES:

1) M.Artin, Algebra, Prentice-Hall of India,2nd Edition, 2011.
2) K.Hoffman and R.Kunze, Linear Algebra, 2nd Edition, Prentice- Hall of India, 2005.
3) O'Neil, P.V., ―Advanced Engineering Mathematics‖, Cengage Learning,7th Revised Edition , 2011.
4) Sundarapandian, V. ―Numerical Linear Algebra‖, Prentice Hall of India, New Delhi, 2008.
5) Friedberg, A.H., Insel, A.J. and Spence, L., ―Linear Algebra‖, Prentice Hall of India, New Delhi, 5th Edition, 2018.

Course Designers:

1. Mr V.Kamalakannan kamalakannan@saveetha.ac.in
2. Mr L.Vigneswaran vigneswaranl@saveetha.ac.in

19MA217	Random Processes and Statistics	L T P C
		3 1 0 4

(COMMON TO ECE, BIO-MED & MED-ELEC)

Preamble :

This course is designed to cover the concepts of probability distributions, random processes and spectral densities for applications such as random signals, digital signal processing etc in communication engineering. The syllabus also covers the techniques of hypothesis testing for small and large samples which plays an important role in real life problems.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

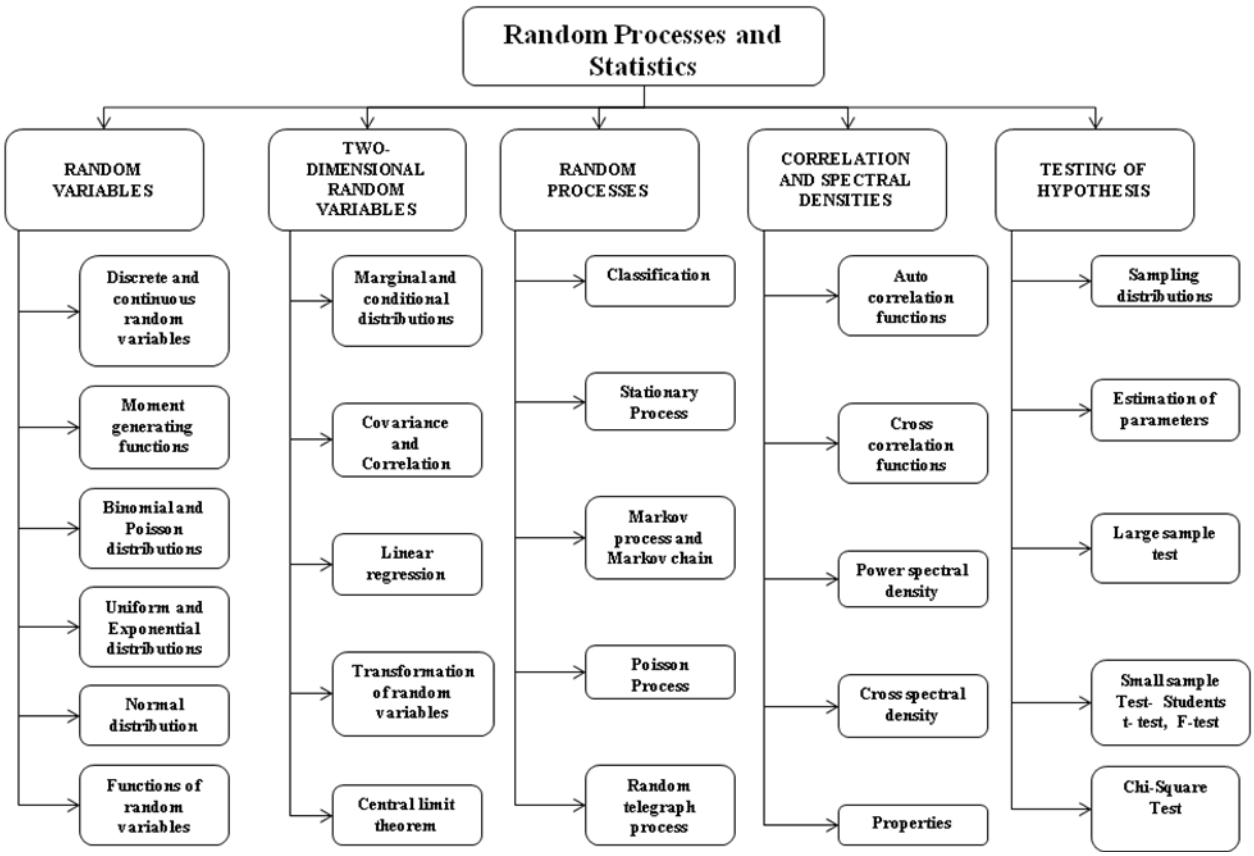
CO1	**Understand** the fundamental concepts of probability and acquire knowledge of standard distributions which can describe real life phenomena.	**Understand**
CO2	**Identify** various distribution functions and acquire skills in handling situations involving more than one variable.	**Apply**
CO3	**Analyze** the various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	**Analyze**
CO4	**Evaluate** functional relationship between random inputs and outputs with the use of Random Process Techniques.	**Evaluate**
CO5	**Apply** the concept of testing of hypothesis for small and large samples in real life problems**.**	**Apply**

Mapping with PO and PSOs

ECE															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	1	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	3	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	1	3	-	2
CO4	3	3	2	1	-	-	-	-	-	-	-	1	3	-	2
CO5	3	2	1	1	2	1	-	-	-	-	-	2	3	1	2

3 – Strong; 2– Medium; 1-Low

Concept Map:



19MA217	Random Processes and Statistics	L T P C
		3 1 0 4

SYLLABUS

UNIT I	RANDOM VARIABLES	12
Random variables - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions- Functions of random variables.		
UNIT II	**TWO - DIMENSIONAL RANDOM VARIABLES**	**12**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).		
UNIT III	**RANDOM PROCESSES**	**12**
Classification – Stationary process – Markov process - Markov chain - Poisson process – Random telegraph process.		
UNIT IV	**CORRELATION AND SPECTRAL DENSITIES**	**12**
Auto correlation functions – Cross correlation functions – Properties – Power spectral density –Cross spectral density – Properties.		
UNIT V	**TESTING OF HYPOTHESIS**	**12**
Sampling distributions – Estimation of parameters – Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t and F distributions for testing means, variances and proportion – Chi-square test- Contingency table (Test for Independency)		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.
2. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8 th Edition, 2015.

REFERENCES :

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
2. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
3. Hwei Hsu, "Schaum"s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata Mc Graw Hill Edition, New Delhi, 9th Reprint, 2010.
4. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8 th Edition, 2007.

Course Designers:

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2. Ms. V. Kavitha — kavithav@saveetha.ac.in

SAVEETHA ENGINEERING COLLEGE
AUTONOMOUS
Affiliated to Anna University | Approved by AICTE
NAAC A GRADE

Department of Electrical and Electronics Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA202	Calculus and Laplace Transforms*	BS	3	1	0	4	2-2	-
2	19MA207	Numerical Methods and Partial Differential Equations*	BS	3	1	0	4	2-2	19MA202
3	19MA214	Series and Transforms	BS	3	1	0	4	2-2	19MA202

Note:

*Exempted for Lateral Entry Students

19MA202	Calculus and Laplace Transforms	L T P C
		3 1 0 4

(COMMON TO BIO MED, ECE, EEE, EIE & MED ELEC)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines. The syllabus also includes Laplace transforms in which various methods can be used to transform the time domain circuits to frequency domain to simplify the solution of differential equations.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

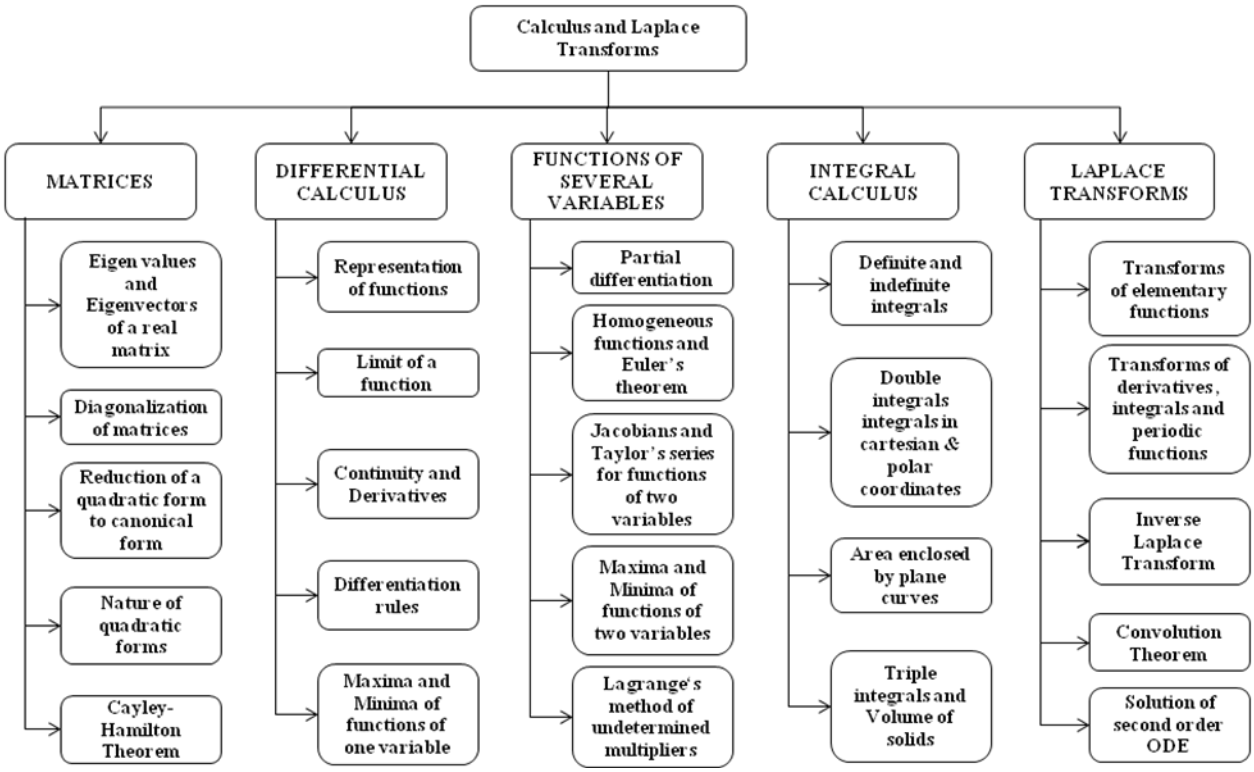
CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**

Mapping with PO and PSOs

EEE														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	1	-	-	-	-	-	-	-	1	1	2
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	3
CO3	3	2	2	-	-	-	-	-	-	-	-	1	1	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1	-	2
CO5	2	3	2	1	-	-	-	-	-	-	-	1	1	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA202	Calculus and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules -Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solid		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1. Grewal B.S., ―Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015.
3. Sanjay Mishra, Fundamentals of Mathematics Differential Calculus, Pearson Education India, June 2016.

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3. Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4. Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5. Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, 5th edition, 2013.

Course Designers:

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2. Mr.L.Vigneswaran vigneswaranl@saveetha.ac.in

19MA207	Numerical Methods and Partial Differential Equations	L T P C 3 1 0 4

(COMMON to EEE & EIE)

Preamble :

The course is designed to provide necessary concepts of standard probability distributions and suitable numerical techniques for curve fitting, interpolation and solving system of equations which are applied in random signals and power systems. The syllabus provides a sound knowledge of Vector calculus which plays an important role in differential geometry and in the study of partial differential equations. Vector calculus is used extensively in electromagnetic fields, gravitational fields and fluid flow.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

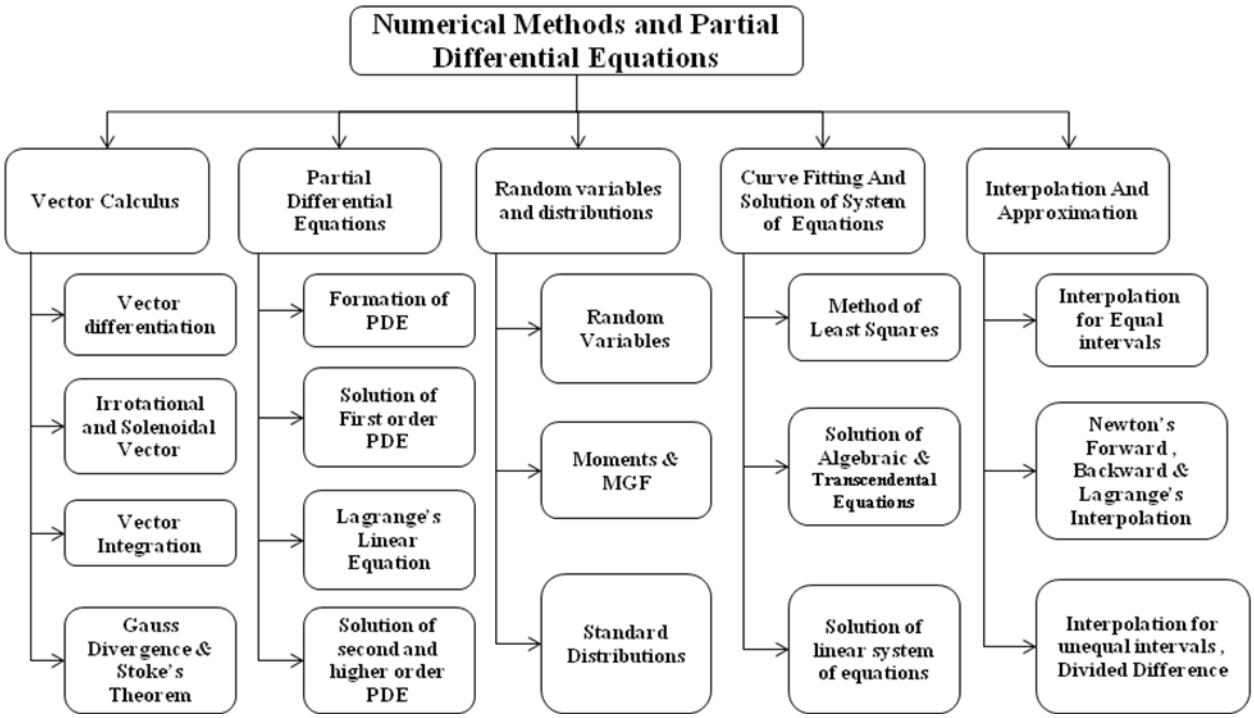
CO1	**Evaluate** line and surface integrals in vector fields.	**Evaluate**
CO2	**Apply** suitable concepts in solving first order and higher order partial differential equations with constant coefficients.	**Apply**
CO3	**Understand** the fundamental concepts of probability and acquire knowledge of standard distributions which can describe real life phenomena.	**Understand**
CO4	**Acquire** knowledge in curve fitting techniques and solving linear equations.	**Analyze**
CO5	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values.	**Apply**

Mapping with PO and PSOs

EEE														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	-	-	-	-	1	2	2
CO3	3	1	2	1	-	-	-	-	-	-	-	1	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	1	1	-	-	-	-	-	-	-	1	2	3

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA207	Numerical Methods and Partial Differential Equations	L T P C 3 1 0 4

SYLLABUS

UNIT I	VECTOR CALCULUS	12
Gradient, divergence and curl – Directional derivative – Irrotational and solenoid vector fields – Vector integration –Gauss divergence theorem and Stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.		
UNIT II	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.		
UNIT III	**RANDOM VARIABLES AND DISTRIBUTIONS**	**12**
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Exponential, Weibull Distributions.		
UNIT IV	**CURVE FITTING AND SOLUTION OF SYSTEM OF EQUATIONS**	**12**
Curve fitting – Method of least squares - Straight Lines - Quadratic and Parabola– Exponential curve - Solution of algebraic and transcendental equations – Newton Raphson method- Solution of linear system of equations – Pivoting - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.		
UNIT V	**INTERPOLATION AND APPROXIMATION**	**12**
Interpolation with equal intervals – Newton's forward and backward difference formulae - Lagrange's interpolation - Interpolation with unequal intervals - Newton's divided difference interpolation.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
2) Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3) Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

EFERENCES :

1) Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2) Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
3) Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill,5th Edition, New Delhi, 2007S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4) Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5) Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

Course Designers:

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19MA214	Series and Transforms	L T P C 3 1 0 4

(COMMON to EEE & EIE)

Preamble :

The aim of this course is to develop an understanding of convergence of sequences and series. The syllabus includes Fourier series analysis which is central to many applications in engineering. The course is designed to study and understand the behavior of transforms such as Fourier Transform, Discrete Fourier Transform, Z Transform and Wavelet Transform which are widely used in Signal Processing.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

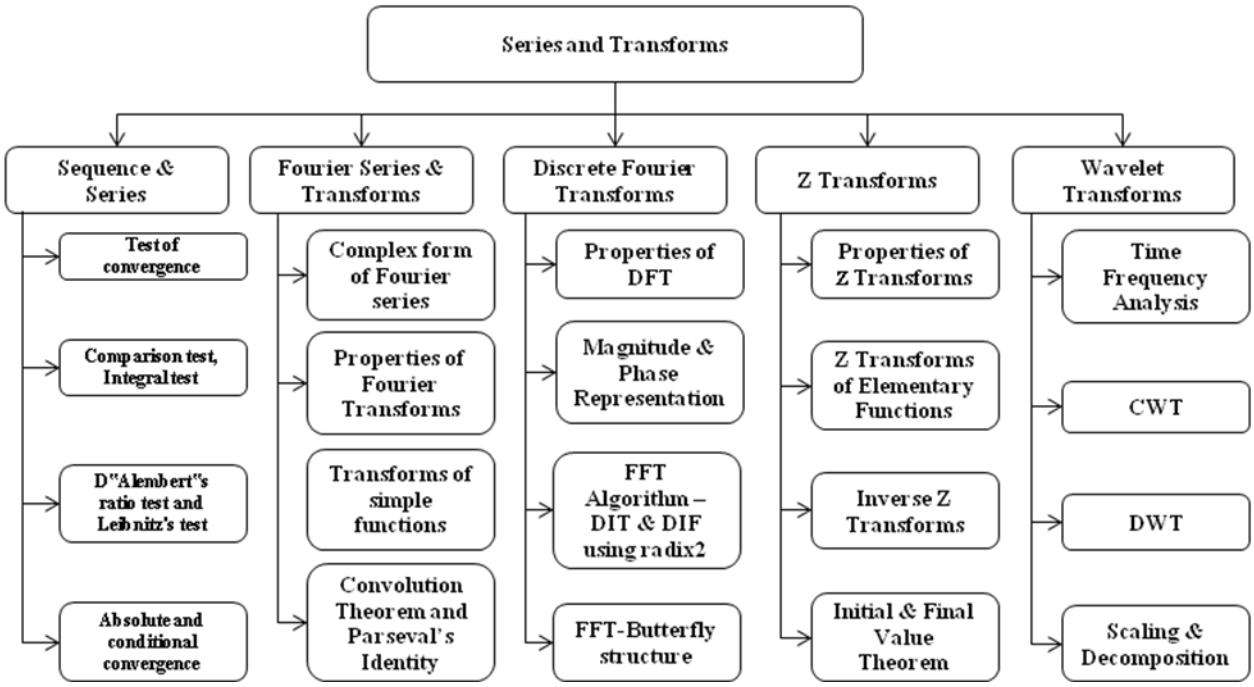
CO1	Study the convergence of real sequences and **apply** them to study the convergence behavior of various infinite series.	**Apply**
CO2	Calculate the complex form of the Fourier series for standard periodic waveforms and **evaluate** the Fourier transforms which represents frequency domain of signals.	**Evaluate**
CO3	Study the frequency domain representation of discrete time signal **using** Discrete time Fourier Transform.	**Analyze**
CO4	To **Analyze** the properties and techniques of Z transform.	**Analyze**
CO5	**Understand** the wavelet transform concepts which are necessary for data compression and noise suppression.	**Understand**

Mapping with PO and PSOs

EEE														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	1	-	-	-	-	-	-	-	-	2	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	1	2
CO3	3	2	2	1	-	-	-	-	-	-	-	-	2	3
CO4	3	2	1	1	-	-	-	-	-	-	-	-	-	3
CO5	3	2	1	1	-	-	-	-	-	-	-	-	1	3

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA214	Series and Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	SEQUENCE AND SERIES	12
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms –Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.		
UNIT II	**FOURIER SERIES AND TRANSFORMS**	**12**
Complex form of Fourier series – Statement of Fourier integral theorem – Fourier transform pair– Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.		
UNIT III	**DISCRETE FOURIER TRANSFORMS**	**12**
Discrete Fourier Transform - properties, magnitude and phase representation – computation of DFT using FFT algorithm –DIT & DIF using radix2 - FFT-Butterfly structure.		
UNIT IV	**Z TRANSFORMS**	**12**
Z-transforms - Elementary properties – Inverse Z-transform using partial fractions and residues –Initial and final value theorems - Convolution theorem.		
UNIT V	**WAVELET TRANSFORMS**	**12**
Introduction of time frequency analysis-Continuous wavelet Transform-CWT as operator-Discrete wavelet transform introduction-scaling function-Decomposition-Interpolation.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Bali N., Goyal M. and Watkins C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2) The Illustrated Wavelet Transform Handbook: Introductory Theory and Applications in Science, Engineering, Medicine and Finance, Second EditionHardcover – Import, 26 Jan 2017 by Paul S. Addison , CNC Press.
3) Algorithms for Discrete Fourier Transform and Convolution - Tolimieri R, Springer publications.

REFERENCES :

1) G. James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,2007.
2) L.C Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
3) N.P. Bali. and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
4) Introduction to Wavelets and Wavelet Transforms: A Primer 1st Edition - C. Sidney Burrus (Author), Ramesh A. Gopinath (Author), Haitao Guo (Author)-Prentice Hall, 1998
5) Mathematics of the Discrete Fourier Transform: With Audio Applications by Julius O., III Smith (Author) – Create space publishers

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2. Ms. V .N. Jayamani jayamani@saveetha.ac.in

Department of Electrical and Instrumentation Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA202	Calculus and Laplace Transforms*	BS	3	1	0	4	2-2	-
2	19MA207	Numerical Methods and Partial Differential Equations*	BS	3	1	0	4	2-2	19MA202
3	19MA214	Series and Transforms	BS	3	1	0	4	2-2	19MA202

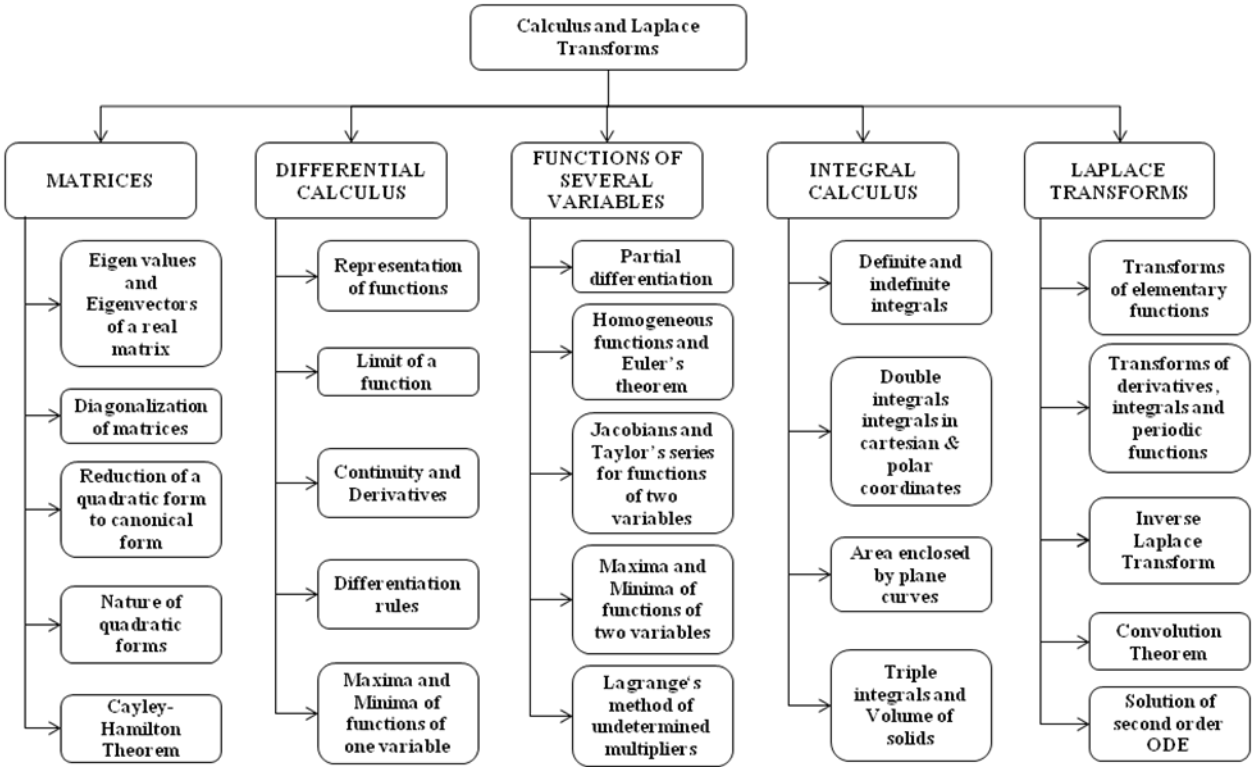
Note:

*Exempted for Lateral Entry Students

Mapping with PO and PSOs

EIE														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	1	-	-	-	-	-	-	-	1	2	1
CO2	3	3	2	-	-	-	-	-	-	-	-	1	3	2
CO3	3	2	2	-	-	-	-	-	-	-	-	1	1	-
CO4	3	3	2	1	-	-	-	-	-	-	-	1	2	2
CO5	2	3	2	1	-	-	-	-	-	-	-	-	3	3

Concept Map:



19MA202	Calculus and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules -Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solid		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1. Grewal B.S., ―Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015.
3. Sanjay Mishra, Fundamentals of Mathematics Differential Calculus, Pearson Education India, June 2016.

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3. Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4. Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5. Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, 5th edition, 2013.

Course Designers:

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19MA207	Numerical Methods and Partial Differential Equations	L T P C 3 1 0 4

(COMMON to EEE & EIE)

Preamble :

The course is designed to provide necessary concepts of standard probability distributions and suitable numerical techniques for curve fitting, interpolation and solving system of equations which are applied in random signals and power systems. The syllabus provides a sound knowledge of Vector calculus which plays an important role in differential geometry and in the study of partial differential equations. Vector calculus is used extensively in electromagnetic fields, gravitational fields and fluid flow.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

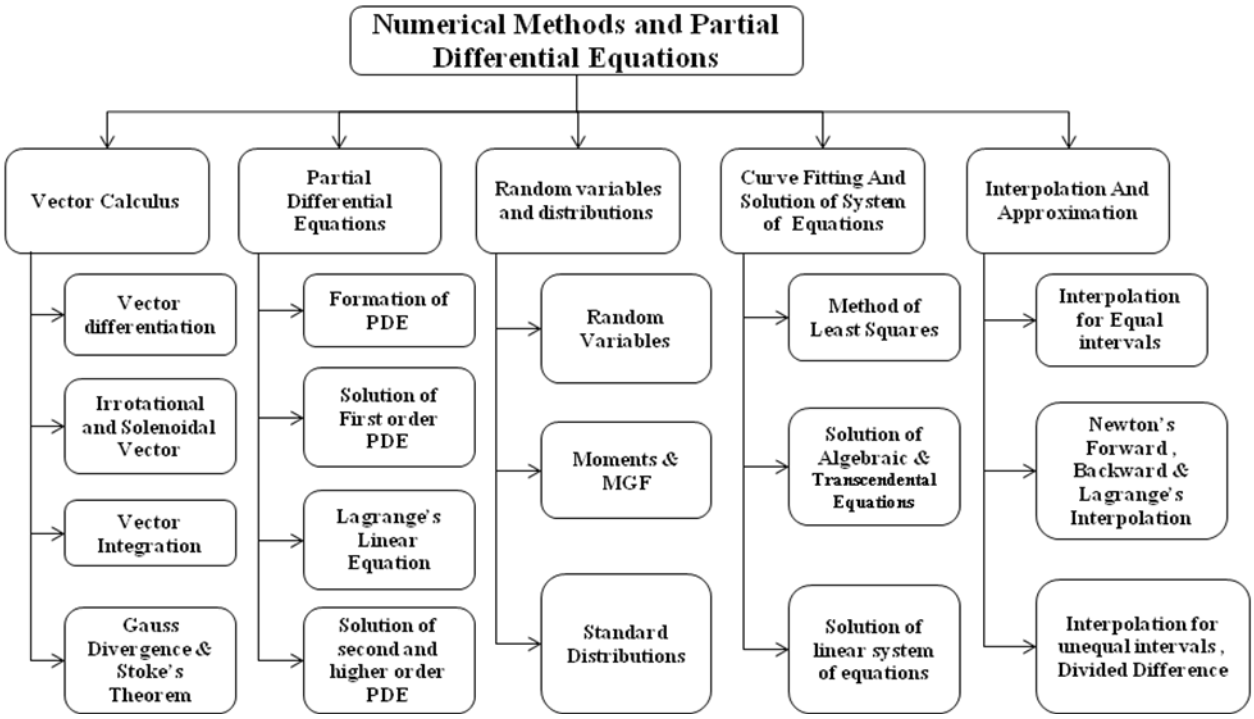
CO1	**Evaluate** line and surface integrals in vector fields.	**Evaluate**
CO2	**Apply** suitable concepts in solving first order and higher order partial differential equations with constant coefficients.	**Apply**
CO3	**Understand** the fundamental concepts of probability and acquire knowledge of standard distributions which can describe real life phenomena.	**Understand**
CO4	**Acquire** knowledge in curve fitting techniques and solving linear equations.	**Analyze**
CO5	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values.	**Apply**

Mapping with PO and PSOs

EIE														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	2	2
CO2	3	2	1	2	-	-	-	-	-	-	-	1	2	2
CO3	3	1	2	1	-	-	-	-	-	-	-	1	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	1	1	-	-	-	-	-	-	-	1	2	3

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA207	Numerical Methods and Partial Differential Equations	L T P C 3 1 0 4

SYLLABUS

UNIT I	VECTOR CALCULUS	12
Gradient, divergence and curl – Directional derivative – Irrotational and solenoid vector fields – Vector integration –Gauss divergence theorem and Stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.		
UNIT II	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.		
UNIT III	**RANDOM VARIABLES AND DISTRIBUTIONS**	**12**
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Exponential, Weibull Distributions.		
UNIT IV	**CURVE FITTING AND SOLUTION OF SYSTEM OF EQUATIONS**	**12**
Curve fitting – Method of least squares - Straight Lines - Quadratic and Parabola– Exponential curve - Solution of algebraic and transcendental equations – Newton Raphson method- Solution of linear system of equations – Pivoting - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.		
UNIT V	**INTERPOLATION AND APPROXIMATION**	**12**
Interpolation with equal intervals – Newton's forward and backward difference formulae - Lagrange's interpolation - Interpolation with unequal intervals - Newton's divided difference interpolation.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
2) Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3) Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1) Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2) Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
3) Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill,5th Edition, New Delhi, 2007S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4) Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5) Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016

Course Designers:

1. Dr. J. Joy Priscilla joypriscilla@saveetha.ac.in
2. Ms. V .N. Jayamani jayamani@saveetha.ac.in

19MA214	Series and Transforms	L T P C 3 1 0 4

(FOR EEE & EIE)

Preamble :

The aim of this course is to develop an understanding of convergence of sequences and series. The syllabus includes Fourier series analysis which is central to many applications in engineering. The course is designed to study and understand the behavior of transforms such as Fourier Transform, Discrete Fourier Transform, Z Transform and Wavelet Transform which are widely used in Signal Processing.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

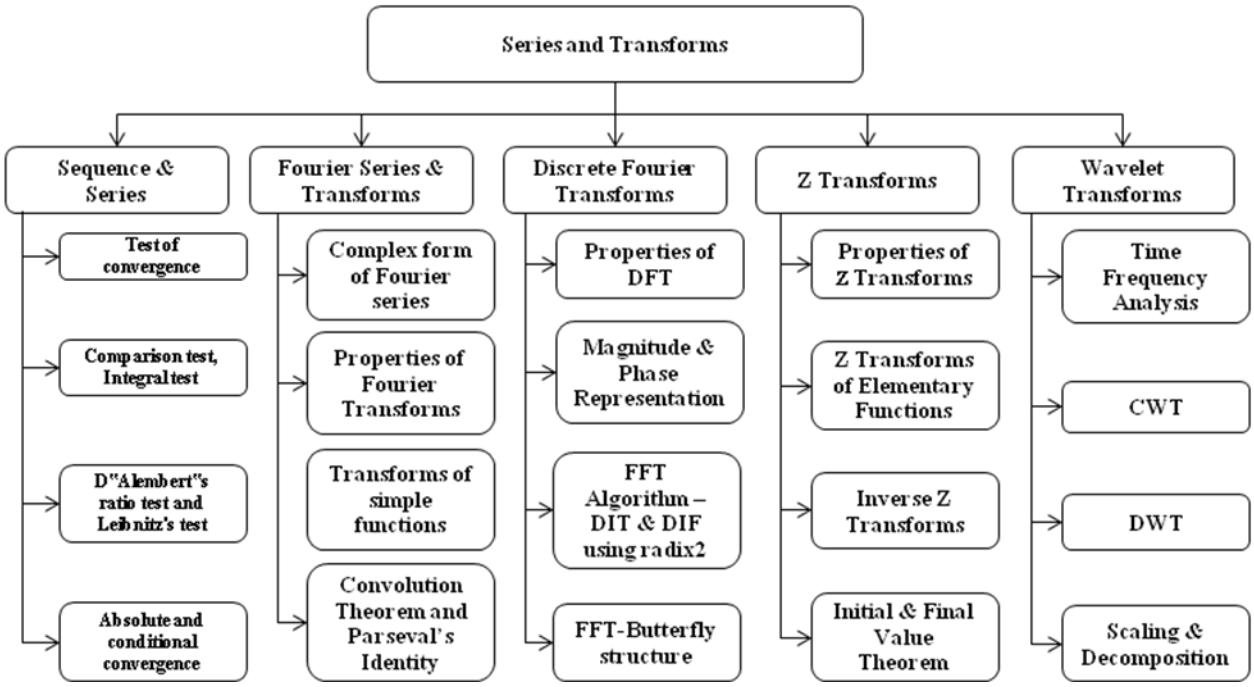
CO1	Study the convergence of real *sequences* and **apply** them to study the convergence behavior of various infinite series.	**Apply**
CO2	Calculate the complex form of the Fourier series for standard periodic waveforms and **evaluate** the Fourier transforms which represents frequency domain of signals.	**Evaluate**
CO3	Study the frequency domain representation of discrete time signal **using** Discrete time Fourier Transform.	**Analyze**
CO4	To **Analyze** the properties and techniques of Z transform.	**Analyze**
CO5	**Understand** the wavelet transform concepts which are necessary for data compression and noise suppression.	**Understand**

Mapping with PO and PSOs

EIE														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	1	-	-	-	-	-	-	-	-	2	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	1	2
CO3	3	2	2	1	-	-	-	-	-	-	-	-	2	3
CO4	3	2	1	1	-	-	-	-	-	-	-	-	-	3
CO5	3	2	1	1	-	-	-	-	-	-	-	-	1	3

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA214	Series and Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	SEQUENCE AND SERIES	12
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms –Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.		
UNIT II	**FOURIER SERIES AND TRANSFORMS**	**12**
Complex form of Fourier series – Statement of Fourier integral theorem – Fourier transform pair– Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.		
UNIT III	**DISCRETE FOURIER TRANSFORMS**	**12**
Discrete Fourier Transform - properties, magnitude and phase representation – computation of DFT using FFT algorithm –DIT & DIF using radix2 - FFT-Butterfly structure.		
UNIT IV	**Z TRANSFORMS**	**12**
Z-transforms - Elementary properties – Inverse Z-transform using partial fractions and residues –Initial and final value theorems - Convolution theorem.		
UNIT V	**WAVELET TRANSFORMS**	**12**
Introduction of time frequency analysis-Continuous wavelet Transform-CWT as operator-Discrete wavelet transform introduction-scaling function-Decomposition-Interpolation.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Bali N., Goyal M. and Watkins C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2) The Illustrated Wavelet Transform Handbook: Introductory Theory and Applications in Science, Engineering, Medicine and Finance, Second EditionHardcover – Import, 26 Jan 2017 by Paul S. Addison , CNC Press.
3) Algorithms for Discrete Fourier Transform and Convolution - Tolimieri R, Springer publications.

REFERENCES :

1) G. James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,2007.
2) L.C Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
3) N.P. Bali. and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
4) Introduction to Wavelets and Wavelet Transforms: A Primer 1st Edition - C. Sidney Burrus (Author), Ramesh A. Gopinath (Author), Haitao Guo (Author)-Prentice Hall, 1998
5) Mathematics of the Discrete Fourier Transform: With Audio Applications by Julius O., III Smith (Author) – Create space publishers

Course Designers:

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2. Ms. V .N. Jayamani jayamani@saveetha.ac.in

SAVEETHA ENGINEERING COLLEGE
AUTONOMOUS
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NAAC A GRADE

Department of Information Technology

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA201	Calculus and Matrix Algebra*	BS	3	1	0	4	2-2	-
2	19MA206	Logic and Combinatorics*	BS	3	1	0	4	2-2	19MA201
3	19MA212	Algebra and Number Theory	BS	3	1	0	4	2-2	19MA201
4	19MA218	Probability and Queueing Theory	BS	3	1	0	4	2-2	19MA201

Note:

*Exempted for Lateral Entry Students

19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

(COMMON TO AGRI, CHEMICAL, CIVIL, CSE, IT & MECH)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Prerequisite: NIL

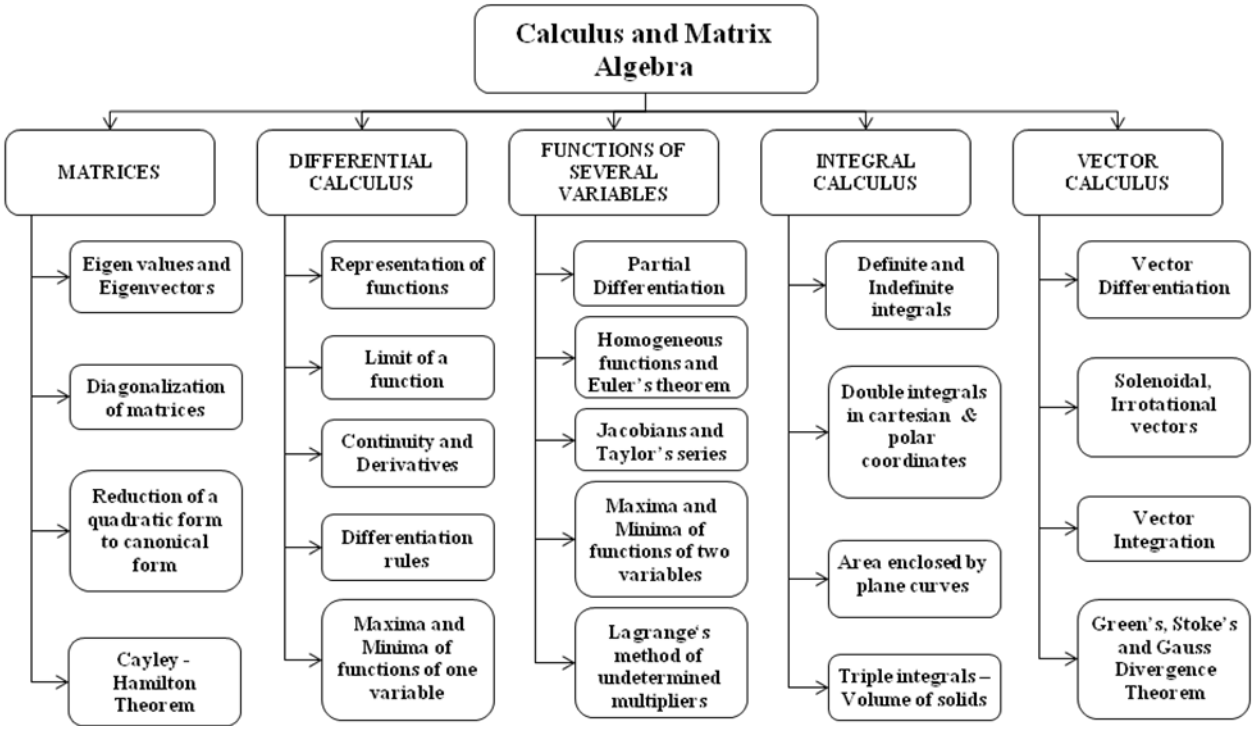
Course Outcomes: At the end of the course learners will be able to:

CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** line and surface integrals in vector fields.	**Evaluate**

Mapping with PO and PSOs

IT														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	2	1
CO2	3	2	2	1	-	-	-	-	-	-	-	1	2	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1
CO4	3	3	1	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	2	1	-	-	-	-	-	-	-	-	1	1

Concept Map:



19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.		
UNIT V	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2) James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
3) Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015

REFERENCES :

1) Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2) Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3) Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4) Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5) Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, NewDelhi, 5th edition, 2013.

Course Designers:

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19MA206	Logic and Combinatorics	L T P C 3 1 0 4

(COMMON to CSE & IT)

Preamble :

This course covers the mathematical topics most directly related to computer science. Topics includes: logic, count ability and counting arguments, proof techniques. Software engineering uses graphs, trees and other data structures. Logic is used in AI research in theorem proving and in database query systems.

Prerequisite:

19MA201- Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

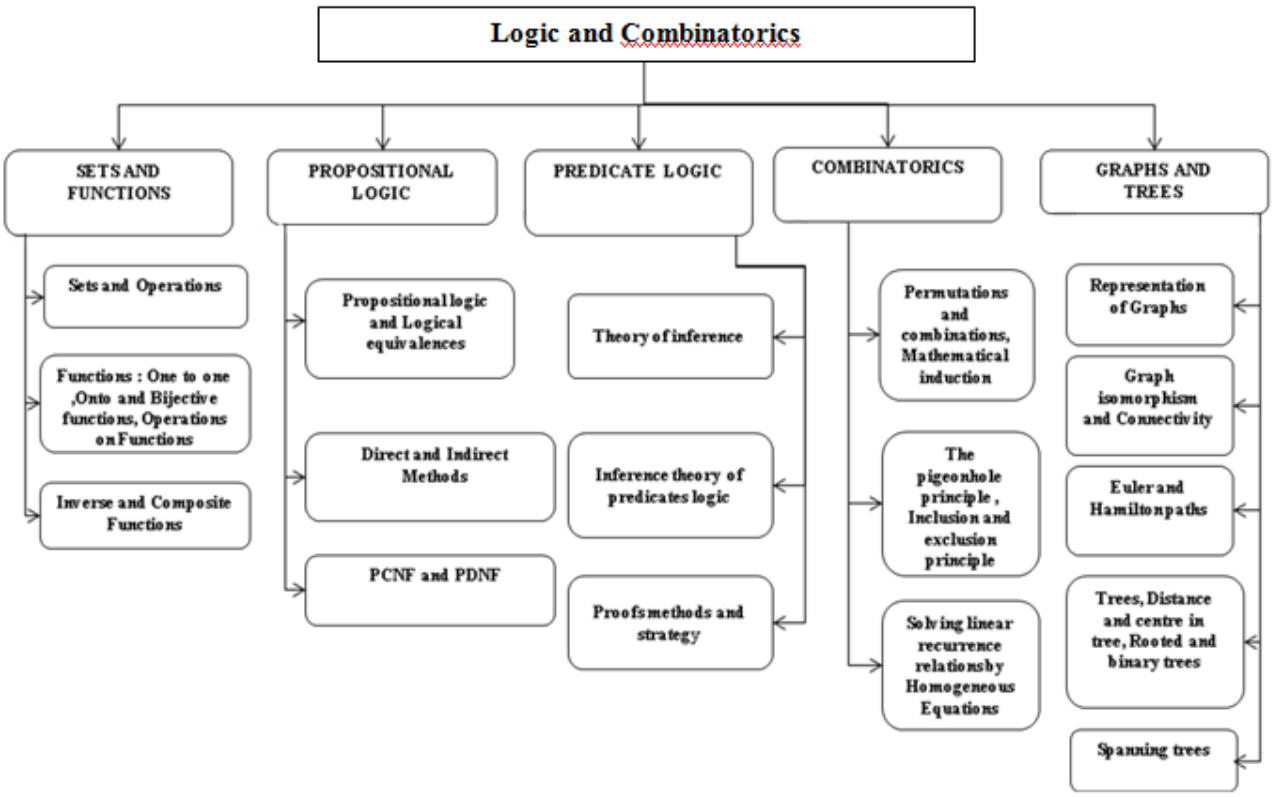
CO1	Construct the class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.	**Understand**
CO2	To extend student's logical and mathematical maturity and ability to deal with abstraction.	**Analyze**
CO3	Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.	**Evaluate**
CO4	Construct the recurrence relation for a given engineering problems and solve the recurrence equation.	**Apply**
CO5	Demonstrate different traversal methods for trees and graphs.	**Understand**

Mapping with PO and PSOs

IT														
Course Outcomes	Program Outcomes												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	1	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO4	3	3	2	1	-	-	-	-	-	-	-	-	1	-
CO5	3	3	2	1	-	-	-	-	-	-	-	-	-	1

3 – Strong; 2 – Medium; 1-Low

Concept Map



19MA206	Logic and Combinatorics	L T P C 3 1 0 4

SYLLABUS

UNIT I	SETS AND FUNCTIONS	12
Sets and operations — Proofs of set identities — Relations — Equivalence relations –Functions : one to one, onto and bijective functions, operations on functions : Inverse and composite Functions.		
UNIT II	**PROPOSITIONAL LOGIC**	**12**
Propositional logic – Arguments – Logical laws – Logical equivalences – Direct and Indirect Methods– PCNF and PDNF (Using Truth tables and Laws).		
UNIT III	**PREDICATE LOGIC**	**12**
Theory of inference – Quantifiers— Predicate formulas—Inference theory of predicates logic. Proofs methods and strategy—Direct method of proofs and Indirect method of proofs.		
UNIT IV	**COMBINATORICS**	**12**
Counting Principles — Permutations and combinations — Mathematical induction – The pigeonhole principle — Inclusion and exclusion principle — Recurrence relations – Solving linear recurrence relations – Generating functions (Homogeneous Equations).		
UNIT V	**GRAPHS AND TREES**	**12**
Representation of graphs – Directed and indirected graphs – Graph isomorphism – Connectivity – Euler and Hamilton graphs. Trees– properties of trees– Distance and centre in tree– Rooted and binary trees–Spanning trees.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
3. J.L., Mott, A. Kandel, T.P. Baker, “Discrete Maths for Computer Scientists & Mathematics”. Second Edition, Prentice Hall of India Pvt Limited, New Delhi,2009.

REFERENCES :.

1. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum’s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
2. Ralph. P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Fourth Edition, Pearson Education Asia, Delhi, 2006.
3. Thomas Koshy, Discrete Mathematics with Applications, Elsevier Publications, 2006.
4. Seymour Lipschutz and Mark Lipson, Discrete Mathematics, Schaum’s Outlines, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, Second edition, 2011.
5. Dr. A.Singaravelu and Dr. M. P. Jeyaramam.,”Graph Theory and Applications” First Edition,2017
6. C Liu, D. Mohapatra Elements of Discrete Mathematics: A Computer Oriented Approach, 2017 .

Course Designers:

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19MA212	Algebra and Number Theory	L T P C
		3 1 0 4

(COMMON to CSE and IT)

Preamble:

This course gives an integrated approach to number theory and abstract algebra, and provide a firm basis for arithmetic's in computer science field. The concepts of divisibility, prime number, GCD, LCM and modular arithmetic in number theory are used in computer programming. The concept of congruence is used in coding theory and cryptography.

Prerequisite:

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

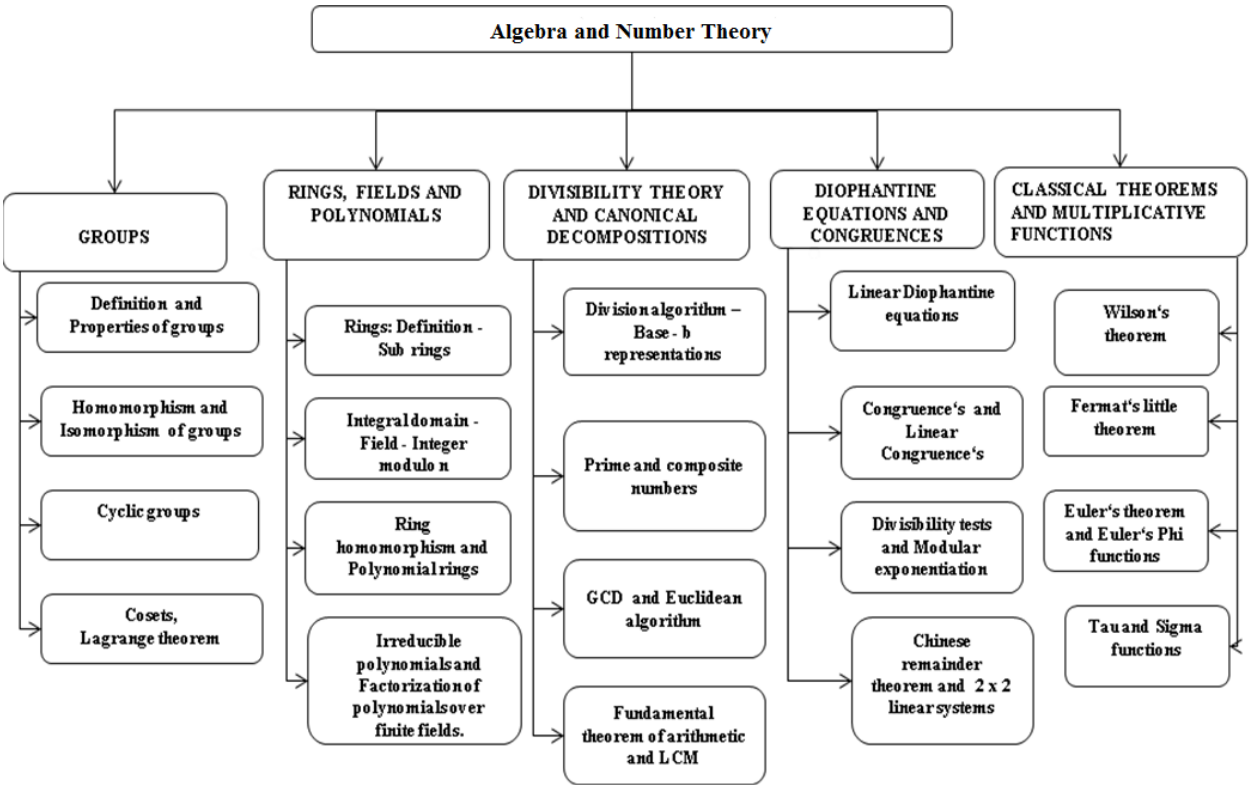
CO1	Apply the basic notions of groups which will then be used to solve related problems	**Apply**
CO2	Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.	**Understand**
CO3	Demonstrate accurate and efficient use of advanced algebraic techniques.	**Evaluate**
CO4	Demonstrate their mastery by solving non - trivial problems related to the concepts.	**Evaluate**
CO5	Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.	**Apply**

Mapping with PO and PSOs

IT														
Course Outcomes	Program Outcomes												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	-	-	-	-	1	1
CO2	3	3	2	1	-	-	-	-	-	-	-	-	-	1
CO3	3	3	2	1	-	-	-	-	-	-	-	-	2	-
CO4	3	3	2	1	-	-	-	-	-	-	-	-	-	2
CO5	3	3	2	1	-	-	-	-	-	-	-	-	1	-

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA212	Algebra and Number Theory	L T P C 3 1 0 4

SYLLABUS

UNIT I	GROUPS	12
Groups : Definition - Properties - Homomorphism - Isomorphism - Cyclic groups - Cosets - Lagrange's theorem.		
UNIT II	**RINGS, FIELDS AND POLYNOMIALS**	**12**
Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n - Ring homomorphism - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.		
UNIT III	**DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS**	**12**
Division algorithm – Base - b representations –Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.		
UNIT IV	**DIOPHANTINE EQUATIONS AND CONGRUENCES**	**12**
Linear Diophantine equations – Congruence‘s – Linear Congruence‘s - Applications: Divisibility tests - Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.		
UNIT V	**CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS**	**12**
Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions – Tau and Sigma functions.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007.
2. Koshy, T., ―Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

REFERENCES :.

1. San Ling and Chaoping Xing, ―Coding Theory – A first Course, Cambridge Publications, Cambridge, 2004
2. Lidl, R. and Pitz, G, "Applied Abstract Algebra", 2nd Edition Springer Verlag, New Delhi, 2006.
3. Niven, I., Zuckerman.H.S., and Montgomery, H.L., ―An Introduction to Theory of Numbers, John Wiley and Sons , Singapore, 2004.
4. Andrews, G. E, “Number theory”, Dover publications, Newyork, 2012.
5. Herstein, I. N, “Topics in Algebra”, 2nd Edition, John Wiley and Sons, India.

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19MA218	Probability and Queueing Theory	L T P C 3 1 0 4

(COMMON to CSE & IT)

Preamble :

This course is designed to provide necessary basic concepts in probability, standard distributions and random processes which are widely applied in random signals, linear systems in communication engineering and IT fields. The syllabus also covers the concepts of Markovian and advanced queueing models which are essential to design and analyze computer networks.

Prerequisite :

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

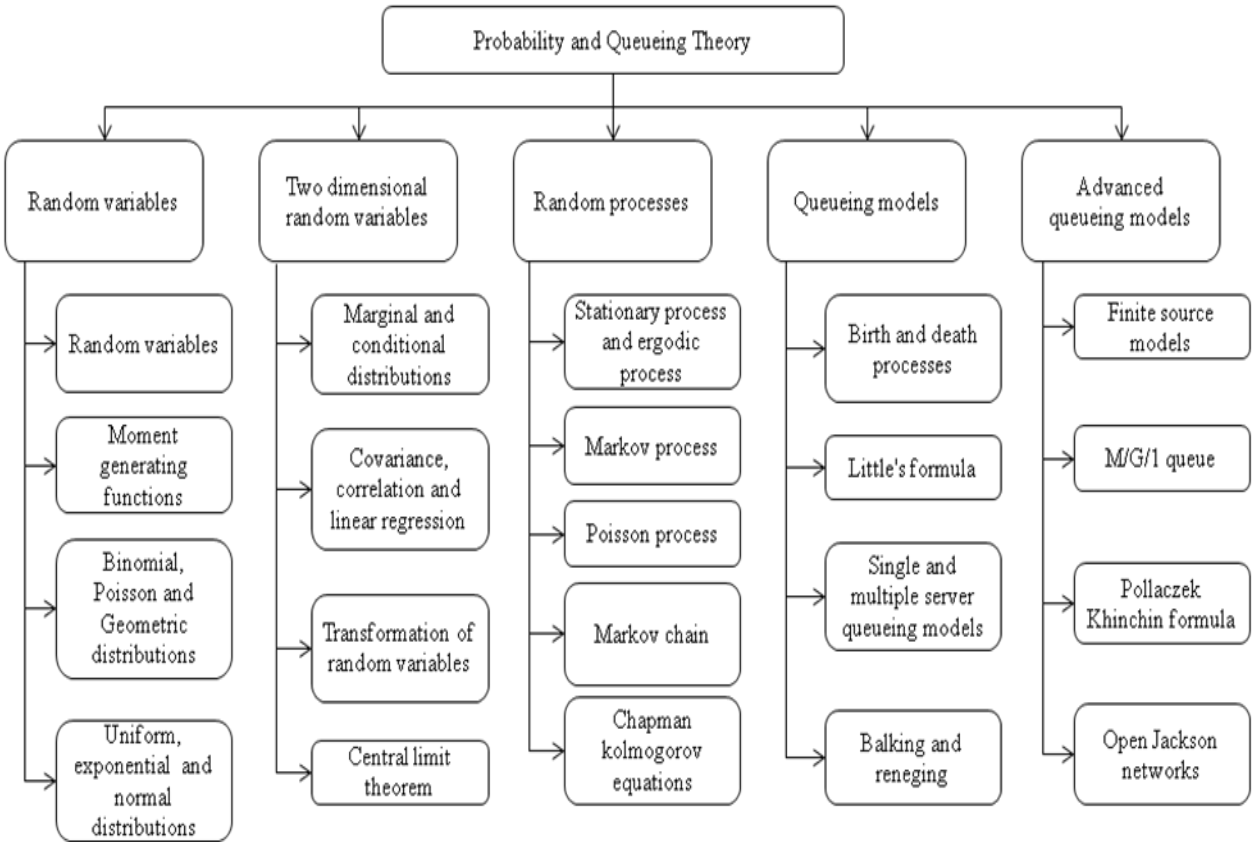
CO1	**Understand** the fundamental concepts of probability and acquire knowledge of standard distributions which can describe real life phenomena.	**Understand**
CO2	**Identify** various distribution functions and acquire skills in handling situations involving more than one variable.	**Apply**
CO3	**Analyze** the various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	**Analyze**
CO4	Understand the basic characteristic features of a queuing system and acquire skills in **analyzing** queuing models.	**Analyze**
CO5	**Analyze** a network of queues with Poisson external arrivals, exponential service requirements and independent routing.	**Analyze**

Mapping with PO and PSOs

IT														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	1	-	-	-	-	-	-	1	1	1
CO2	3	3	2	2	1	-	-	-	-	-	-	-	1	1
CO3	3	3	2	2	1	-	-	-	-	-	-	1	2	2
CO4	3	3	2	1	1	-	-	-	-	-	-	1	1	1
CO5	3	3	2	1	1	-	-	-	-	-	-	1	1	1

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA218	Probability and Queueing Theory	L T P C 3 1 0 4

SYLLABUS

UNIT I	RANDOM VARIABLES AND DISTRIBUTIONS	12
Discrete and continuous random variables –Functions of a random variable–Moments – Moment generating functions – Binomial Poisson, Geometric, Uniform, Exponential, and Normal distributions		
UNIT II	**TWO - DIMENSIONAL RANDOM VARIABLES**	**12**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables –Central limit theorem.		
UNIT III	**RANDOM PROCESSES**	**12**
Classification – Stationary process – Ergodic process – Markov process – Poisson process – Discrete parameter Markov chain – Classification of state of a Markov Chain – Chapman Kolmogorov equations.		
UNIT IV	**QUEUEING MODELS**	**12**
Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little‟s formula - Queues with finite waiting rooms – Queues with impatient customers: Balking and reneging.		
UNIT V	**ADVANCED QUEUEING MODELS**	**12**
Finite source models - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Ibe. O.C., “Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2014.
2) Gross. D. and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student edition, 2012

REFERENCES :

1) Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2016.
2) Hwei Hsu, "Schaum‟s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2014.
3) Robertazzi, "Computer Networks and Systems: Queueing Theory and Performance Evaluation", , 3rd Edition, Springer, 2012.
4) Yates. R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
5) Taha. H.A., "Operations Research", 8th Edition, Pearson Education, Asia, 2010.

Course Designers:

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2. Mr. H. Prathab prathab@saveetha.ac.in

SAVEETHA ENGINEERING COLLEGE
AUTONOMOUS
Affiliated to Anna University | Approved by AICTE
NAAC A GRADE

Department of Mechanical Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA201	Calculus and Matrix Algebra*	BS	3	1	0	4	2-2	-
2	19MA205	Differential Equations and Laplace Transforms*	BS	3	1	0	4	2-2	19MA201
3	19MA211	Statistics and Numerical Methods	BS	3	0	2	4	2-1-2	19MA201 • **Theory C- 2** • **Practical C – 1** • No Observation • Only record

Note:

*Exempted for Lateral Entry Students

19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

(COMMON TO AGRI, CHEMICAL, CIVIL, CSE, IT & MECH)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Prerequisite: NIL

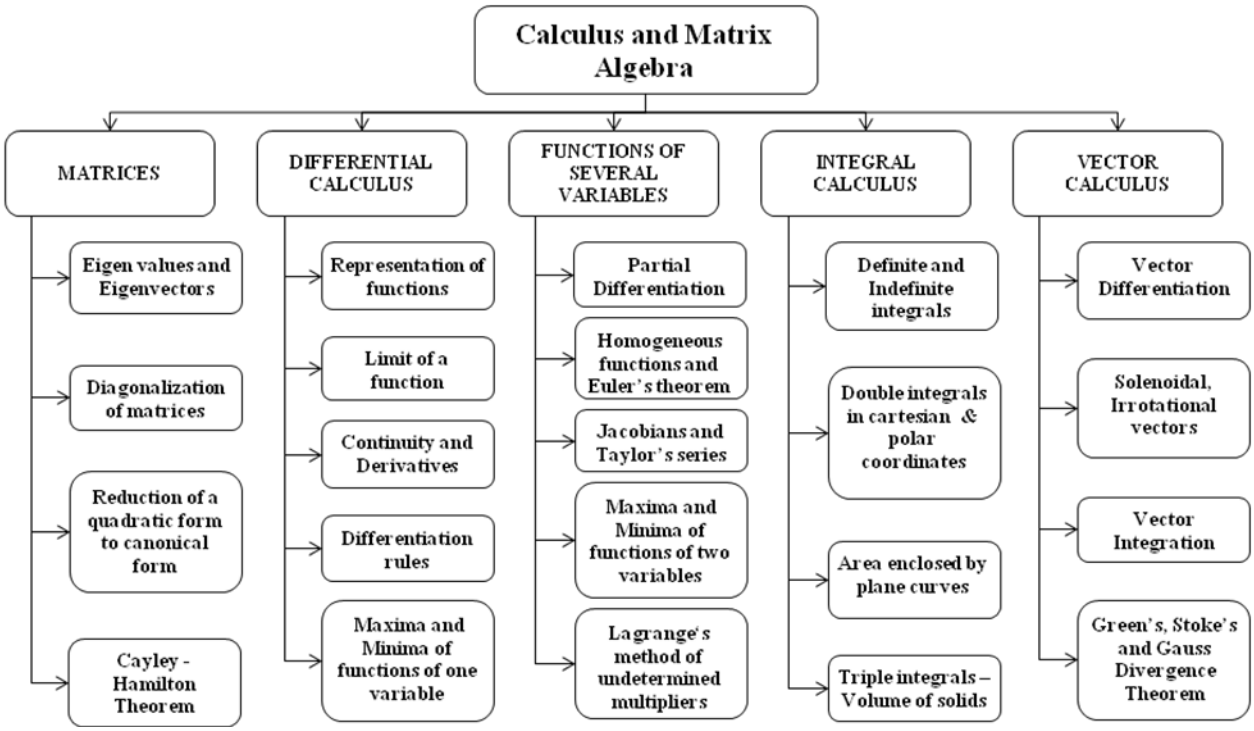
Course Outcomes: At the end of the course learners will be able to:

CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** line and surface integrals in vector fields.	**Evaluate**

Mapping with PO and PSOs

MECH															
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	3	2
CO2	3	2	2	1	-	-	-	-	-	-	-	1	3	3	2
CO3	3	2	2	-	-	-	-	-	-	-	-	1	3	2	2
CO4	3	3	1	-	-	-	-	-	-	-	-	-	3	2	2
CO5	3	2	2	1	-	-	-	-	-	-	-	-	3	2	2

Concept Map:



19MA201	Calculus and Matrix Algebra	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.		
UNIT V	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2) James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
3) Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015

REFERENCES :

1) Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2) Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3) Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4) Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5) Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, NewDelhi, 5th edition, 2013.

Course Designers:

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2 Ms. P. S. Narmathadevi narmathadevi@saveetha.ac.in

19MA205	Differential Equations and Laplace Transforms	L T P C 3 1 0 4

(COMMON TO CHEMICAL, CIVIL & MECHANICAL)

Preamble :

This course is designed to cover topics such as Fourier series, Differential equations and Laplace Transforms. The syllabus includes various techniques to solve differential equations which are essential to handle practical problems arising in the field of engineering. Fourier series are widely used in signal analysis to find strength and vibrations of buildings. The course includes Laplace transforms in which various methods can be used to transform the time domain functions to frequency domain.

Prerequisite:

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

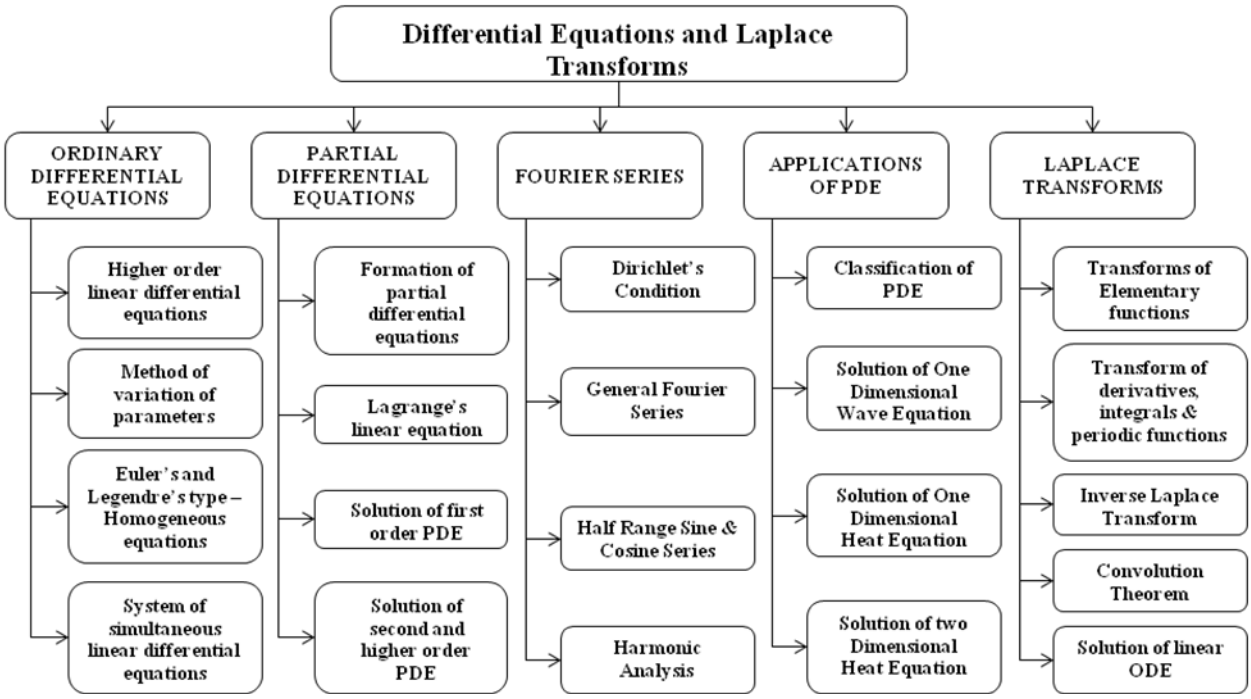
CO1	**Analyze** the suitable techniques for solving second and higher order differential equations.	**Analyze**
CO2	**Apply** suitable concepts in solving first order and higher order partial differential equations with constant coefficients.	**Apply**
CO3	**Evaluate** the Fourier series for standard periodic waveforms.	**Evaluate**
CO4	**Apply** the Fourier series techniques to solve wave and heat equations.	**Apply**
CO5	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**

Mapping with PO and PSOs

MECH															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2	1	-	-	-	-	-	-	-	1	3	3	2
CO2	3	3	2	2	-	-	-	-	-	-	-	1	3	3	2
CO3	3	2	3	1	-	-	-	-	-	-	-	-	3	2	2
CO4	3	3	2	2	-	-	-	-	-	-	-	-	3	2	2
CO5	3	3	2	1	-	-	-	-	-	-	-	-	3	2	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA205	Differential Equations and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	ORDINARY DIFFERENTIAL EQUATIONS	12
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients		
UNIT II	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations – Lagrange's linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and Non-homogeneous types.		
UNIT III	**FOURIER SERIES**	**12**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series-Harmonic Analysis.		
UNIT IV	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Basic properties –Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms –Transform of periodic functions – Convolution Theorem - Application to solution of linear second order ordinary differential equations with constant coefficients.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2) Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1) Bali N., Goyal M. and Watkins C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2) Jain R.K. and Iyengar S.R.K., ― Advanced Engineering Mathematics ‖, Narosa Publications, New Delhi , 3rd Edition, 2007.
3) O'Neil, P.V. ―Advanced Engineering Mathematics‖, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4) Sastry, S.S, ―Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5) Wylie, R.C. and Barrett, L.C., ―Advanced Engineering Mathematics ―Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

Course Designers:

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2. Ms. P. S. Narmathadevi narmathadevi@saveetha.ac.in

19MA211	Statistics and Numerical Methods	L T P C 3 0 2 4

(COMMON TO CIVIL & MECHANICAL)

Preamble:

The goal of the course is to provide a sound knowledge in testing of hypothesis for small and large samples which plays an important role in real time engineering problems. The syllabus deals with the basic concepts of design of experiments which are essential in the field of agriculture and statistical quality control. This course aims to impart knowledge in Numerical methods for solution of system of equations, interpolation, differentiation and integration. The syllabus also provides the solution for some of these methods using PYTHON techniques.

Prerequisite:

19MA201 - Calculus and Matrix Algebra

Course Outcomes: At the end of the course learners will be able to:

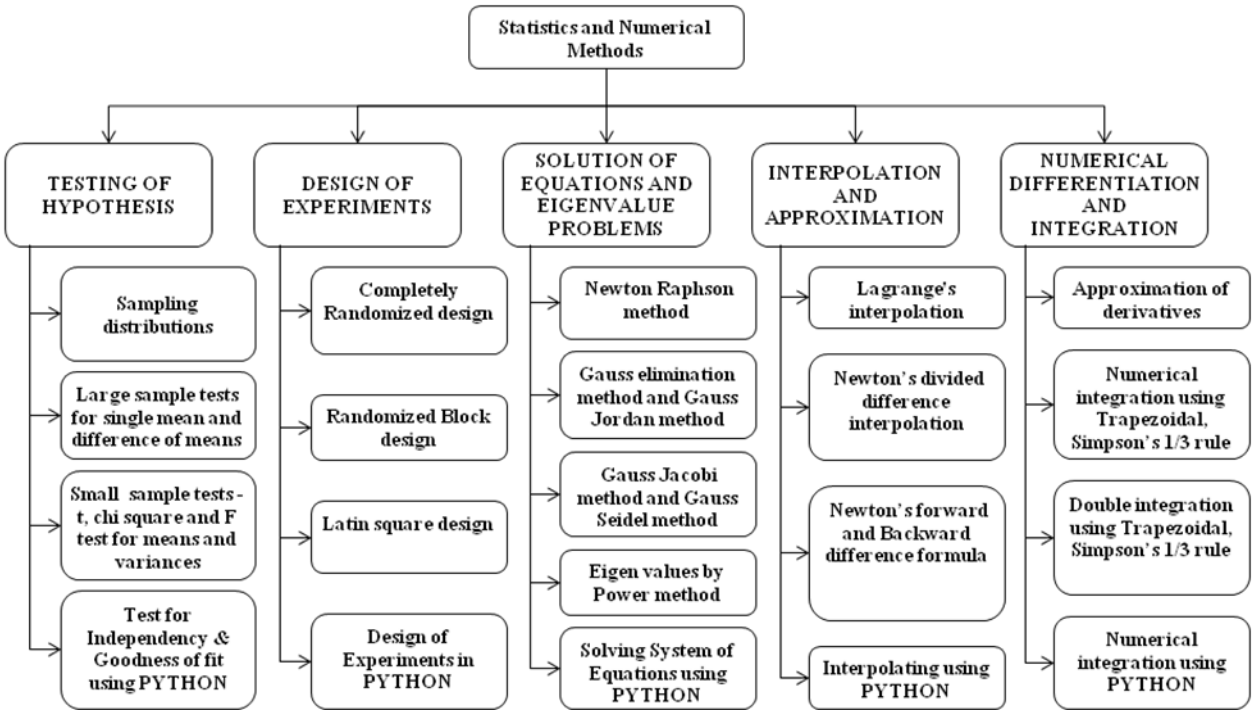
CO1	**Apply** the concept of testing of hypothesis for small and large samples in real life problems**.**	**Apply**
CO2	**Apply** the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.	**Apply**
CO3	**Obtain** solutions of algebraic and transcendental equations and solve linear system of equations using suitable numerical methods.	**Understand**
CO4	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values.	**Apply**
CO5	**Evaluate** derivatives and integrals using Numerical techniques.	**Evaluate**

Mapping with PO and PSOs

MECH															
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	1	-	-	-	-	-	-	-	1	3	3	2
CO2	3	3	2	1	-	-	-	-	-	-	-	1	3	3	2
CO3	3	3	2	-	-	-	-	-	-	-	-	1	3	2	2
CO4	3	3	3	1	-	-	-	-	-	-	-	1	3	2	2
CO5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA211	STATISTICS AND NUMERICAL METHODS	L T P C 3 0 2 4

SYLLABUS

UNIT I	TESTING OF HYPOTHESIS	12
Sampling distributions – Estimation of parameters – Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, chi square and F distributions for testing means, variance - Contingency table (Test for Independency)-Goodness of fit. **Testing of small samples (t, F and chi square) using Python.**		
UNIT II	**DESIGN OF EXPERIMENTS**	**12**
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design – **One way and two way classifications using Python.**		
UNIT III	**SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**	**12**
Solution of algebraic and transcendental equations – Newton Raphson method. Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method. **Newton Raphson and Gauss Seidal method using Python.**		
UNIT IV	**INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION**	**12**
Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's rule. **Interpolation and Numerical Integration using Python.**		
UNIT V	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Taylor's series method – Euler's method – Modified Eulers's method – Fourth order Runge-Kutta method for solving first and second order equations – Adams Bashforth's predictor – corrector methods for solving first order equations . **Runge-Kutta and Adams Bashforth' method using Python**.		
TOTAL: 75 PERIODS		

TEXT BOOKS:

1) Grewal. B.S., and Grewal. J.S.,"Numerical methods in Engineering and Science", Khanna Publishers, 45th Edition, New Delhi, 2017.
2) Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia,7th Edition, New Delhi, 2009
3) Gupta, S.C, and Kapoor, V.K. (2004). Fundamental of Mathematical Statistics (11th Ed),Sultan Chand & Sons, New Delhi.
4) Kent D. Lee. (2014). Python Programming Fundamentals (2nd Ed), Springer. DOI 10.1007/978-1-4471-6642-9

REFERENCES :

1. Statistics and Numerical Methods by T. Veerarajan & T Ramachandran- 29 Oct 2018.
2. SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India
3. Gerald. C. F., and Wheatley. P. O., Applied Numerical Analysis, Pearson Education, Asia,6th Edition, New Delhi, 2006.
4. Jaan Kiusalaas., Numerical Methods in Engineering with Python, Cambridge University Press The Edinburgh Building, Cambridge, UK., 2005
5. José Unpingco., Python for Probability, Statistics, and Machine Learning, Springer, DOI 10.1007/978-3-319-30717-6., 2016

Course Designers:

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2. Mr.K.Thirumalai thirumalai@saveetha.ac.in

SAVEETHA ENGINEERING COLLEGE
AUTONOMOUS
Affiliated to Anna University | Approved by AICTE
NAAC A GRADE

Department of Medical Electronics Engineering

S. No	Sub. Code	Sub. Title	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA202	Calculus and Laplace Transforms*	BS	3	1	0	4	2-2	-
2	19MA204	Complex Variables and Ordinary Differential Equations*	BS	3	1	0	4	2-2	19MA202
3	19MA213	Linear Algebra and Numerical Methods	BS	3	1	0	4	2-2	19MA202
4	19MA217	Random Processes and Statistics	BS	3	1	0	4	2-2	19MA202

Note:

*Exempted for Lateral Entry Students

19MA202	Calculus and Laplace Transforms	L T P C
		3 1 0 4

(COMMON TO BIO MED, ECE, EEE, EIE & MED ELEC)

Preamble:

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. This is a foundation course which mainly deals with topics such as matrices, single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines. The syllabus also includes Laplace transforms in which various methods can be used to transform the time domain circuits to frequency domain to simplify the solution of differential equations.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

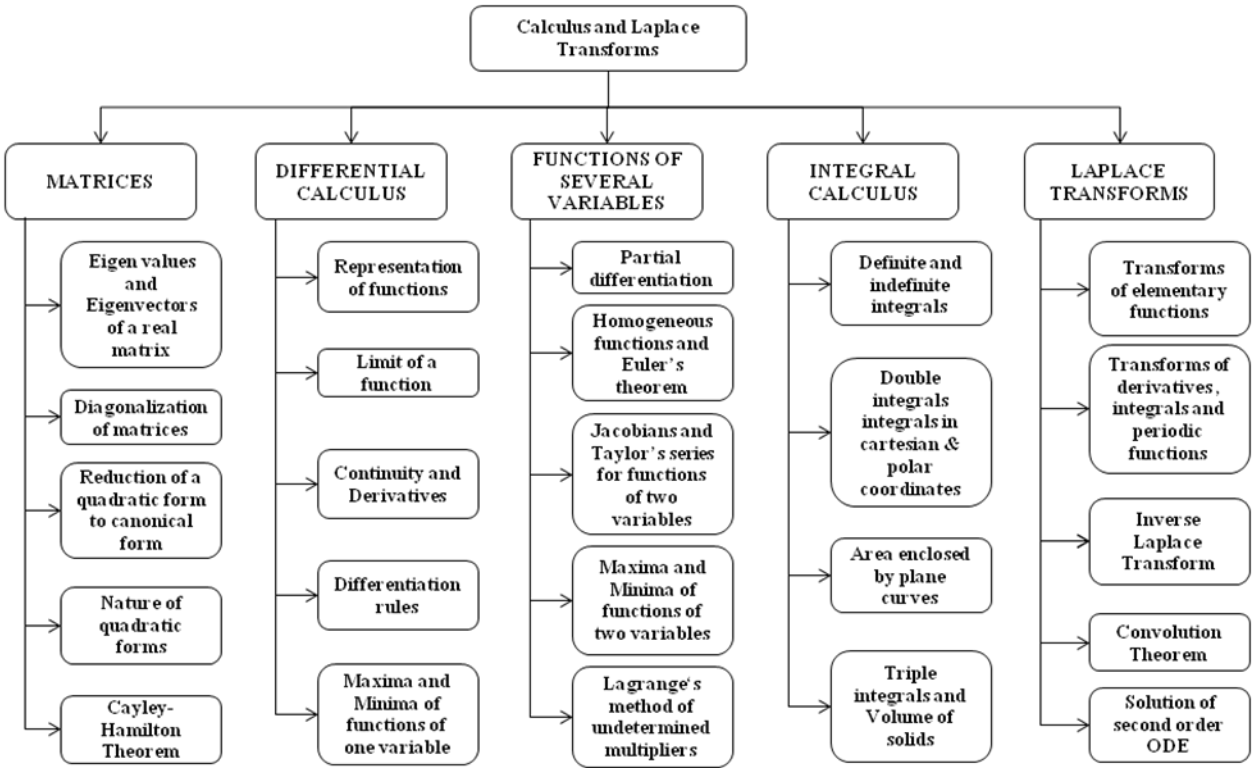
CO1	**Develop** the use of matrix algebra techniques which is needed by engineers for practical applications	**Analyze**
CO2	**Apply** the various differentiation concepts in model problems and to obtain maxima and minima for a given function.	**Apply**
CO3	**Evaluate** maxima and minima for a given function with several variables by finding stationary points.	**Evaluate**
CO4	Acquire sound knowledge of techniques in integral calculus and **apply** the necessary tools in evaluating multiple integrals which are used to solve model engineering problems.	**Apply**
CO5	**Evaluate** Laplace transforms of elementary functions and apply those concepts in solving linear second order ordinary differential equations with constant coefficients.	**Evaluate**

Mapping with PO and PSOs

MED ELEC														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	1	-	-	-	-	-	-	-	1	3	2
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1	3	1
CO5	2	3	2	1	-	-	-	-	-	-	-	-	3	2

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA202	Calculus and Laplace Transforms	L T P C 3 1 0 4

SYLLABUS

UNIT I	MATRICES	12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.		
UNIT II	**DIFFERENTIAL CALCULUS**	**12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules -Maxima and Minima of functions of one variable.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Double integrals – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solid		
UNIT V	**LAPLACE TRANSFORMS**	**12**
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1. Grewal B.S., ―Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Kreyszig.E Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition, 2015.
3. Sanjay Mishra, Fundamentals of Mathematics Differential Calculus, Pearson Education India, June 2016.

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, Calculus, Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
3. Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4. Srimantha Pal and Bhunia, S.C, Engineering Mathematics, Oxford University Press, 2015.
5. Veerarajan.T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, 5th edition, 2013.

Course Designers:

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19MA204	Complex Variables and Ordinary Differential Equations	L T P C
		3 1 0 4

(COMMON to ECE , BME & MED ELEC)

Preamble:

This course is designed to cover topics such as Vector Calculus, Complex Analysis , Sequences and series. Vector calculus and differential equations can be widely used for modeling the various laws of physics. The syllabus includes concepts of analytic functions which are applied to evaluate Contour Integrals.

Prerequisite:

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

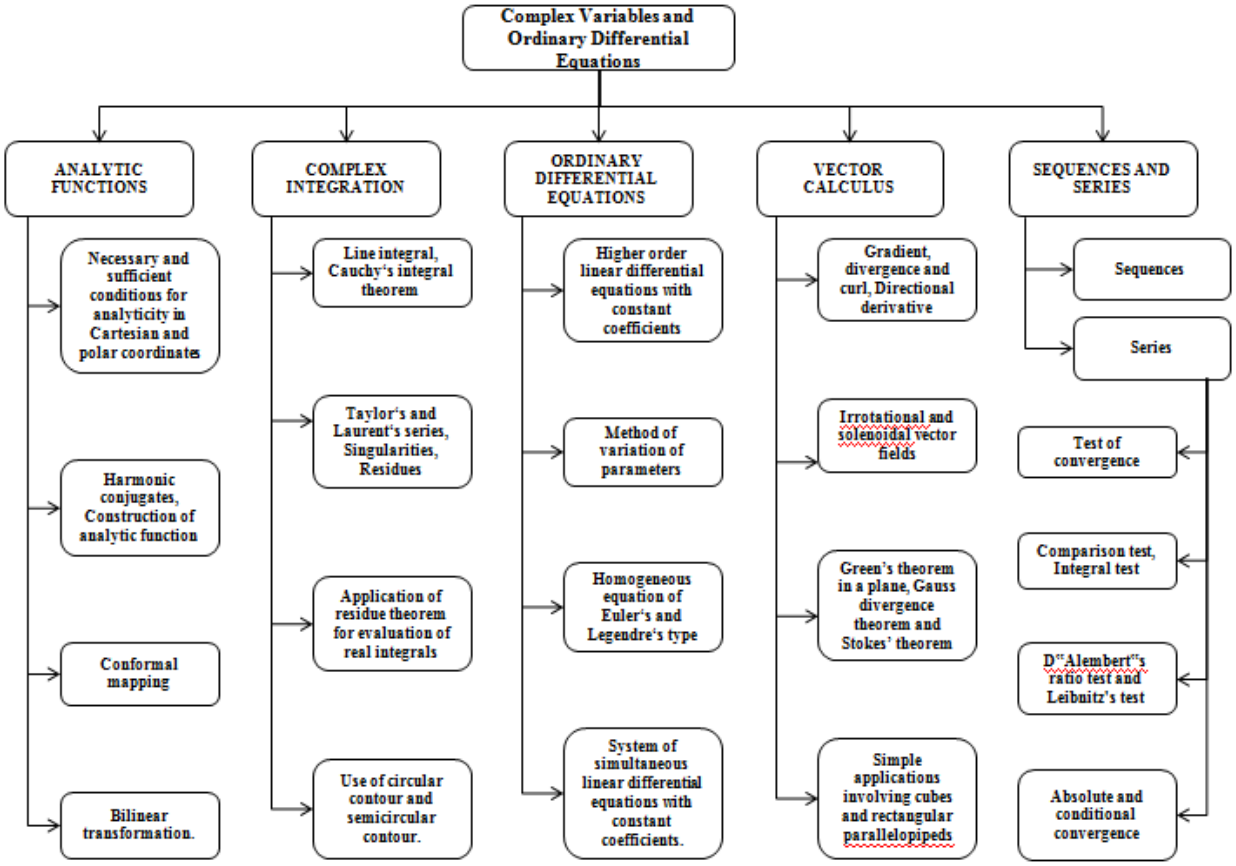
CO1	**Identify** and construct analytic functions and conformal mapping.	**Apply**
CO2	Understand the fundamental concepts of complex analysis and **apply** them to evaluate contour integrals.	**Apply**
CO3	**Analyze** various techniques in solving ordinary differential equations.	**Analyze**
CO4	**Determine** the vector differentiation and vector integration.	**Evaluate**
CO5	**Test** the convergene of infinite series and evaluate the limits.	**Evaluate**

Mapping with PO and PSOs

MED ELEC														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO4	3	3	1	1	-	-	-	-	-	-	-	-	2	2
CO5	3	2	1	1	-	-	-	-	-	-	-	1	2	1

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA204	Complex Variables and Ordinary Differential Equations	L T P C 3 1 0 4

SYLLABUS

UNIT I	ANALYTIC FUNCTIONS	12
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – $w = z + c, cz, \frac{1}{z}, z^2$, Bilinear transformation.		
UNIT II	**COMPLEX INTEGRATION**	**12**
Line integral - Cauchy‘s integral theorem – Cauchy‘s integral formula – Taylor‘s and Laurent‘s series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.		
UNIT III	**ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler‘s and Legendre‘s type – System of simultaneous linear differential equations with constant coefficients.		
UNIT IV	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.		
UNIT V	**SEQUENCES AND SERIES**	**12**
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D‘‘Alembert‘‘s ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence		
TOTAL: 60 PERIODS		

TEXT BOOKS:

1) Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, Nineth Edition, Laxmi Publications Pvt Ltd., 201
2) Grewal. B.S, “Higher Engineering Mathematics”, 43rd Edition, Khanna Publications, Delhi, 2014.
3) Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi,1st Edition ,2017.

REFERENCES :

1) Dass, H.K., and Er. Rajnish Verma,” Higher Engineering Mathematics”, S. Chand Private Ltd., 2011
2) Peter V. O‘‘Neil,” Advanced Engineering Mathematics”, 7th Edition, Cengage learning, 2012.
3) Sivarama Krishna Das P. and C.Vijayakumari, “Engineering Mathematics” , First Edition, Pearson Publishing 2017

Course Designers:

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19MA213	Linear Algebra and Numerical Methods	L T P C
		3 1 0 4

(COMMON to ECE & MED ELEC)

Preamble:

This course is designed to introduce the basic notions of groups, rings, fields which will then be used to solve related problems. The syllabus provides the basic concepts of vector spaces, linear transformations and inner product spaces. The course includes the concepts of numerical techniques to solve system of linear equations and to interpolate the missing data in a given range.

Prerequisite:

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

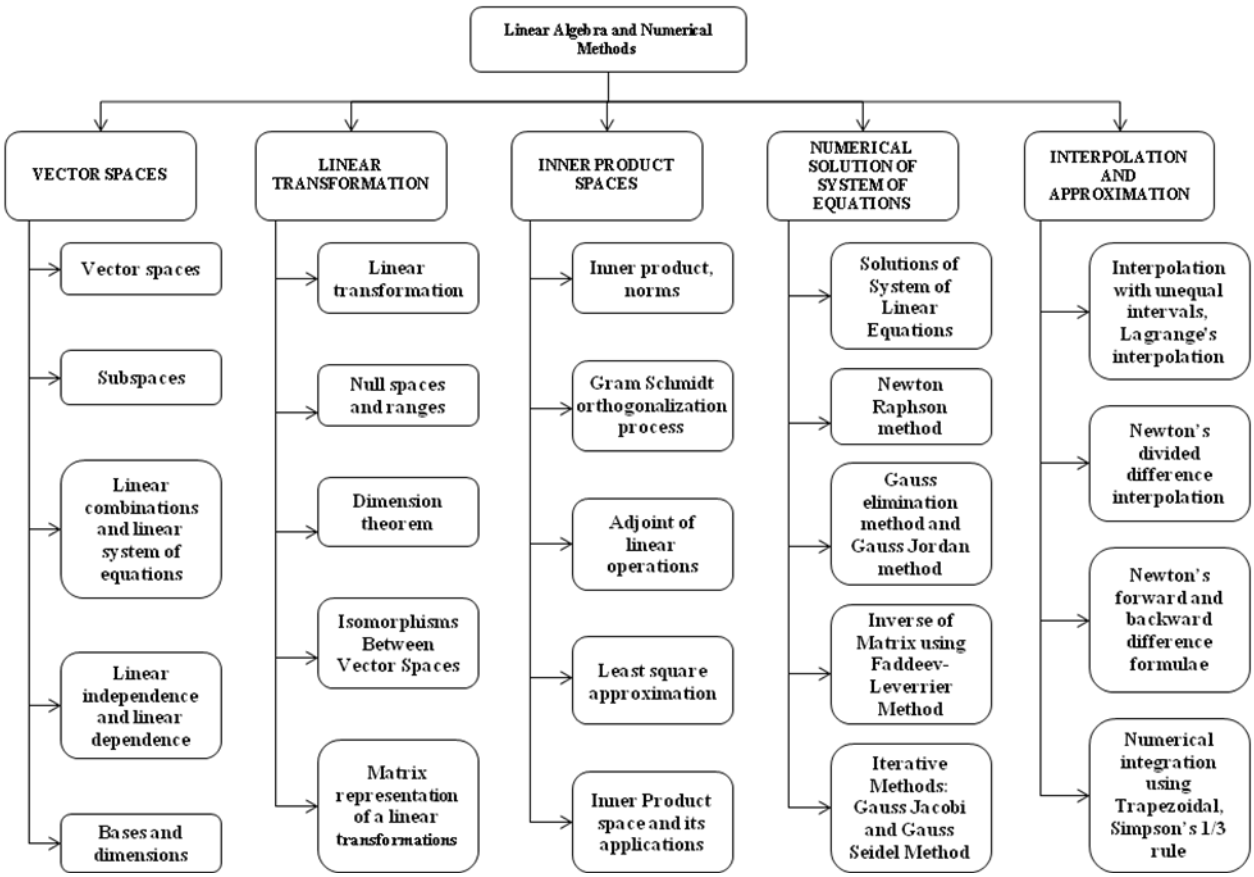
CO1	**Understand** the concepts of vector spaces.	**Understand**
CO2	**Understand** the concepts of vector space, linear transformations and diagonalization	**Understand**
CO3	**Apply** the concept of inner product spaces in orthogonalization.	A**pply**
CO4	**Analyze** suitable numerical techniques for solving system of linear equations.	**Analyze**
CO5	**Apply** interpolation in constructing approximate polynomial to represent the data and to find the intermediate values	**Apply**

Mapping with PO and PSOs

MED ELEC														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	-	-	-	-	-	-	-	-	1	3	2
CO2	3	1	2	-	-	-	-	-	-	-	-	1	3	2
CO3	2	1	2	-	-	-	-	-	-	-	-	1	3	-
CO4	3	2	2	2	-	-	-	-	-	-	-	1	3	1
CO5	3	2	3	2	-	-	-	-	-	-	-	1	3	1

3 – Strong; 2 – Medium; 1-Low

Concept Map:



19MA213	Linear Algebra and Numerical Methods	L T P C 3 1 0 4

SYLLABUS

UNIT I	VECTOR SPACES	12
Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.		
UNIT II	**LINEAR TRANSFORMATION**	**12**
Linear transformation - Null spaces and ranges - Dimension theorem - Isomorphism's Between Vector Spaces- Matrix representation of a linear transformations .		
UNIT III	**INNER PRODUCT SPACES**	12
Inner product, norms - Gram Schmidt orthogonalization process - Bessel's Inequality, Parseval's Identity - Adjoint of linear operations - Least square approximation- Inner Product space and its applications.		
UNIT IV	**NUMERICAL SOLUTION OF SYSTEM OF EQUATIONS**	**12**
Solutions of System of Linear Equations- Newton Raphson method, Solutions to linear systems -Direct method-Gauss elimination method- Pivoting - Gauss Jordan method - Inverse of Matrix using Faddeev-Leverrier Method - Iterative Method - Gauss Jacobi and Gauss Seidel Method.		
UNIT V	**INTERPOLATION AND APPROXIMATION**	**12**
Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation - Interpolation with equal intervals - Newton's forward and backward difference formulae- Numerical integration using Trapezoidal, Simpson's 1/3 rule.		

TEXT BOOKS:

1) Lay, D.C., ―Linear Algebra and its Applications‖, 5th Edition, Pearson Education, 2015.
2) SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 4th Revised Edition, New Delhi, 2017.
3) Saumyen Guha and Rajesh Srivastava, "Numerical methods for Engineering and Science", Oxford Higher Education, New Delhi, 2010.
4) Strang, G., ―Linear Algebra and its applications‖, Thomson (Brooks/Cole), New Delhi, 2005.

REFERENCES:

1) M.Artin, Algebra, Prentice-Hall of India,2nd Edition, 2011.
2) K.Hoffman and R.Kunze, Linear Algebra, 2nd Edition, Prentice- Hall of India, 2005.
3) O'Neil, P.V., ―Advanced Engineering Mathematics‖, Cengage Learning,7th Revised Edition , 2011.
4) Sundarapandian, V. ―Numerical Linear Algebra‖, Prentice Hall of India, New Delhi, 2008.
5) Friedberg, A.H., Insel, A.J. and Spence, L., ―Linear Algebra‖, Prentice Hall of India, New Delhi, 5th Edition, 2018.

Course Designers:

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19MA217	Random Processes and Statistics	L T P C
		3 1 0 4

(COMMON TO ECE, BIO-MED & MED-ELEC)

Preamble :

This course is designed to cover the concepts of probability distributions, random processes and spectral densities for applications such as random signals, digital signal processing etc in communication engineering. The syllabus also covers the techniques of hypothesis testing for small and large samples which plays an important role in real life problems.

Prerequisite :

19MA202 - Calculus and Laplace Transforms

Course Outcomes: At the end of the course learners will be able to:

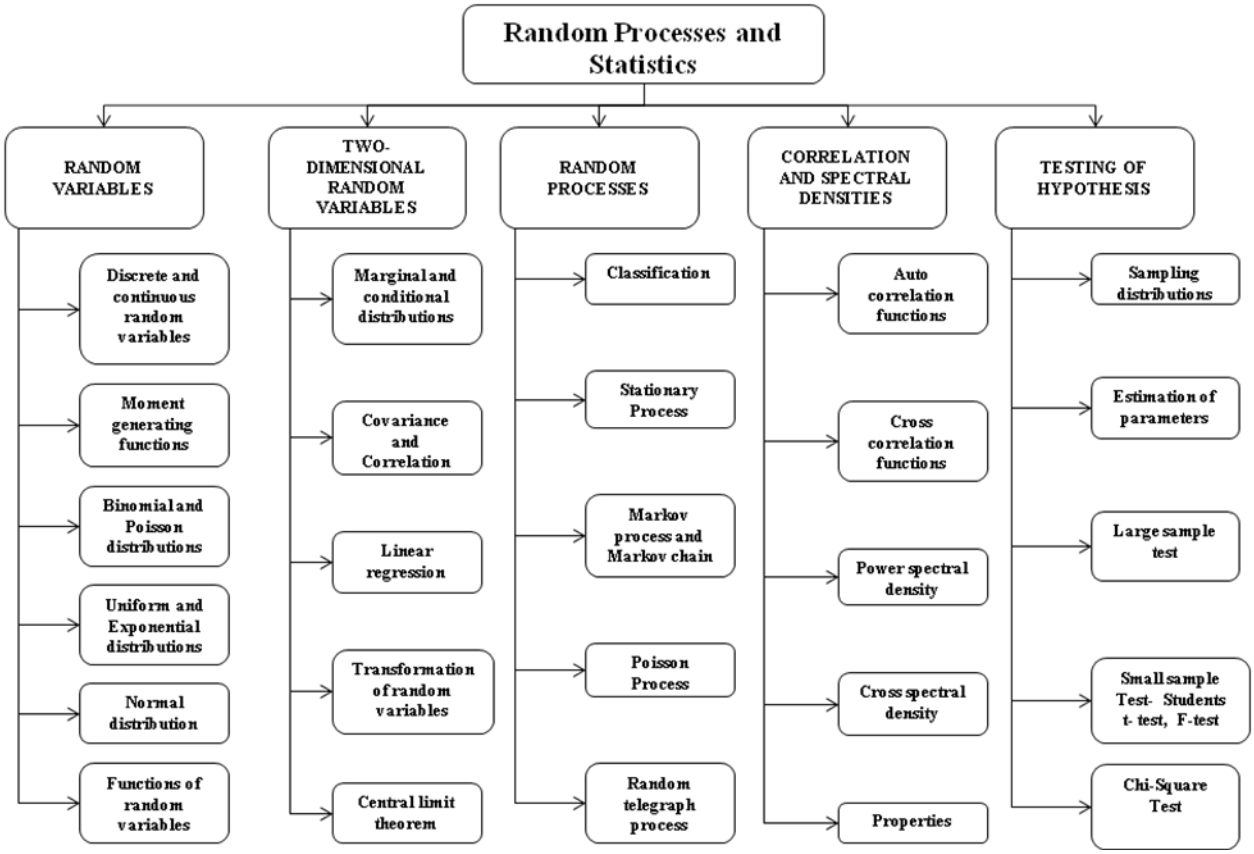
CO1	**Understand** the fundamental concepts of probability and acquire knowledge of standard distributions which can describe real life phenomena.	**Understand**
CO2	**Identify** various distribution functions and acquire skills in handling situations involving more than one variable.	**Apply**
CO3	**Analyze** the various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	**Analyze**
CO4	**Evaluate** functional relationship between random inputs and outputs with the use of Random Process Techniques.	**Evaluate**
CO5	**Apply** the concept of testing of hypothesis for small and large samples in real life problems**.**	**Apply**

Mapping with PO and PSOs

MED ELEC														
Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	2
CO2	3	2	1	2	-	-	-	-	-	-	-	1	3	2
CO3	3	2	1	1	-	-	-	-	-	-	-	1	3	-
CO4	3	3	2	1	-	-	-	-	-	-	-	1	2	-
CO5	3	2	1	1	-	-	-	-	-	-	-	1	3	1

3 – Strong; 2– Medium; 1-Low

Concept Map:



19MA217	Random Processes and Statistics	L T P C 3 1 0 4

SYLLABUS

UNIT I	RANDOM VARIABLES	12
Random variables - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions- Functions of random variables.		
UNIT II	**TWO - DIMENSIONAL RANDOM VARIABLES**	**12**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).		
UNIT III	**RANDOM PROCESSES**	**12**
Classification – Stationary process – Markov process - Markov chain - Poisson process – Random telegraph process.		
UNIT IV	**CORRELATION AND SPECTRAL DENSITIES**	**12**
Auto correlation functions – Cross correlation functions – Properties – Power spectral density –Cross spectral density – Properties.		
UNIT V	**TESTING OF HYPOTHESIS**	**12**
Sampling distributions – Estimation of parameters – Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t and F distributions for testing means, variances and proportion – Chi-square test- Contingency table (Test for Independency)		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.
2. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8 th Edition, 2015.

REFERENCES :

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
2. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata Mc Graw Hill Edition, New Delhi, 9th Reprint, 2010.
4. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8 th Edition, 2007.

Course Designers:

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SAVEETHA ENGINEERING COLLEGE

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NAAC A GRADE

Autonomous Syllabus

OFFERED BY

Department of Mathematics

UG Open Electives

(Common to all Departments)

UG Open Electives

S. No	Sub. Code	Sub. Title	Departments	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MA601	Resource Management Techniques	Common to All	UG Elective	3	0	0	3	2-1	-
2	19MA602	Statistics for Engineers	Common to All	UG Elective	3	0	0	3	2-1	-

19MA601	Resource Management Techniques	L T P C 3 0 0 3

(COMMON TO ALL)

Preamble :

The course is designed to identify situations in which linear programming techniques can be applied. It helps to understand basic concepts and general mathematical structure of a LPP model. The syllabus helps to examine multiple optimal solutions and prohibited routes in the transportation and assignment problems. The objective of PERT and CPM is to schedule activities associated with any project in an efficient manner.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to

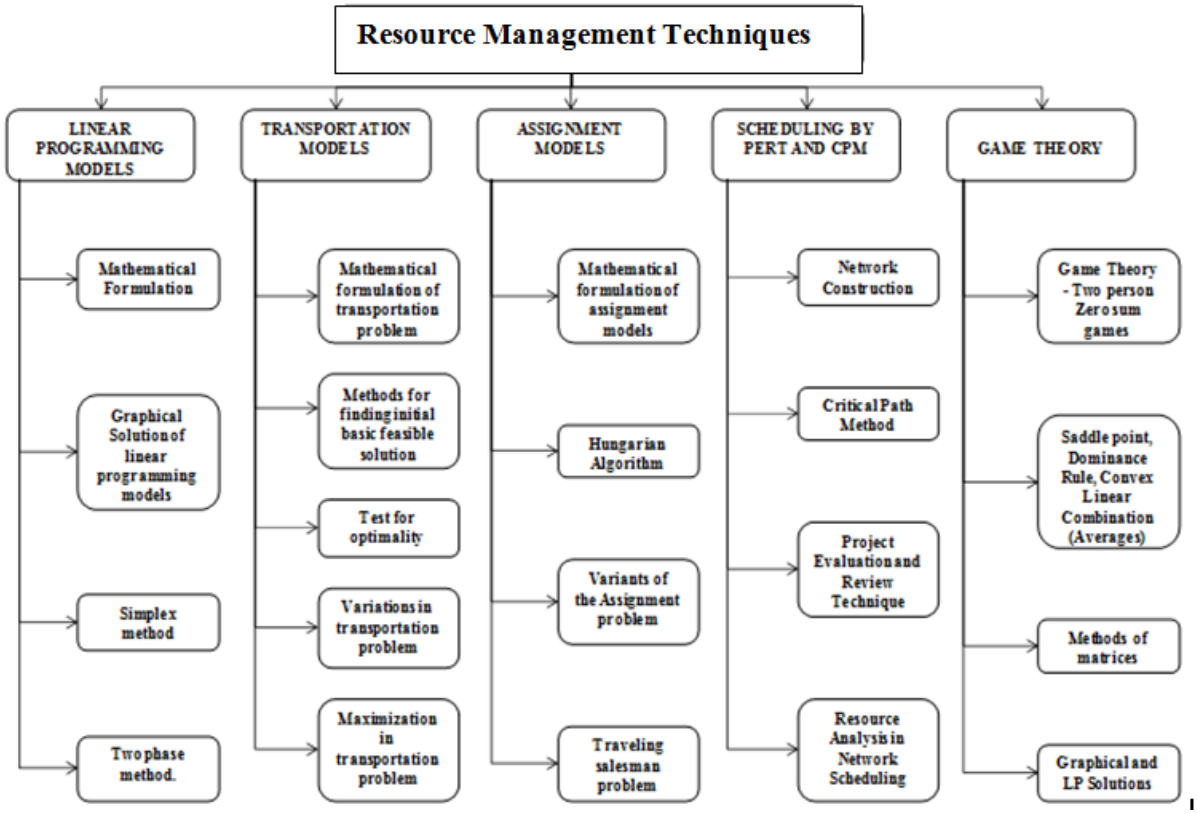
CO1	**Apply** simplex method to solve optimization problems	**Apply**
CO2	**Analyze** and formulate a transportation problem involving a large number of shipping routes.	**Analyze**
CO3	**Understand** the features of assignment problems.	**Understand**
CO4	**Construct** network diagrams of activities involved in a project management **using** PERT and CPM techniques.	**Create**
CO5	**Analyze** the game theory techniques in mathematical models of strategic interaction between rational decision-makers.	**Analyze**

Mapping with PO and PSOs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-	-	-	-	1	1	2
CO2	3	2	3	-	-	2	2	-	-	1	1	2
CO3	3	2	3	-	-	2	2	-	-	1	1	2
CO4	3	2	3	-	-	3	2	-	-	1	1	2
CO5	3	2	3	-	-	-	-	-	-	1	1	2

3 – Strong; 2– Medium; 1-Low

Concept Map:



19MA601	Resource Management Techniques	L T P C 3 0 0 3

SYLLABUS

UNIT I	LINEAR PROGRAMMING MODELS	9
Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Two phase method.		
UNIT II	**TRANSPORTATION MODELS**	**9**
Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – test for optimality- Variations in transportation problem – Maximization in transportation problem.		
UNIT III	**ASSIGNMENT MODELS**	**9**
Mathematical formulation of assignment models -Hungarian Algorithm – Variants of the Assignment problem – Traveling salesman problem.		
UNIT IV	**SCHEDULING BY PERT AND CPM**	**9**
Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling.		
UNIT V	**GAME THEORY**	**9**
Game Theory - Two person Zero sum games - Saddle point, Dominance Rule, Convex Linear Combination (Averages), methods of matrices, graphical and LP Solutions.		
		TOTAL: 45 PERIODS

TEXT BOOKS:

1) Taha H.A., "Operations Research : An Introduction " 8th Edition, Pearson Education, 2008.
2) A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education, Asia, 2005.

REFERENCES :

1) Prem Kumar Gupta, D.S. Hira, "Operations Research", S.Chand & Company Ltd, New Delhi, 3rd Edition , 2008.
2) John W. Chinneck "Feasibility and Infeasibility in Optimization Algorithms and Computational Methods' Springer, 2008.
3) Ravindran, Phillips, Solberg, "Operations Research: Principles And Practice", 2ND ED, JohnWiley & Sons, 01-Jul-2007
4) Ibe, O.C. "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007

Course Designers:

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2. Dr.V.Anandan anandanviswanathan@saveetha.ac.in

19MA602	Statistics for Engineers	L T P C
		3 0 0 3

(COMMON TO ALL)

Preamble:

The goal of the course is to provide an in depth knowledge about sampling, regression analysis and quality control. The main objective of many statistical investigations is to make predictions preferably on the basis of mathematical equations. This course aims at providing the required skill to apply the statistical tools in engineering problems. The syllabus also provides special techniques of quality assurance..

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

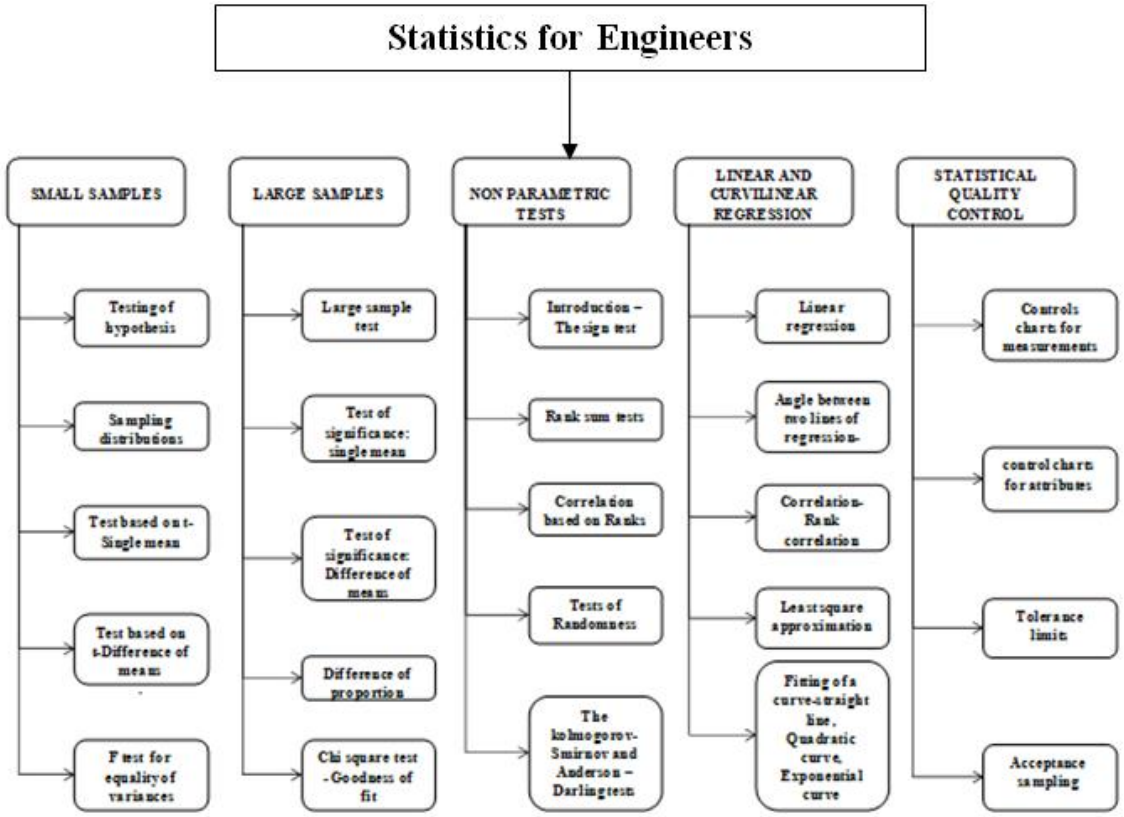
CO1	**Understand** the various applications of t and F distributions in statistics and the relationship between them.	**Understand**
CO2	**Demonstrate** the concepts of parameter, statistic and their utility in large sample tests.	**Apply**
CO3	**Understand** various methods of non parametric tests and concepts related to testing of hypothesis.	**Understand**
CO4	**Appreciate** the use of regression analysis for estimation and prediction purposes.	**Apply**
CO5	**Develop** the notion of sampling distributions and statistical quality control in production field.	**Create**

Mapping with PO and PSOs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-		-	-	1	1	2
CO2	3	2	3	-	-	-		-	-	1	1	2
CO3	3	2	3	-	-	-		-	-	1	1	2
CO4	3	2	3	-	-	-		-	-	1	1	2
CO5	3	2	3	-	-	-		-	-	1	1	2

3 – Strong; 2– Medium; 1-Low

Concept Map:



19MA602	Statistics for Engineers	L T P C
		3 0 0 3

SYLLABUS

UNIT I	SMALL SAMPLES	9
Testing of hypothesis-Introduction –Sampling distributions –Estimation of parameters- test based on t – Single mean- difference of means- F test for equality of variances.		
UNIT II	**LARGE SAMPLES**	**9**
Testing of hypothesis-Introduction- Large sample test-Parameter and statistic –Test of significance: single mean- difference of means-single proportion –difference of proportion- Chi square test - Goodness of fit- Test for Independency of attributes.		
UNIT III	**NON PARAMETRIC TESTS**	**9**
Introduction –The sign test- Rank sum tests – Correlation based on Ranks – Tests of Randomness- The Kolmogorov- Smirnov and Anderson –Darling tests.		
UNIT IV	**LINEAR AND CURVILINEAR REGRESSION**	**9**
Introduction- Linear regression- Regression coefficients –properties of regression- Angle between two lines of regression- Correlation- Rank correlation –curvilinear regression curves – Fitting of a curve- straight line , Quadratic curve, Exponential curve.		
UNIT V	**STATISTICAL QUALITY CONTROL**	**9**
Controls charts for measurements (X and R Charts) – control charts for attributes (p,c and np charts) – Tolerance limits – Acceptance sampling.		
		TOTAL: 45 PERIODS

TEXT BOOKS:

1) Johnson, R.A., Miller, I and Freund J., Miller and Freund's'"Probability and Statistics for Engine Pearson Education, Asia, 8 th Edition, 2015.
2) S.C. Gupta , V. K. Kapoor, " Fundamentals of Mathematical Statistics" Sultan Chand and sons, 11th Revised Edition , 2004.

References:

1) Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, Delhi, 8 th Edition, 2014.
2) 2) Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4 Edition, 2007.
3) Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3 rd Edi Elsevier, 2004.
4) Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problem Probability and Statistics", Tata McGraw Hill Edition, 2004.
5) Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8 th Edition, 2007.

Course Designers:

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SAVEETHA ENGINEERING COLLEGE

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Autonomous Syllabus

OFFERED BY

Department of Mathematics

PG Courses

PG PAPERS

S. No	Sub. Code	Sub. Title	Departments	Cat	L	T	P	C	Hours Split	Pre-requisite
1	19MMA01	Applied Mathematics for Electronics Engineers	ME (AE & VLSI)	BS	3	1	0	4	2-2	-
2	19MMA02	Applied Mathematics for Communication Engineers	ME (CN)	BS	3	1	0	4	2-2	-
3	19MMA03	Applied Mathematics for Engineers	ME (CAD / CAM)	BS	3	1	0	4	2-2	-
4	19MMA04	Applied Probability and Statistics	ME (CSE & SE)	BS	3	1	0	4	2-2	-
5	19MMA05	Linear Algebra and Number Theory	ME (CSE)	PG Elective	3	1	0	4	2-2	-
6	19MMA06	Applied Mathematics for Electrical Engineers	ME (EST)	BS	3	1	0	4	2-2	-

19MMA01	Applied Mathematics for Electronics Engineers	L T P C
		4 0 0 4

(COMMON TO M.E AE & VLSI)

Preamble:

The goal of this course is to demonstrate various analytical skills in applied mathematics and extensive experience with the tactics of problem solving and logical thinking applicable in electronics engineering. This course also will help the students to solve problems in electronics engineering using mathematical tools from several mathematical areas, including fuzzy logic, matrix theory, probability, dynamic programming and queuing theory.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

CO1	**Understand** the concepts of Fuzzy logic, Fuzzy propositions and Fuzzy quantifiers.	**Apply**
CO2	**Apply** various methods in matrix theory for matrix decomposition and solving system of linear equations.	**Apply**
CO3	**Evaluate** probability and moments in standard distributions of discrete and continuous random variables	**Evaluate**
CO4	**Analyze** the principle of optimality, formulation and computational procedure of dynamic programming.	**Analyze**
CO5	**Analyze** a network of queues with Poisson external arrivals, Exponential service requirements and independent routing.	**Analyze**

19MMA01	Applied Mathematics for Electronics Engineers	L T P C
		4 0 0 4

SYLLABUS

UNIT I	FUZZY LOGIC	12
Classical logic – Multivalued logics – Fuzzy propositions – Fuzzy quantifiers.		
UNIT II	**MATRIX THEORY**	**12**
Cholesky decomposition - Generalized Eigenvectors - Canonical basis - QR factorization - Least squares method - Singular value decomposition.		
UNIT III	**PROBABILITY AND RANDOM VARIABLES**	**12**
Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a Random variable.		
UNIT IV	**DYNAMIC PROGRAMMING**	**12**
Dynamic programming – Principle of optimality – Forward and backward recursion – Applications of dynamic programming – Problem of dimensionality.		
UNIT V	**QUEUEING MODELS**	**12**
Poisson Process – Markovian queues – Single and multi-server models – Little's formula - Machine interference model – Steady state analysis – Self-service queue.		
		TOTAL: 60 PERIODS

REFERENCES:

1) Johnson, R.A., Miller, I and Freund J., "Miller and Freund‟s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

2) Taha, H.A., "Operations Research: An Introduction", 9th Edition, Pearson Education, Asia, New Delhi, 2016.

Course Designers:

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19MMA02	Applied Mathematics for Communication Engineers	L T P C
		4 0 0 4

(For M.E CN)

Preamble:

The goal of this course is to demonstrate various analytical skills in applied mathematics for problem solving and logical thinking applicable in communication engineering. The syllabus is design to identify, formulate and solve problems in electronics engineering using mathematical tools from several mathematical fields, including linear algebra, matrix linear programming, probability, numerical solution of ordinary differential equations and queueing models.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

CO1	**Understand** the concepts of vector space, linear transformations, eigenvalues and matrix decomposition.	**Understand**
CO2	**Apply** suitable optimization techniques for solving linear programming models.	**Apply**
CO3	**Evaluate** the numerical solution of differential equations by single and multistep methods.	**Evaluate**
CO4	Understand the concepts of probability and random variables and **apply** them to evaluate correlation and regression between variables.	**Apply**
CO5	Understand the characteristic features of a queuing system and acquire skills in **analyzing** queuing models.	**Analyze**

19MMA02	Applied Mathematics for Communication Engineers	L T P C
		4 0 0 4

SYLLABUS

UNIT I	**LINEAR ALGEBRA**	**12**
Vector spaces – Norms – Inner products – Eigenvalues using QR transformations – QR factorization - Generalized eigenvectors – Canonical forms – Singular value decomposition and applications - Pseudo inverse – Least square approximations - Toeplitz matrices and some applications.		
UNIT II	**LINEAR PROGRAMMING**	**12**
Formulation – Graphical solution – Simplex method – Big M method - Two phase method - Transportation problems - Assignment models.		
UNIT III	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Runge - Kutta method of fourth order for system of IVPs - Numerical stability of Runge - Kutta method- Adams - Bashforth multistep method - Shooting method, BVP : Finite difference method and collocation method and orthogonal collocation method.		
UNIT IV	**PROBABILITY AND RANDOM VARIABLES**	**12**
Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function - Two dimensional random variables - Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation**.**		
UNIT V	**QUEUEING MODELS**	**12**
Poisson Process – Markovian queues – Single and multi - server models – Little's formula - Machine interference model – Steady state analysis – Self-service queue.		
		TOTAL: 60 PERIODS

REFERENCES:

1)Burden, R. C. and Faires, J. D., "Numerical Analysis ", 9th Edition, Cengage Learning, 2016.

2)Gross, D., Shortle, J.F., Thompson, J. M. and Harris, C. M., "Fundamentals of Queueing Theory 4th Edition, Wiley, 2014.

3)Johnson, R.A., Miller, I and Freund J., "Miller and Freund"s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

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19MMA03	Applied Mathematics for Engineers	L T P C
		4 0 0 4

(FOR M.E CAD / CAM)

Preamble:

This course is designed to enrich the knowledge in various advanced mathematical techniques such as matrix theory, calculus of variations, probability and random variables, Laplace transforms and Fourier transforms. The fundamental concepts in these areas will be more useful for the students to model the engineering problems and solving them by applying these methods.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

CO1	**Apply** various methods in matrix theory to solve system of linear equations.	**Apply**
CO2	**Maximize** and minimize the functional that occur in various branches of engineering disciplines.	**Evaluate**
CO3	**Compute** probability and moments in standard distributions of discrete and continuous random variables.	**Evaluate**
CO4	**Apply** Laplace transforms in solving initial, boundary value problems and Partial Differential Equations.	**Apply**
CO5	**Analyze** the techniques of Fourier transforms in solving partial differential equations.	**Analyze**

19MMA03	Applied Mathematics for Engineers	L T P C
		4 0 0 4

SYLLABUS

UNIT I	MATRIX THEORY	12
The Cholesky decomposition - Generalized Eigenvectors - Canonical basis - QR factorization - Least squares method - Singular value decomposition.		
UNIT II	**CALCULUS OF VARIATIONS**	**12**
Concept of variation and its properties – Euler's equation – Functional dependant on first and higher order derivatives – Functionals dependant on functions of several independent variables – Variational problems with moving boundaries – Isoperimetric problems - Direct methods : Ritz and Kantorovich methods.		
UNIT III	**PROBABILITY AND RANDOM VARIABLES**	**12**
Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.		
UNIT IV	**LAPLACE TRANSFORM TECHNIQUES FOR PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Laplace transform - Definitions - Properties – Transform error function - Bessel's function - Dirac delta function - Unit step functions – Convolution theorem – Inverse Laplace transform: Complex inversion formula – Solutions to partial differential equations: Heat equation - Wave equation.		
UNIT V	**FOURIER TRANSFORM TECHNIQUES FOR PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Elementary functions - Dirac delta function – Convolution theorem – Parseval's identity – Solutions to partial differential equations: Heat equation - Wave equation - Laplace and Poison's equations.		
		TOTAL: 60 PERIODS

REFERENCES:

1. James, G., "Advanced Modern Engineering Mathematics ", 3rd Edition, Pearson Education, 2004.

2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

Course Designers:

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2. Mr.K.Thirumalai thirumalai@saveetha.ac.in

19MMA04	Applied Probability and Statistics	L T P C
		4 0 0 4

(COMMON TO M.E CSE & SE)

Preamble:

The course is designed to provide the solid foundation in applied probability and various statistical methods which form the basis for other areas in the mathematical sciences including statistics and modern optimization methods. It is framed to address the issues and the principles of estimation theory, testing of hypothesis and multivariate analysis.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

CO1	**Understand** discrete and continuous random variables and their applications in computing	**Understand**
CO2	**Identify** various distribution functions and help in acquiring skills in handling situations involving more than one variable.	**Understand**
CO3	**Evaluate** Consistency, efficiency, estimators and analyze the maximum likelihood estimation.	**Evaluate**
CO4	**Apply** the concept of testing of hypothesis for small and large samples in real life problems**.**	**Apply**
CO5	Perform exploratory **analysis** of multivariate data, such as multivariate normal density, calculate descriptive statistics and test for multivariate normality.	**Analyze**

19MMA04	Applied Probability and Statistics	L T P C
		4 0 0 4

SYLLABUS

UNIT I	PROBABILITY AND RANDOM VARIABLES	12
Probability – Axioms of probability – Conditional probability – Baye‘s theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.		
UNIT II	**TWO DIMENSIONAL RANDOM VARIABLES**	**12**
Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation		
UNIT III	**ESTIMATION THEORY**	**12**
Unbiased estimators – Method of moments – Maximum likelihood estimation - Curve fitting by principle of least squares – Regression lines.		
UNIT IV	**TESTING OF HYPOTHESIS**	**12**
Sampling distributions – Type I and Type II errors – Small and large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.		
UNIT V	**MULTIVARIATE ANALYSIS**	**12**
Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components - Population principal components – Principal components from standardized variables		
		TOTAL: 60 PERIODS

REFERENCES:

1.Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2017.

2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill,5 th Edition, 2016.

3. Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, New Delhi, 9 th Edition, 2016.

4. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 6 th Edition, New Delhi, 2016.

Course Designers:

1. Ms.N.Jegajothi jegajothi@saveetha.ac.in
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19MMA05	Linear Algebra and Number Theory	L T P C
		4 0 0 4

(ELECTIVE FOR ME CSE)

Preamble:

The general theory of mathematical systems involving addition and scalar multiplication has the applications to many areas of computer science. Mathematical systems of this form are called Vector spaces or linear spaces. Number theory deals with various applications such as encrypting and decrypting messages, algorithms for finding GCD of integers and concept of modular arithmetic in generating Pseudo random numbers.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to

CO 1	**Understand** the fundamental concepts of vector space.	**Understand**
CO 2	**Analyze** the concepts of linear transformations and diagonalization	**Analyze**
CO 3	**Apply** the concept of inner product spaces in orthogonalization.	**Apply**
CO 4	**Apply** the concepts of modular arithmetic in appropriate Computer Science and Engineering applications like pseudo-random number generation, encryption and decryption of messages.	**Apply**
CO 5	**Analyze** the concepts of congruence, primes and co-primes in multiplicative functions	**Analyze**

19MMA05	Linear Algebra and Number Theory	L T P C 4 0 0 4

SYLLABUS

UNIT I	VECTOR SPACES	12
Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.		
UNIT II	**LINEAR TRANSFORMATION**	**12**
Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of a linear transformations - Eigenvalues and eigenvectors - Diagonalizability.		
UNIT III	**INNER PRODUCT SPACES**	**12**
Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation		
UNIT IV	**THE FUNDAMENTALS OF INTEGERS**	**12**
Division algorithm – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.		
UNIT V	**DIOPHANTINE EQUATIONS AND CONGRUENCES**	**12**
Linear Diophantine equations – Congruence‘s – Linear Congruence‘s -Chinese remainder theorem - Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions – Tau and Sigma functions.		
		TOTAL: 60 PERIODS

REFERENCES:

1) Kolman, B. Hill, D.R., Introductory Linear Algebra‖, Pearson Education, First Reprint, 2009.
2) Kumaresan, S., Linear Algebra – A Geometric Approach‖, Prentice – Hall of India, Reprint, 2010.
3) Lay, D.C., Linear Algebra and its Applications‖, 5th Edition, Pearson Education, 2015.
4) Niven, I., Zuckerman.H.S., and Montgomery, H.L., ―An Introduction to Theory of Numbers‖, John
5) Wiley and Sons , 2016.
6) Koshy, T., ―Elementary Number Theory with Applications‖, Elsevier Publications, 2002.
7) San Ling and Chaoping Xing, ―Coding Theory – A first Course‖, Cambridge Publications, 2004.

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19MMA06	Applied Mathematics for Electrical Engineers	L T P C 4 0 0 4

(FOR M.E EST)

Preamble:

The goal of this course is to demonstrate various analytical skills in applied mathematics and extensive experience with the tactics of problem solving and logical thinking applicable for the students of electrical engineering. This course also will help the students to identify, formulate, abstract, and solve problems in electrical engineering using mathematical tools from a variety of mathematical areas, including matrix theory, calculus of variations, probability, linear programming and Fourier series.

Prerequisite: NIL

Course Outcomes: At the end of the course learners will be able to:

CO1	**Apply** various methods in matrix theory to solve system of linear Equations	**Apply**
CO2	**Maximize** and minimize the functional that occur in Electrical engineering discipline.	**Evaluate**
CO3	**Understand** discrete and continuous random variables and their applications electronic transmissions.	**Understand**
CO4	**Apply** suitable optimization techniques for solving linear programming models.	**Apply**
CO5	**Analyze** Fourier series and its applications in power spectrum.	**Analyze**

19MMA06	Applied Mathematics for Electrical Engineers	L T P C 4 0 0 4

SYLLABUS

UNIT I	MATRIX THEORY	12
Cholesky decomposition - Generalized Eigenvectors - Canonical basis - QR Factorization – Least squares method - Singular value decomposition.		
UNIT II	**CALCULUS OF VARIATIONS**	**12**
Concept of variation and its properties – Euler's equation – Functional dependent on first and higher order derivatives – Functionals dependent on functions of several independent variables – Variational problems with moving boundaries – Isoperimetric problems - Direct methods : Ritz and Kantorovich methods.		
UNIT III	**PROBABILITY AND RANDOM VARIABLES**	**12**
Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.		
UNIT IV	**LINEAR PROGRAMMING**	**12**
Formulation – Graphical solution – Simplex method – Big M method - Two phase method - Transportation and Assignment models.		
UNIT V	**FOURIER SERIES**	**12**
Fourier trigonometric series : Periodic function as power signals – Convergence of series – Even and odd function : Cosine and sine series – Non periodic function : Extension to other intervals – Power signals : Exponential Fourier series – Parseval's theorem and power spectrum – Eigenvalue problems and orthogonal functions – Regular Sturm - Liouville systems – Generalized Fourier series.		
		TOTAL: 60 PERIODS

REFERENCES:

1. Andrews L.C. and Phillips R.L., "Mathematical Techniques for Engineers and Scientists", Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
2. Bronson, R. "Matrix Operation", Schaum's outline series, 2 nd Edition, McGraw Hill, 2011.
3. Elsgolc, L. D. "Calculus of Variations", Dover Publications, New York, 2007.
4. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8 th Edition, 2015.
5. O'Neil, P.V., "Advanced Engineering Mathematics", Thomson Asia Pvt. Ltd., Singapore, 2003.
6. Taha, H.A., "Operations Research, An Introduction", 9 th Edition, Pearson education, New Delhi, 2016.

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Department of Mathematics

Minutes of Board of studies meeting held on 26.02.19

The First **Board of studies meeting of Department of Mathematics** was conducted on **26.02.19** in Conference Hall, Saveetha Engineering College, Chennai.

The following Members attended:

Members from Saveetha Engineering college:

- Dr.R.Ramesh – Principal
- Dr.R.Senthilkumar – Vice Principal
- Prof.A.Gandhi – Dean-III
- HODs & Autonomous Coordinators of all Departments
- All Faculty members of Department of Mathematics

Expert Members:

1.Dr.K.Thirusangu Associate professor, Department of Mathematics. **SIVET college**, Chennai **2. Dr.R.S.Selvaraj** Associate professor, Department of Mathematics, **NIT - Warangal**	Two Experts from outside to be nominated by the Academic Council	
Dr. V. Sarada, Professor, CEG Campus, **Anna University**	One Expert nominated by the vice-chancellor	
Mr. Sivakumar Ganesan Sr. Associate - Projects Advanced Data Analytics, Cognizant	Industry Expert	
Mr.K.Lenin **ME Cad Cam Alumnus (2016)** Manager - Sony Traders	Alumnus nominated by the Principal	

Minutes of the BOS meeting

The meeting was chaired by our beloved Principal **Dr.R.Ramesh**.

1. Principal introduced the Board of studies members and gave a warm welcome to all Faculty members.
2. The Department head Ms.J.Joy Priscilla presented the proposed syllabus with unit wise contents for all subjects offered by Department of Mathematics to other Engineering Departments.
3. After the presentation, discussion session was there and the subject experts gave their suggestions.
4. **Dr.V. Saradha** insisted that matrices unit should be included in the First semester for all the branches to create a comfort zone for the first year students in Mathematics. **Dr.R.S.Selvaraj and Dr.K.Thirusangu** also suggested the same.
5. **Dr.V. Saradha** suggested to include Functions of random variables, Transformation of random variables and Central limit theorem in the Probability subjects.
6. Madam also said to include Ergodic process, Random telegraph process and semi Random telegraph process in Random Process. Spectral densities and Linear time invariant system units also shall be included.
7. **Dr.R.S.Selvaraj** suggested to include basic foundation level topics in the first semester. Sir also suggested to include Functions of several variables before Integral Calculus unit.
8. **Dr.R.S.Selvaraj** told to alter the units in "Applied Calculus" as follows:

   Unit I-Matrices; Unit II-Functions of several variables; Unit III- Multiple Integrals;

   Unit-IV -Vector Calculus; Unit V- Ordinary differential equations.
9. Sir also insisted to remove Bessel's function from the syllabus of "Random process techniques" as it is not apt for syllabus title.

   Dr.V. Saradha and Dr.K.Thirusangu also suggested the same.
10. **Dr.R.S.Selvaraj** suggested to include Complex variables and Contour integration for Electrical and Electronics Engineering as the students of that branch will need those concepts.
11. Sir also said to include ODE for CSE and IT branches if possible and pointed out that title of the subject **Series and Analysis** does not match with unit contents and suggested to rename as **Fourier series and complex variables.**
12. **Dr.R.S.Selvaraj** suggested to specify the units and topics with chapter numbers in Text Books for all the subjects as it will be easy for the Question paper setter.

13. **Dr.K.Thirusangu** insisted that Basic concepts to be taught in the first semester and told not to omit any fundamental topics in the syllabus.
14. Sir suggested to change the subject name of "TPDE for Mechanical Engineering" to "Transforms Techniques".
15. **Dr.K.Thirusangu** also suggested that Branch name need not be mentioned in subject name. Sir said to name the subjects relevant to the contents included.
16. **Mr. Sivakumar Ganesan** insisted to include the basic concepts of statistics for Information Technology branch as statistics plays a vital role in data analysis.
17. **Mr. Sivakumar Ganesan** also suggested to include statistics and probability concepts for Electrical and Electronics Engineering.
18. **Mr.K.Lenin** suggested that relevance of related subjects should be told to the students during the course.
19. **Mr.K.Lenin** also requested the Faculty members to mention the applications of the Mathematical concepts in the respective Engineering fields while teaching.
20. Finally Ms.J.Joy Priscilla thanked everyone for their valuable suggestions.

The meeting successfully ended with **High Tea**.

SAVEETHA ENGINEERING COLLEGE

Affiliated to Anna University | Approved by AICTE

DEPARTMENT OF MATHEMATICS

2nd Board of Studies Meeting

24.12.2019

AGENDA

1) **Revision of**

   a. AGRI syllabus as per ICAR.

   b. 2 papers in CSE/IT departments

   c. 2 papers in EIE department

2) **Inclusion** of 3 Aptitude Papers

3) **Suggestions – BOS Members**

(ONLY FOR AGRI as PER ICAR)

19MA203	COMPLEX VARIABLES AND DIFFERENTIAL EQUATIONS	L	T	P	C
		2	1	0	3

UNIT I	ORDINARY DIFFERENTIAL EQUATIONS	12

Exact and Bernoulli's differential equations – equations reducible to exact form by integrating factors-equations of first order and higher degree-Clairaut's equation-Differential equations of higher orders-method of finding complementary functions and particular integrals-method of variations of parameters-Cauchy and Legendre's linear equations-Simultaneous linear differential equations with constant coefficients.

UNIT II	ANALYTIC FUNCTIONS	12

Series solution techniques – Bessel's and Legendre's differential equations- Functions of a complex variable - Limit-continuity and analytic functions-Cauchy-Riemann equations-Harmonic functions.

UNIT III	FOURIER SERIES	12

Periodic functions-Fourier series-Euler's formulae- Dirichlet's conditions-Functions having arbitrary period –Fourier series for function having period 2L - Even and odd functions – Half-range series-Fourier Sine and Cosine series - Harmonic analysis.

UNIT IV	PARTIAL DIFFERENTIAL EQUATIONS	12

Formation of partial differential equations using elimination of arbitrary constants and arbitrary functions – Higher order linear partial differential equations with constant coefficients – Solution of non-linear partial differential equations – Charpit's method.

UNIT V	APPLICATION OF PDE	12

Classification of PDE – Solutions on one dimensional wave equation – One dimensional heat flow equations –Steady state solution of two dimensional heat flow equations - Laplace Equation (excluding insulated edges)

TOTAL: 60 PERIODS

TEXT BOOKS:

1.Grewal B.S 2004, "Higher Engineering Mathematics , Khanna Publishers,New Delhi 43rd Edition,2014.
2.Ramana B.V2008, "Engineering Mathematics" , Tata McGraw Hill, New Delhi.

REFERENCES :

1.Bali N ,Goyal M and Watkins C, "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt Ltd) New Delhi , 7th Edition 2009.
2. Veerarajan T., "Transforms and Partial differential equations", Second reprint, Tata McGraw Hill Education Pvt Ltd, New Delhi 2012.
3. Narayan Shanti, 2004 "A Textbook of Matrices.,S.Chand and Co. Ltd., New Delhi.
4.Bali N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Lakshmi Publications Pvt Ltd, New Delhi 2014.

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ONLY FOR AGRI as PER ICAR)

19MA216	NUMERICAL ANALYSIS AND LAPLACE TRANSFORMATION	L T P C 2 1 0 3
UNIT I	**FINITE DIFFERENCE**	**12**
Finite difference-various difference operators and their relationships-interpolation with equal intervals-Newton's forward and backward interpolation formula. Numerical differentiations using Newton's forward and backward interpolation.		
UNIT II	**INTERPOLATION AND NUMERICAL DIFFERENTIATION**	**12**
Bessel's and Stirling's difference interpolation formulae-Interpolation with unequal intervals-Newton's divided difference formula - Lagrange's interpolation formula.		
UNIT III	**NUMERICAL INTEGRATION AND SOLUTIONS OF ODE**	**12**
Numerical integrations of single integrals using Trapezoidal and Simpson's rules-Numerical solutions of ordinary differential equations by Picard's and Taylor's series-Euler's and Modified Euler's methods-Runge-Kutta method		
UNIT IV	**LAPLACE TRANSFORMS**	**12**
Existence conditions-Transforms of elementary functions-basic properties-shifting theorems-Inverse transforms-Convolution theorem-Transform of periodic functions-Application to solution of linear second order ordinary and simultaneous differential equations		
UNIT V	**TESTING OF HYPOTHESIS**	**12**
Level of significance-Degrees of freedom-Statistical errors-Large sample test(Z-test) – Small sample test t-test (One-tailed, two-tailed and Paired tests) – Testing of significance through variance (F-test)-Chi-square test – contingency table-Correlation, Regression		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1.Grewal B.S and Grewal J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi 2015.
2.NageswaraRaoG.,Statistics for Agricultural Sciences, BS Publications.

REFERENCES :

1.Gerald C.F and Wheatley P.O., "Applied Numerical Analysis", Pearson Education, Asia 6th Edition, New Delhi 2006.
2.SankaraRao K "Numerical methods for Scientists and Engineers" , Prentice Hall of India Private Ltd, 3rd Edition, New Delhi 2007.
3.Rangaswamy R., "A textbook of Agricultural Statistics", New Age Int. Publications Ltd.
4.Agarwal B.L., "Basic Statistics", Wiley Eastern Ltd, New Age International Ltd.

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(FOR EEE & EIE)

19MA207	NUMERICAL METHODS AND PARTIAL DIFFERENTIAL EQUATIONS	L T P C 3 1 0 4
UNIT I	**VECTOR CALCULUS**	**12**
Gradient, divergence and curl – Directional derivative – Irrotational and solenoid vector fields – Vector integration –Gauss divergence theorem and Stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.		
UNIT II	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.		
UNIT III	**RANDOM VARIABLES AND DISTRIBUTIONS**	**12**
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Exponential, Weibull Distributions.		
UNIT IV	**CURVE FITTING AND SOLUTION OF SYSTEM OF EQUATIONS**	**12**
Curve fitting – Method of least squares - Straight Lines - Quadratic and Parabola– Exponential curve - Solution of algebraic and transcendental equations – Newton Raphson method- Solution of linear system of equations – Pivoting - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.		
UNIT V	**INTERPOLATION AND APPROXIMATION**	**12**
Interpolation with equal intervals – Newton's forward and backward difference formulae - Lagrange's interpolation - Interpolation with unequal intervals - Newton's divided difference interpolation.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
2) Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3) Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1) Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2) Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
3) Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill,5th Edition, New Delhi, 2007S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4) Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5) Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

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(FOR EEE & EIE)

19MA214	SERIES AND TRANSFORMS	L T P C 3 1 0 4
UNIT I	**SEQUENCE AND SERIES**	**12**
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series –Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.		
UNIT II	**FOURIER SERIES AND TRANSFORMS**	**12**
Complex form of Fourier series – Statement of Fourier integral theorem – Fourier transform pair– Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.		
UNIT III	**DISCRETE FOURIER TRANSFORMS**	**12**
Discrete fourier Transform - properties, magnitude and phase representation – computation of DFT using FFT algorithm –DIT & DIF using radix2 - FFT-Butterfly structure.		
UNIT IV	**Z TRANSFORMS**	**12**
Z-transforms - Elementary properties – Inverse Z-transform using partial fractions and residues – Initial and final value theorems - Convolution theorem.		
UNIT V	**WAVELET TRANSFORMS**	**12**
Introduction of time frequency analysis-Continuous wavelet Transform-CWT as operator-Discrete wavelet transform introduction-scaling function-Decomposition-Interpolation.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1) Bali N., Goyal M. and Watkins C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2) The Illustrated Wavelet Transform Handbook: Introductory Theory and Applications in Science, Engineering, Medicine and Finance, Second EditionHardcover – Import, 26 Jan 2017 by Paul S. Addison , CNC Press.
3) Algorithms for Discrete Fourier Transform and Convolution - Tolimieri R, Springer publications.

REFERENCES :

1) G. James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,2007.
2) L.C Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
3) N.P. Bali. and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
4) Introduction to Wavelets and Wavelet Transforms: A Primer 1st Edition - C. Sidney Burrus (Author), Ramesh A. Gopinath (Author), Haitao Guo (Author)-Prentice Hall, 1998
5) Mathematics of the Discrete Fourier Transform: With Audio Applications by Julius O., III Smith (Author) – Create space publishers

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(FOR CSE & IT)

19MA206	LOGIC and COMBINATORICS	L T P C 3 1 0 4
UNIT I	**SETS AND FUNCTIONS**	**12**
Sets and operations — Proofs of set identities — Relations — Equivalence relations –Functions : one to one, onto and bijective functions, operations on functions : Inverse and composite Functions.		
UNIT II	**PROPOSITIONAL LOGIC**	**12**
Propositional logic – Arguments – Logical laws – Logical equivalences – Direct and Indirect Methods– PCNF and PDNF (Using Truth tables and Laws).		
UNIT III	**PREDICATE LOGIC**	**12**
Theory of inference – Quantifiers— Predicate formulas—Inference theory of predicates logic. Proofs methods and strategy—Direct method of proofs and Indirect method of proofs.		
UNIT IV	**COMBINATORICS**	**12**
Counting Principles — Permutations and combinations — Mathematical induction – The pigeonhole principle — Inclusion and exclusion principle — Recurrence relations – Solving linear recurrence relations – Generating functions (Homogeneous Equations).		
UNIT V	**GRAPHS AND TREES**	**12**
Representation of graphs – Directed and indirected graphs – Graph isomorphism – Connectivity – Euler and Hamilton graphs. Trees– properties of trees– Distance and centre in tree– Rooted and binary trees–Spanning trees.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
3. J.L., Mott, A. Kandel, T.P. Baker, “Discrete Maths for Computer Scientists & Mathematics”. Second Edition, Prentice Hall of India Pvt Limited, New Delhi,2009.

REFERENCES :.

1. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum’s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
2. Ralph. P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Fourth Edition, Pearson Education Asia, Delhi, 2006.
3. Thomas Koshy, Discrete Mathematics with Applications, Elsevier Publications, 2006.
4. Seymour Lipschutz and Mark Lipson, Discrete Mathematics, Schaum’s Outlines, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, Second edition, 2011.
5. Dr. A.Singaravelu and Dr. M. P. Jeyaramam.,”Graph Theory and Applications” First Edition,2017
6. C Liu, D. Mohapatra Elements of Discrete Mathematics: A Computer Oriented Approach, 2017 .

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(FOR CSE & IT)

19MA212	ALGEBRA AND NUMBER THEORY	L T P C 3 1 0 4

UNIT I	**GROUPS**	**12**
Groups : Definition - Properties - Homomorphism - Isomorphism - Cyclic groups - Cosets - Lagrange's theorem.		
UNIT II	**RINGS, FIELDS AND POLYNOMIALS**	**12**
Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n - Ring homomorphism - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.		
UNIT III	**DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS**	**12**
Division algorithm – Base - b representations –Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.		
UNIT IV	**DIOPHANTINE EQUATIONS AND CONGRUENCES**	**12**
Linear Diophantine equations – Congruence‘s – Linear Congruence‘s - Applications: Divisibility tests - Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.		
UNIT V	**CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS**	**12**
Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions – Tau and Sigma functions.		
		TOTAL: 60 PERIODS

TEXT BOOKS:

1. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007.
2. Koshy, T., ―Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

REFERENCES :.

1. San Ling and Chaoping Xing, ―Coding Theory – A first Course, Cambridge Publications, Cambridge, 2004
2. Lidl, R. and Pitz, G, "Applied Abstract Algebra", 2nd Edition Springer Verlag, New Delhi, 2006.
3. Niven, I., Zuckerman.H.S., and Montgomery, H.L., ―An Introduction to Theory of Numbers, John Wiley and Sons , Singapore, 2004.
4. Andrews, G. E, “Number theory”, Dover publications, Newyork, 2012.
5. Herstein, I. N, “Topics in Algebra”, 2nd Edition, John Wiley and Sons, India.

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APTITUDE PAPERS

19EY703	System of Numerical and Logical Terminologies (Common to all Branches)	L	T	P	C
		0	0	2	1

PREAMBLE

This course is designed to assess candidates in terms of their skills, knowledge, ability and personality. **Aptitude tests are** accurate way of predicting the potential contribution of a candidate and the likelihood of them achieving success within the organization. It can improve decision making, logical thinking, time management and IQ. The use of aptitude and knowledge tests to screen potential job applicants has long been standard practice across many different sectors.

PREREQUISITE

Basic mathematical concepts

COURSE OUTCOMES

At the end of the course learners will be able to		
CO1	Understand the underlying properties of numbers that we use in day to day life	Understand
CO2	Understand the variety of ways that simple mathematical tools can be used for.	Understand
CO3	Can apply the short cuts of the mathematical tools to reduce the time durationin problem solving	Apply
CO4	Can think logically to apply the reasoning methods and evaluate complex relationships between the variables	Evaluate
CO5	Break down the given problem into discrete parts and analyse the ways in which it can be solved	Analysis
CO6	Create his own method of arriving at a solution for a given problem	Create

MAPPING OF COs WITH POs AND PSOs

1- Low 2 – moderate 3 - significant

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	-	-	-	-	-	-	-	-	-
CO2	**2**	**3**	-	-	-	-	-	-	-	-	-	-
CO3	-	**3**	**2**	-	-	-	-	-	-	-	-	-
CO4	-	**3**	-	-	-	-	-	-	-	-	-	-
CO5	-	**3**	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	**2**	-	-	-	-	-	-	-	-

Syllabus

Unit 1: Number Concepts **6 Hours**

Classification of Real number system: Integers / Fractions, Rational / Irrational –**Number properties**: Even/ Odd property, Prime/Composite, Co-prime, Divisibility test, Remainder theorem – Factors – HCF / LCM –Unit's digit problems – Factorial problems **–**Surds and indices –Vedic Maths.
Reasoning ability: Ranking sequence.

Unit 2: Percentages **6 Hours**

Concept of Percentages, Percentage Increase/Decrease,Continuous increase and decrease– **Profit and Loss**: Fundamental concepts, Mark up and down sales, Traders sales deal – **SI and CI:**Fundamental concepts, relational concepts, quarterly and half yearly calculations
Reasoning ability: Coding and Decoding

Unit 3: Ratios and proportions **6 Hours**

Ratios: Rules and concepts, proportions, value based problems – **Averages**: Weighted Average, Continued and discontinued Sums **– Mixtures and alligations**: Mixture of 2 elements, Mixture of more than 2 elements, Replacement problems – **Partnerships**: Time dependent, Time independent
Reasoning ability: Direction sense

Unit 4: Algebra **6 Hours**

Expressions: Terms, Powers, types, Degrees – **Identities**: Squares, Cubes and Power of N – **Linear equations**: Single variable, Multi variable – **Quadratic equations**: Finding roots, types of roots – **Word problems**: Framing equations from statements.
Reasoning ability: Blood relations

Unit 5: Practical math topics **6 Hours**

Problems on ages –**Clocks:** angle between hands, forming straight lines and right angles, Gaining and losing time – **Calendars:** Finding the day, Same calendar – Logarithms –Progressions: Arithmetic and geometric progression, Sequence and series.
Reasoning ability: Non-verbal: Mirror image,Water image, Paper cutting and Paper folding – Number series and Alphabet series.

Total: 30 Hours

TEXT BOOKS:

1. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal – 2017

2. "Teach Yourself Quantitative Aptitude" by Arun Sharma – 2017

3. "A modern approach verbal and non -verbal reasoning" by R.S. Aggarwal – 2017

REFERENCE BOOKS

1. "Shortcuts in Mathematics" by AkhileshKhare – 2016

2. "Vedic maths for competitive exams" by Ravi Shankar – 2016

2. "Quantitative Aptitude for Competitive Examination"by AbhijitGuha - 2017

19EY704	Advanced quantitative and logical reasoning (Common to all Branches)	L	T	P	C
		0	0	2	1

PREAMBLE

This course is designed to assess candidates in terms of their skills, knowledge, ability and personality. **Aptitude tests are** accurate way of predicting the potential contribution of a candidate and the likelihood of them achieving success within the organization. It can improve decision making, logical thinking, time management and IQ. The use of aptitude and knowledge tests to screen potential job applicants has long been standard practice across many different sectors.

PREREQUISITE

Fundamental mathematics, Basic Quantitative and Logical reasoning concepts

COURSE OUTCOMES

At the end of the course learners will be able to		
CO1	Understand the topics which predominantly appear in the quantitative and logical reasoningAssessments.	Understand
CO2	Decode the problem type and apply the related method to find the solution	Apply
CO3	Apply simple logical thinking to solve the problems related to reasoning	Apply
CO4	Interpret the data provided in different format related to the question asked	Analysis

MAPPING OF COs WITH POs AND PSOs

1- Low 2 – moderate 3 - significant

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**-**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Syllabus

UNIT – I TIME AND WORK **6 Hours**

Introduction,Chain Rule, Unitary Method, Efficiency and Ratios, work and wages, joining and leaving, Alternate days, **Pipes and Cisterns:** Inlet pipes and Outlet pipes
Reasoning ability: Syllogism, Statement and conclusions

UNIT – 2 TIME AND DISTANCE **6 Hours**

Concepts, Uniform speed, Average speed, Relative speed, Ratio concept, Races, Circular Tracks –**Problems on Trains:** same direction and opposite direction - **Boats and Streams:** downstream speed and Upstream speed.
Reasoning ability:seating arrangement - linear, circular, square, rectangle, input-output

Unit 3: COUNTING METHODS **6 Hours**

Principles of counting, Factorial notation - **Permutation:**Linear, Circular, with and without repetition –**Combination**: Exactly model, Either or model, At least model and At most model – **Set Theory**: Standard sets, Venn diagrams, Union and intersection – **Probability:** Introduction, Sample space, Types of Events, Count based problems and Probability based problems
Reasoning ability: Analogy - Flowcharts

Unit 4: GEOMETRY **6 Hours**

Two Dimensional:lines and angles, perimeter and areas - **3 Dimensional**: volumes and surface areas, Trigonometry: Trigonometric ratios, heights and distances – **Coordinate geometry**: Line Equations, Slopes, Perpendicular and parallel lines- Functions
Reasoning ability: Cubes and Dice – Inequalities

Unit 5: DATA INTERPRETATION AND PUZZLES **6 Hours**

Data interpretation: Introduction, Data tables, Bar graphs, line graphs, pie charts, mixed charts, Statistical measures – Data sufficiency.
Reasoning ability: – Mathematical operations, Logical puzzles.

Total: 30 Hours

TEXT BOOKS:

1. Quantitative Aptitude for Competitive Examinations by R.S. Aggarwal – 2017

2. Teach Yourself Quantitative Aptitude by Arun Sharma – 2017

3. A modern approach verbal and non -verbal reasoning by R.S. Aggarwal – 2017

REFERENCE BOOKS

1. A Complete Book of Data Interpretation & Analysis by ADDA - 2019

2. Quantitative Aptitude for Competitive Examination by AbhijitGuha – 2017

3. Solved Placement Papers Campus Recruitment by Praxis groups - 2017

19EY706	COMPANY SPECIFIC ASSESMENTS FOR EMPLOYABILITY (Common to all Branches)	L	T	P	C
		0	0	2	1

PREAMBLE

To crack the company assessments for employability during campus interviews, a student should be proficient in quantitative aptitude, logical reasoning and verbal ability. This course is designed with an objective of equipping students with question patterns and strategies to successfully ace the aptitude tests. It helps students to understand the different types of questions asked by different companies and acts as a thorough test-prep module.

PREREQUISITE

Intermediate knowledge of quantitative aptitude, logical reasoning and verbal ability.

COURSE OUTCOMES

At the end of the course learners will be able to		
CO1	Understand the concepts required to write the test.	Understand
CO2	Apply quantitative aptitude and logical reasoning skills in the company specific tests.	Apply
CO3	Apply verbal ability skills in the company specific tests.	Apply
CO4	Understand and apply the problem solving techniques	Apply
CO5	Apply time management and short-cut methods to solve problems in the company specific aptitude tests	Apply
CO6	Ascertain specific areas for self-improvement by evaluation of scores in multiple mock tests.	Evaluate

MAPPING OF COs WITH POs AND PSOs

1- Low 2 – moderate 3 - significant

COURSE OUTCOMES	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS

UNIT 1 –COMPANY SPECIFIC TIER 1TEST PATTERN **6**

Tier 1 Company Assessment patterns for employability (Quantitative techniques and logical ability Section) – Sample sets of Tier 1 Company questions – Cognitive learning technique introduction

UNIT 2– COMPANY SPECIFIC TIER 2 TEST PATTERN **6**

Tier 2 Company Assessment patterns for employability (Quantitative techniques and logical ability Section) – Sample sets of Tier 2 Company questions – Cognitive learning technique

UNIT 3 –VERBAL ABILITY **6**

Application of Verbal Ability concepts in Question Types such as Sentence Errors, Sentence Correction and Sentence Completion –High Frequency words – Spellings – Idioms – Phrasal Verbs - Application of strategies in Analogies – Synonyms – Antonyms – Order of Words – Odd Word Out, Reading Comprehension passages – keyword search strategies

UNIT 4–COMPANY SPECIFIC TIER 1 VERBAL ABILITY PATTERN **6**

Tier 1 Company Assessment patterns for employability (Verbal section)-Company specific mock tests for Verbal Ability section

UNIT 5 – COMPANY SPECIFIC TIER 2 VERBAL ABILITY PATTERN **6**

Tier 2 Company Assessment patterns for employability (Verbal section) - Company specific mock tests for Verbal Ability section

TOTAL: 30Hours

TEXT BOOKS

1. Quantitative Aptitude for Competitive Examinations by R.S.Aggarwal
2. A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal
3. A Modern Approach to Logical Reasoning by R.S. Aggarwal

REFERENCE BOOKS

1. “Shortcuts in Mathematics” by AkhileshKhare – 2016
2. “Vedic maths for competitive exams” by Ravi Shankar – 2016
3. “Quantitative Aptitude for Competitive Examination” by AbhijitGuha– 2017
4. How to Prepare For Verbal Ability and Reading Comprehensionby Arun Sharma, MeenakshiUpadhyay
- 8th edition

Department of Mathematics

Minutes of Board of studies meeting held on 24.12.19

The Second **Board of studies meeting of Department of Mathematics** was conducted on **24.12.19** in Seminar Hall, Saveetha Engineering College, Chennai.

The following Members attended:

Members from Saveetha Engineering college:

- Dr.R.Ramesh – Principal
- Dr.R.Senthilkumar – Vice Principal
- Prof.A.Gandhi – Dean-III
- HODs & Autonomous Coordinators of all Departments
- All Faculty members of Department of Mathematics

Expert Members:

1.Dr.K.Thirusangu Associate professor, Department of Mathematics. **SIVET college**, Chennai **2. Dr.R.S.Selvaraj** Associate professor, Department of Mathematics, **NIT - Warangal**	Two Experts from outside to be nominated by the Academic Council	
Dr. V. Sarada, Professor, CEG Campus, **Anna University**	One Expert nominated by the vice-chancellor	
Mr. Sivakumar Ganesan Sr. Associate - Projects Advanced Data Analytics, Cognizant	Industry Expert	
Mr.K.Lenin **ME Cad Cam Alumnus (2016)** Manager - Sony Traders	Alumnus nominated by the Principal	

Minutes of the BOS meeting

The meeting was chaired by our beloved Principal **Dr.R.Ramesh**.

1. Principal introduced the Board of studies members and gave a warm welcome to all Faculty members.
2. The Department head Ms.J.Joy Priscilla presented the proposed syllabus with unit wise contents for all subjects offered by Department of Mathematics to other Engineering Departments.
3. After the presentation, discussion session was there and the subject experts gave their suggestions.
4. **Dr.V. Saradha** insisted that matrices unit should be included in the First semester for all the branches to create a comfort zone for the first year students in Mathematics. **Dr.R.S.Selvaraj and Dr.K.Thirusangu** also suggested the same.
5. **Dr.V. Saradha** suggested to include Functions of random variables, Transformation of random variables and Central limit theorem in the Probability subjects.
6. Madam also said to include Ergodic process, Random telegraph process and semi Random telegraph process in Random Process. Spectral densities and Linear time invariant system units also shall be included.
7. **Dr.R.S.Selvaraj** suggested to include basic foundation level topics in the first semester. Sir also suggested to include Functions of several variables before Integral Calculus unit.
8. **Dr.R.S.Selvaraj** told to alter the units in "Applied Calculus" as follows:

   Unit I-Matrices; Unit II-Functions of several variables; Unit III- Multiple Integrals;

   Unit-IV -Vector Calculus; Unit V- Ordinary differential equations.
9. Sir also insisted to remove Bessel's function from the syllabus of "Random process techniques" as it is not apt for syllabus title.

   Dr.V. Saradha and Dr.K.Thirusangu also suggested the same.
10. **Dr.R.S.Selvaraj** suggested to include Complex variables and Contour integration for Electrical and Electronics Engineering as the students of that branch will need those concepts.
11. Sir also said to include ODE for CSE and IT branches if possible and pointed out that title of the subject **Series and Analysis** does not match with unit contents and suggested to rename as **Fourier series and complex variables.**
12. **Dr.R.S.Selvaraj** suggested to specify the units and topics with chapter numbers in Text Books for all the subjects as it will be easy for the Question paper setter.

13. **Dr.K.Thirusangu** insisted that Basic concepts to be taught in the first semester and told not to omit any fundamental topics in the syllabus.
14. Sir suggested to change the subject name of "TPDE for Mechanical Engineering" to "Transforms Techniques".
15. **Dr.K.Thirusangu** also suggested that Branch name need not be mentioned in subject name. Sir said to name the subjects relevant to the contents included.
16. **Mr. Sivakumar Ganesan** insisted to include the basic concepts of statistics for Information Technology branch as statistics plays a vital role in data analysis.
17. **Mr. Sivakumar Ganesan** also suggested to include statistics and probability concepts for Electrical and Electronics Engineering.
18. **Mr.K.Lenin** suggested that relevance of related subjects should be told to the students during the course.
19. **Mr.K.Lenin** also requested the Faculty members to mention the applications of the Mathematical concepts in the respective Engineering fields while teaching.
20. Finally Ms.J.Joy Priscilla thanked everyone for their valuable suggestions.

The meeting successfully ended with **High Tea**.