KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

(DEEMED TO BE UNIVERSITY)

(Under Section 3 of the UGC Act 1956)

Anand Nagar, Krishnankoil - 626126

Srivilliputtur(via), Virudhunagar(Dt.), Tamil Nadu, INDIA

CURRICULUM AND SYLLABUS

B.Sc. Mathematics

(2017 and Later)

DEPARTMENT OF MATHEMATICS

SCHOOL OF ADVANCED SCIENCES

KALASALINGAM UNIVERSITY
(KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION)
(Under Section 3 of the UGC Act 1956)
Anand Nagar, Krishnankoil-626126

Srivilliputtur(via), Virudhunagar(Dt.), Tamil Nadu, INDIA

(www.kalasalingam.ac.in)

DEPARTMENT OF MATHEMATICS

VISION

To be a global centre of excellence in mathematics for the growth of science and technology.

MISSION

- **To provide quality education and research in mathematics through updated curriculum and effective teaching learning process.**
- **To inculcate innovative skills, team work and ethical practices among students so as to meet societal expectations.**

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PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1: Technical Proficiency:

Provide a degree course, suitable for students of high ability, combining and relating mathematics, statistics, and the social sciences.

PEO2: Professional Growth:

Prepare students for further study, or for professional and managerial careers, particularly in areas requiring the application of quantitative skills.

PEO3: Management Skills:

Provide students with knowledge of mathematics, Management and the interaction between the two.

PROGRAMME OUTCOMES (PO)

POs describe what students are expected to know or to be able to do by the time of graduation from the programme. The Program Outcomes of UG in Mathematics are:

At the end of the programme, the students will be able to:

1) Think in a critical manner.
2) Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
3) Formulate and develop mathematical arguments in a logical manner.
4) Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses.
5) Understand, formulate and use quantitative models arising in social science, business and other contexts.
6) Apply the concepts studied, in real life situations.

B. Sc MATHEMATICS CURRICULUM

Semester-I

Course Category	Subject	Course Code	L	T	P	C
Language Paper	Tamil / Hindi	BAE17R112 / BAE17R151	4	0	0	3
AEC Course – I	Communicative English	BAE17R107	3	0	0	2
Core Course – I	Differential Calculus	MAT17R121	4	2	0	6
Core Course – II	Statistics – I	MAT17R143	4	2	0	6
Core Course - III	Mechanics & Properties of matter	PHY17R141	4	0	2	6
Total Credits			23			

Semester-II

Course Category	Subject	Course Code	L	T	P	C
Language Paper	Poetry, Short Stories, Fiction, Grammar, Composition And Vocabulary	BAE17R111	4	0	0	3
AEC Course - II	Environmental Science	CHY17R103	3	0	0	2
Core Course IV	Differential Equations	MAT17R122	4	2	0	6
Core Course V	Statistics - II	MAT17R144	4	2	0	6
Core Course VI	Optics and Electricity	PHY17R142	4	0	2	6
Total credits			23			

Semester- III

Course Category	Subject	Course Code	L	T	P	C
Core Course VII	Three Dimensional Analytical Geometry and Theory of Equations	MAT17R221	4	2	0	6
Core Course VIII	Programming in C	BCS17R271	4	0	2	6
Core Course IX	Thermodynamics & Modern Physics	PHY17R241	4	0	2	6
SEC-A	Skill Enhancement Course –1		3	0	0	2
Total Credits			20			

Semester- IV

Course Category	Subject	Course Code	L	T	P	C
Core Course X	Modern Algebra	MAT17R228	4	2	0	6
Core Course XI	Object Oriented Programming with C++	BCS17R272	4	0	2	6
Core Course XII	Analog and Digital Electronics	PHY17R242	4	0	2	6
SEC-B	Skill Enhancement Course – 2		3	0	0	2
Total Credits						20

Semester-V

Course Category	Subject	L	T	P	C
DSE-A1	Discipline Specific Elective-1	4	2	0	6
DSE-A2	Discipline Specific Elective-2	4	2	0	6
DSE-A3	Discipline Specific Elective-3	4	2	0	6
SEC-C	Skill Enhancement Course -3	3	0	0	2
Total Credits					20

Semester-VI

Course Category	Subject	L	T	P	C
DSE-B1	Discipline Specific Elective-1	4	2	0	6
DSE-B2	Discipline Specific Elective-2	4	2	0	6
DSE-B3	Discipline Specific Elective-3	4	2	0	6
SEC-D	Skill Enhancement Course -4	3	0	0	2
Total Credits		20			

Skill Enhancement Course

Skill Enhancement Course (SEC- A)

(Choose any one)

Subject	Course Code
1. Integral Calculus	MAT17R222
2.Application of Ordinary Differential Equation	MAT17R223
3. Pure Geometry	MAT17R224

Skill Enhancement Course (SEC- B)

(Choose any one)

Subject	Course Code
1. Sequences and Series	MAT17R225
2.Fourier Series and Laplace Transforms	MAT17R226
3.Fourier Transform and Z-Transform	MAT17R227

Skill Enhancement Course (SEC- C)

(Choose any one)

Subject	Course Code
1.Classical Algebra	MAT17R321
2.Number Theory	MAT17R322
3. Mathematical Modeling	MAT17R323

Skill Enhancement Course (SEC- D)

(Choose any one)

Subject	Course Code
1.Vector Calculus	MAT17R324
2.Boolean Algebra	MAT17R325
3. Mathematical Finance	MAT17R326

Discipline Specific Elective

Discipline Specific Elective- A (DSE – A)

DSE-A1 (Choose Any One)	
Subject	**Course Code**
1. Linear Algebra	MAT17R331
2. Automata Theory	MAT17R332
3. Encryption and Cryptography	MAT17R333
DSE-A2 (Choose Any One)	
1. Real Analysis	MAT17R334
2. Stochastic Process	MAT17R335
3. Classical Optimization	MAT17R336
DSE-A3 (Choose Any One)	
1. Mechanics	MAT17R337
2. Astronomy	MAT17R338
3. Fractal Geometry	MAT17R339

Discipline Specific Elective

Discipline Specific Elective- A (DSE – B)

DSE-B1 (Choose Any One)	
Subject	**Course Code**
1. Operations Research	MAT17R341
2. Numerical Methods	MAT17R342
3. Queuing Theory	MAT17R343
DSE-B2 (Choose Any One)	
1. Complex Analysis	MAT17R344
2. Fuzzy logic and Its applications	MAT17R345
3. Special functions	MAT17R346
DSE-B3 (Choose Any One)	
1. Graph Theory	MAT17R347
2. Combinatorics	MAT17R348
3. Coding Theory	MAT17R349

B. Sc MATHEMATICS

Consolidated CGPA Credits

Semester	**Number of Credits**
Semester – I	23
Semester – II	23
Semester – III	20
Semester – IV	20
Semester – V	20
Semester – VI	20
Total Credits	126

BAE17R112 தமிழ் இலக்கிய வரலாறும் புதினமும் (With effect from June 2017)	L	T	P	Credit
	3	0	0	3

Pre-requisite: NIL **Course Category:** Language
Course Type: Theory

கூறு-1 **(9 Hours)**

தமிழ் மொழியின் பழமையும் சிறப்பும் –திராவிட மொழிக்குடும்பம்
தமிழ்நாடு-தமிழின் சிறப்புகள்
பழந்தமிழ் இலக்கண நூல்கள்-தொல்காப்பியம்,நன்னூல் முதலிய இலக்கண நூல்கள்-எழுத்து,சொல்,பொருள் அதிகாரங்கள்

கூறு-2 **(9 Hours)**

சங்க காலம்-மூன்று சங்கங்கள்-இலக்கியச் சான்றுகள்-கல்வெட்டுச் சான்றுகள்
இலக்கண,சங்க நூல்களின் சிறப்பு-பத்துப் பாட்டு-எட்டுத்தொகை-சங்கத் தமிழர் மாண்புகள்

கூறு-3 **(9 Hours)**

சங்கம் மருவிய காலம்-பதிணெண் கீழ்க்கணக்கு நூல்கள்-வகைகள்
காப்பிய இலக்கிய வரலாறு-ஐம்பெருங்காப்பயங்கள்-சிறு காப்பியங்கள்-காப்பியக்கூறுகள்

கூறு-4 **(9 Hours)**

புதினம்
தேடல்

கூறு-5 **(9 Hours)**

அடிப்படை இலக்கணம்
முதல்,சார்பு எழுத்துக்கள்,மொழி முதல்,இறுதி எழுத்துக்கள்,வல்லினம் மிகும் மிகா இடங்கள்

பாட நூல்:

1.தமிழ் இலக்கிய வரலாறு, முனைவர் ச.வே.சுப்பிரமணியன், மணிவாசகர் பதிப்பகம், 31,சிங்கர் தெரு,பாரி முனை, சென்னை-600 108
2.நன்னூல்-எழுத்ததிகாரம், முனைவர் சு.அழகேசன் உரை, சுதன் பதிப்பகம், தூத்துக்குடி
3.தேடல், பொன்னீலன், ஒன்பதாம் பதிப்பு, நியூபுக் ஹவுஸ் வெளியீடு, சென்னை-98

BAE17R107 COMMUNICATIVE ENGLISH	L	T	P	Credit
	3	0	0	2
Pre-requisite: NIL	**Course Category:** AEC Course **Course Type:** Theory			

Preamble:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skils which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

The present course hopes to address some of these aspects through an interactive mode of teaching-learning processes and by focusing on various dimensions of communication skills. Some of these are:

Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note-taking etc.

While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. It is hoped that after studying this course, students will find a difference in their personal and professional interactions.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: Understand the types of Communication - Understand
CO2: Analyse the Verbal Communication and Non Verbal Communication - Apply
CO3: Practice dynamics of Professional presentations - Apply
CO4: Know how to translate the foreign language - Understand
CO5: Know how to write letters both personal and professional - Apply

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1						L
CO2		M				
CO3						M

CO4						
CO5		M				

Unit - I **(5 Hours)**

Introduction: Theory of Communication, Types and modes of Communication

Unit - II **(5 Hours)**

Language of Communication:
Verbal and Non-verbal (Spoken and Written)
Personal, Social and Business
Barriers and Strategies
Intra Personal, Inter Personal and Group Communication

Unit - III **(5 Hours)**

Speaking Skills:
Monologue
Dialogue
Group Discussion
Effective Communication/ Mis- Communication
Interview
Public Speech

Unit - IV **(5 Hours)**

Reading and Understanding
CloZe Reading
Comprehension
Summary Paraphrasing
Analysis and Interpretation
Translation (from Indian language to English and vice-versa)
Literary/Knowledge Texts

Unit – V **(5 Hours)**

Writing Skills
Documenting
Report Writing
Making notes
Letter Writing

Books Prescribed

1. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, DrRanjana Kaul, Dr.Brat Biswas
2. Fluency in English Part II Oxford University Press, 2006
3. Business English, Pearson, 2008.

MAT17R121 Differential Calculus	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** Core **Course Type:** Theory			

Course Objective(s):
To enable the student to understand the basic concepts in differential calculus.

Course Outcome(s):
Upon successful completion of this course, students will be able to
CO1: Understand the concept of differentiability of functions and successive differentiation,
CO2: Know the concept of maxima, minima and tangent and normal.
CO3: Understand about some singular points and parametric representation of curves.
CO4: Know about polar coordinates and tracing of curves in polar coordinates.
CO5: Learn Rolle's theorem and mean value theorem and its application.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M	H		H	
CO2				M		
CO3	L		M			L
CO4		M	H		H	
CO5				M		

UNIT-I **(15 Hours)**
Limit and Continuity ($\varepsilon \; and \delta \; definition$) - Differentiability of functions - Successive differentiation -Leibnitz's theorem - Partial differentiation - Euler's theorem on homogeneous functions.

UNIT-II **(15 Hours)**
Tangents and normals - Maxima minima – Curvature - Asymptotes.

UNIT-III **(15 Hours)**
Singular points - Tracing of curves - Parametric representation of curves - tracing of parametric curves.

UNIT-IV **(15 Hours)**
Polar coordinates - tracing of curves in polar coordinates.

UNIT-V **(15 Hours)**
Rolle's theorem - Mean value theorem – Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series -Maclaurin's series of sinx, cosx, e^x, log(1+x), $(1+x)^m$.

Text Book(s):
S.Narayanan, T.K.Manickavachagam pillai, Calculus, volume -I, S.Viswanathan publishers, 2014.
Unit-I:Chapter III(Sections 1.1 to 1.6), Chapter VIII(Sections 1.1 to 1.7)

Unit-II: Chapter XI(Sections 1.1 - 1.4), Chapter V(Sections 1.1 - 1.5)
Unit-III: Chapter XII(Sections 2.1 -2.7)
Unit-IV: Chapter XIII(Sections 1.1 - 1.2), Chapter XIII(Sections 2.1)
Unit-V: Chapter VI(2.1-2.5), Chapter VII(1.1-1.4)

Reference Book(s):

1.H.Anton, I.Birens and S.Davis, Calculus, John Wiley and Sons, Inc., 2002.
2.G.B.Thomas and R.L.Finney, Calculus, Perason Education, 2007.

MAT17R143 STATISTICS - I	L	T	P	Credit
	4	2	0	6

Pre-requisite: NIL **Course Category:** Core
Course Type: Theory

Course Objective(s):

To enable the students to acquire the knowledge of probability and distributions.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: to understand the basic concept of Probability and Independent events.

CO2: to know the concept of random variables, distribution function and joint probability density function.

CO3: to study about mathematical expectation and generating function.

CO4: to understand the concept about Binominal and Poisson distribution.

CO5: to learn about Normal distribution and M.G.F and moments of Normal distribution.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M			H	
CO2	L					M
CO3			M	L		
CO4		M				H
CO5			L		M	

UNIT I: Theory of Probability (15 Hours)

Random Experiment – Event – Probability: Mathematical Notion – Probability function – Laws of Addition of probabilities – Laws of multiplication or Theorem of Compound Probability –

Independent Events – Pairwise Independent Events – Mutually Independent Events –Baye's Theorem.

UNIT II: **Random Variables and Distribution Functions (15 Hours)**

Random Variables- Distribution Function –Properties of Distribution Function – Discrete Random variable – Probability mass function – Discrete distribution function – Continuous random variable - Probability density function - Continuous distribution function – Joint p.m.f and marginal and conditional probability function – Joint p.d.f – Joint density function, marginal density function – Independent random variable – The conditional distribution function and conditional p.d.f.

UNIT III: **Mathematical Expectation and Generating Functions (15 Hours)**

Mathematical Expectation – Additional theorem of expectation – Multiplication theorem of expectation – Covariance – Expectation of linear combination of random variables - Variables of a linear combination of random variables - Expectation of continuous random variables – Moment generating function – Theorems on moment generating functions.

UNIT IV: Theoretical Discrete Distributions (15 Hours)

Binomial Distribution: Recurrence relation for the moments of Binomial Distribution – Moments Generating functions of Binomial Distribution – Recurrence relation for the probabilities of Binomial Distribution.

Poisson Distribution: Moments of the Poisson Distribution – Mode of the Poisson Distribution – Recurrence relation for the moments of the Poisson Distribution – Moment generating function of Poisson Distribution – Additive property of independent Poisson variates– Recurrence formula for the probability of Poisson distribution

UNIT V: Theoretical Continuous Distributions (15 Hours)

Normal Distribution: Chief characteristics of the Normal Distribution and Normal probability curve – M.G.F of Normal Distribution – Moments of Normal Distribution – A linear comination of independent Normal variates is also a Normal variate– Area property – Importance of Normal Distribution – Fitting of Normal Distribution.

Text Book(s):

S.C.Gupta, V.K.Kapoor, **Elements of Mathematical Statistics,** Sultan Chand and Sons,Third Editon, Reprint 2015.
Unit I: Chapter 4 (4.5-4.5.2, 4.6-4.6.2, 4.7, 4.7.2-4.7.4, 4.8);
Unit II: Chapter 5 (5.1-5.4.1, 5.4.3, 5.5.1-5.5.5)
Unit III: Chapter 6 (6.1-6.9.1);
Unit IV: Chapter 7 (7.2, 7.2.2, 7.2.6, 7.2.10, 7.3.1-7.3.5, 7.3.8-7.3.9)
Unit V: Chapter 8 (8.1, 8.2.2, 8.2.5, 8.2.7-8.2.8, 8.2.11, 8.2.13-8.2.14)

Reference(s):

1. S. Arumugam and A. Thangapandi Isaac, **Statistics,** New Gamma Publishing Houses, Edition, Year 2009.
2. S.C.Gupta, V.K.Kapoor, **Fundamental of Mathematical Statistics,** Sultan Chand and Sons, Eleventh Edition, Reprint 2008.

PHY17R141 Mechanics & Properties of Matter	L	T	P	Credit

	4	**0**	**2**	**6**

Pre-requisite: NIL **Course Category:** Core
Course Type: Theory with Practical component

Course Objective(s):

This course focuses on the basic concepts of mechanics and their applications in solving various physical problems. Also it focuses on the analysis of the different properties of matter

Course Outcome(s):

Upon successful completion of this course, students will be able to
CO1: Acquire fundamental knowledge in Newtonian mechanics.
CO2: Gain the knowledge of gravitational force between bodies including planets
CO3: Analyze the elastic properties of materials
CO4: Analyze the viscous properties of materials
CO5: Understand the concepts of surface tension and its implications.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M	M		M	H
CO2			H		M	H
CO3		M	M			H
CO4		M	H		M	H
CO5		M			M	H

Unit I: Mechanics (15 Hours)

Laws of impact – direct impact of spheres – expression for loss of kinetic energy during collision - moment of inertia – parallel & perpendicular axes theorem – proof – law of conservation of angular momentum – expression for rotational kinetic energy – torque - compound pendulum theory – period –torsional pendulum theory –moment of inertia of a disc – moment of inertia of a uniform rod , circular disc and solid sphere (proof).

Unit II: Gravitation (15 Hours)

Kepler's laws of motion – Newton's universal law of gravitation – Determination of G by Boy's method – inertial mass & gravitational mass – variation of g with altitude – latitude – depth , poles & equator – satellites – orbital velocity – escape velocity – relation.

Unit III: Elasticity (15 Hours)

Definition – stress – strain – three modulii of elasticity – units – dimensions – Hooke's law – definition – yield point – elastic limit – elastic fatigue – Poisson's ratio – definition – limiting values – relation between q , n , k and σ - expression for bending moment – theory of uniform and non – uniform bending.

Unit IV: Viscosity & fluid motion (15 Hours)

Definition – units – dimension – stream lined motion & turbulent motion – definition – Poiseuilli's formula to determine η (without correction for pressure head) – equation of continuity – Bernoulli's theorem – statement only – venturimeter – Ostwald's viscometer –

motion of bodies in highly viscous media – definition – terminal velocity – Stoke's experiment with theory (dimension method).

Unit V: Surface tension (15 Hours)

Definition – units – dimensions – surface energy definition – units – Excess pressure inside a spherical and cylindrical drop & bubble (synclastic system proof) – angle of contact – capillarity – ST determination by capillary rise - experiment to determine ST & IST by drop weight method – determination of ST of a liquid by Jaeger's method – variation of ST with temperature.

Text Book(s):

1. Mechanics & Properties of matter, Brijlal, N. Subrahmanyan, S. Chand &Co., 2002.

Reference(s):

1. Mechanics Berkeley Physics course, Charles Kittel, Tata McGraw-Hill, 2007
2. University Physics, Ronald Lane Reese, Thomson Brooks/Cole, 2003.

Mechanics, D.S. Mathur, S. Chand & Co., 2000.

Allied laboratory Mechanics and Properties of Matter Laboratory

1. Measurements of length (or diameter) using verniercaliper, screw gauge and travelling microscope.
2. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
3. To determine the Elastic Constants of a Wire by Searle's method.
4. Compound pendulum – g and k.
5. Non-uniform bending – Pin and Microscope.
6. Uniform bending – Optic lever.
7. Cantilever depression – scale and telescope.
8. Torsion Pendulum.
9. Surface tension – Capillary rise.
10. Experiment to determine coefficient of viscosity of low viscous liquid by capillary Flow Method (Poiseuille's method).

Reference Book(s):

1. Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publishers.
3. Engineering Practical Physics, S.Panigrahi& B.Mallick,2015, CengageLearningIndiaPvt. Ltd.
4. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition,2011, KitabMahal, New Delhi.

BAE17R111 **POETRY, SHORT STORIES, FICTION, GRAMMAR, COMPOSITION AND VOCABULARY**	**L**	**T**	**P**	**Credit**
	4	**0**	**0**	**3**
Pre-requisite: NIL	**Course Category:** Language **Course Type:** Theory			

Course Objective(s):

The course aims to help the students achieve fluency and accuracy in English.

Course Outcome(s):

CO1: To introduce World renowned poets to students.
CO2: To make them understand the nuances of Short stories.
CO3: To acquaint students with the writings of Nobel laurates.
CO4: To excel in Grammar.
CO5: To excel in Composition.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M				
CO2			H		L	
CO3	M			L		M
CO4		M			M	
CO5		M				L

Unit – I – Poetry **(9 Hours)**

Nissim Ezekiel – Night of the scorpion
Robert Frost – Road Not Taken
Percy Bysshe Shelley – Ode to the West Wind

Unit – II – Short Stories **(9 Hours)**

Jesse Owens - My Greatest Olympic Prize
R.K.Narayan – An Astrologer's Day
Stephen Leacock – My Financial Career

Unit – III – Fiction **(9 Hours)**

Ernest Hemingway – The Old man and the Sea

Unit – IV – Grammar **(9 Hours)**

a. Tenses
b. Nouns – Countable and Uncountable
c. Kinds of Sentences
d. Articles
e. Prepositions

Unit – V – Composition and Vocabulary **(9 Hours)**

1. **Composition**

a. Letter Writing (Formal and Informal)
b. Curriculum Vitae
c. Situational Conversation

2. **Vocabulary**

One Word Substitutes:

alimony, amateur, amnesty, anaesthesia, anarchist, anatomy, anonymous, archive, atheist, autobiography, cannibal, carcinogen, cardiologist, carnivorous, centenarian, contemporary, connoisseur, cosmopolitan, crew, detective, (21 – 40) emigrant, epitaph, extempore, fauna, feminist, fleet, flora, forgery, gymnasium, gynaecologist, herbivorous, hypocrisy,

incorrigible, kleptomania, lexicographer, manuscript, mercenary, misanthrope, mortuary, novice, (41 – 60) obituary, omniscient, ophthalmologist, optimist, omnipotent, orphan, panacea, parasite, pedestrian, pessimist, philanthropy philatelist, polygamy, posthumous, post-mortem, secular, somnambulist , theology, unanimous, utopia.

Book(s) Prescribed:

Sadanand Kamalesh. & Punitha, Susheela. **Spoken English: A Foundation Course**. Part 2 Orient Black Swan, New Delhi, 2011

Taylor, Grant. **English Conversational Practice**. New Delhi. Tata McGraw- Hill, 1975

CHY17R103 Environmental Science	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	**2**
Pre-requisite: NIL	**Course Category**: AEC Course **Course Type:** Theory			

Course Objective(s):

Creating awareness among engineering students about the importance of environment, the effect of technology on the environment and ecological balance is the prime aim of the course.

Course Outcome(s):

At the end of this course, the student is expected to

CO1: To Know the importance of environmental studies and methods of conservation of natural resources.

CO2: Describe the structure and function of an ecosystem and explain the values and Conservation of bio-diversity.

CO3: Explain the sources, environmental effects and control measures of various types of pollutions.

CO4: Select the appropriate methods for waste management.

CO5: Recall social issues and legal provision and describe the necessities for environmental act.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M			L	
CO2				L		
CO3	L		M			
CO4		M				L
CO5					M	

Unit-I: Natural Resources **(5 Hours)**

Definition, scope, and importance of environmental sciences -Need for public awareness-

Natural resources: Forest resources, Water resources, Land resources, Mineral resources, and Energy resources - Role of an individual in conservation of natural resources.

Unit-II: Ecosystem and Biodiversity (5 Hours)

Concept of an ecosystem - Structure and function of an ecosystem - Food chains, food webs and ecological pyramids - Biodiversity - Definition, value of biodiversity- Hot spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit-III: Environmental Pollution (5 Hours)

Sources, consequences and control measures of Air pollution, Water pollution, Soil pollution, Thermal pollution and nuclear pollution. Environmental threats -, Acid rain, Climate change, Global warming (Greenhouse effect), Ozone layer depletion. Fireworks: current environmental issues.

Unit-IV: Management of Environmental Pollution (5 Hours)

Causes, effects, treatments methods and control measures of solid waste, municipal waste, biomedical waste - Waste minimization techniques - Cleaner technology-- Disaster management: floods, earthquake, cyclone, landslides and Tsunami.

Unit-V: Social Issues and the Environment (5 Hours)

Water conservation, rain water harvesting- Environmental impact assessment- Precautionary and polluters pay principle- environment protection act - air (prevention and control of pollution) act - water (prevention and control of pollution) act - Population explosion - Family Welfare Programmes - Environment and human health - Human Rights - Women and Child Welfare.

Text Book(s):

1. Dhameja, S. K., Environmental Engineering and Management, S. K. Kataria and sons, New Delhi, 1st edition 2015.
2. Anubha Kaushik and Kaushik C.P., Environmental Science & Engineering" New Age international Publishers, New Delhi, 2010.

Reference(s):

1. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., 2nd edition, 2004.
2. Erach Bharucha, Textbook for Environmental Studies, UGC, New Delhi, 2004.
3. Miller T.G. Jr., "Environmental Science", Wadsworth Publishing Co. USA, 2nd edition 2004.
4. Erach Bharucha, "The Biodiversity of India", Mapin publishing Pvt. Ltd., Ahmedabad India, 2002.
5. Trivedi R.K., "Handbook of Environmental Laws", Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro media, 2003.
6. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
7. Wager K.D., "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
8. Sawyer C. N, McCarty P. L, and Parkin G. F., Chemistry for Environmental Engineering,

McGraw-Hill, Inc., New York, 1994.

MAT17R122 DIFFERENTIAL EQUATIONS	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** Core **Course Type:** Theory			

Course Objective(s):

To make the students to solve the differential equations using ordinary methods and using Laplace transforms.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: Know the method of finding solution to first order and higher degree.

CO2: Understand the methods in solving the linear differential equations with constant coefficient and variable coefficient.

CO3: Know about the method of solving differential equation using variation of parameters

CO4: Solve the first order partial differential equation.

CO5: Understand the concept of Laplace transform and its application in solving differential equations.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1	M	M				L
CO2		H		M		
CO3	L		M			M
CO4		L			M	
CO5			H			M

UNIT – I: **(15 Hours)**

Exact differential equations – Equations of the first order but of higher degree – Equations solvable for y – Equations solvable for x and p - Clairaut's form – Equations that do not contain x, y explicitly – Equations homogeneous in x and y .

UNIT-II: **(15 Hours)**

Linear equations with constant coefficients -Linear equations with variable coefficients– Equations reducible to the linear homogeneous equations – Simultaneous linear differential equations with constant coefficients.

UNIT-III: **(15 Hours)**

Linear equations of the second order – Reduction to the normal form – Change of the independent variables – Variation of parameters.

UNIT-IV: (15 Hours)

Partial differential equations of the first order – Derivation of partial differential equations – Lagrange's method of solving the linear equations– Standard forms– Equations reducible to the standard forms.

UNIT-V: (15 Hours)

Laplace Transforms – Theorems –problems– Evaluation of integrals – inverse Laplace Transforms – Results – Solving ordinary differential equation with constant coefficient and variable coefficients – Solving simultaneous linear equations using Laplace Transforms.

Text Book(s):

S. Narayanan & T.K. Manicavachagam Pillay, Differential Equations and its Applications, Viswanathan Printers, Revised Edition, 2012.

Unit-I:Chapter II(Sections 6.1 to 6.4), Chapter IV(Sections 1, 2, 3, 4)

Unit-II: Chapter V(Sections 1 to 6), Chapter VI (Sections 6)

Unit-III: Chapter VIII(Sections 1 to 4)

Unit-IV: Chapter XII(Sections 1 to 5)

Unit-V: Chapter IX

Reference(s):

S. Arumugam and Thangapandi Isaac, Differential Equations and its Applications, New Gamma Publishing House, 2011.

MAT17R144 STATISTICS - II	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** Core **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the concept of attributes and sampling distribution.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: understand the concept of correlation and regression.

CO2: study about the basic concept of theory of attributes.

CO3: understand the concept of testing of hypothesis for large samples.

CO4: understand the concept exact sampling distribution.

CO5: know the concept of student's t-distribution and F-distribution.

Mapping of Course Outcome(s):

CO / PO	**PO**

	1	2	3	4	5	6
CO1	L	M			H	
CO2		H	L			M
CO3	M		M			
CO4		M		H	M	
CO5			L			H

UNIT I: Correlation and Regression **(15 Hours)**

Bivariate distribution, Correlation – Scatter diagram – Karl Pearson Coefficient of Correlation – Limits for correlation coefficient – Rank Correlation – Repeated Ranks – Regression – Lines of Regression – Regression coefficients – Properties of regression coefficient – Angle between two lines of regression.

UNIT II: Theory of Attributes **(15 Hours)**

Introduction – Notations –Dichotomy – Classes and Class frequencies – Order of classes and class frequencies – Relation between class frequencies – Class symbols as operators – Consistence of data – Conditions for consistency of data – Independence of attributes – Criterion of independence – Symbols $(AB)_0$ and δ– Association of Attributes – Yule's Coefficient of association – Coefficient of Colligation.

UNIT III: **Sampling and Large Sample Test** **(15 Hours)**

Types of Sampling- Parameters and statistic – Sampling distribution – Standard Error: Tests of Significance – Null hypothesis – Error in sampling – Critical Region and Level of significance – Tests of significance for large samples – Test for single proportion – Test of significance for difference of proportions – Test of significance for single mean – Test of significance for difference of means.

UNIT IV: **Exact Sampling Distribution** **(15 Hours)**

Chi-square variate– M.G.F of χ^2 distribution – Additive property of Chi-square variates– Chi-square test of goodness of fit – Independence of attributes

UNIT V: **Exact sampling distribution (Continued)** **(15 Hours)**

Student's 't' (Definition) – Derivation of Student's t-distribution – Application of t-distribution – Test for single mean – t-Test for difference of means – t-Test for testing significance of an observed – F-statistic (Definition) – Applications of F –distribution.

Text Book(s):

S.C.Gupta, V.K.Kapoor,**Elements of Mathematical Statistics,** Sultan Chand and Sons,Third Editon, Reprint 2015.

Unit I: Chapter 10 (10.1-10.3.1, 10.6-10.7.1, 10.7.3-10.7.5)
Unit II: Chapter 11
Unit III: Chapter 12 (12.2-12.8, 12.9.1, 12.9.2, 12.13, 12.14)
Unit IV: Chapter 13 (13.1, 13.3, 13.3.3, 13.5.2, 13.5.3)
Unit V: Chapter 14(14.2, 14.2.1, 14.2.5-14.3.1)

Reference(s):

1. S. Arumugam and A. Thangapandi Isaac, **Statistics,** New Gamma Publishing Houses,Edition, Year 2009.
2. S. C. Gupta, V. K. Kapoor, **Fundamental of Mathematical Statistics,** Sultan Chand and Sons, Eleventh Edition, Reprint 2008.

PHY17R142 Optics and Electricity	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** Program Core **Course Type:** Theory with Practical component			

Course Objective(s):

This course aims to give clear understanding of the basic concepts of optics and electricity

Course Outcome(s):

Upon successful completion of this course, students will be able to
CO1: Acquire fundamental knowledge in Ray optics.
CO2: Gain the knowledge of different types of LASER and their applications
CO3: Understand the different components of fibre optic communication systems
CO4: Analyze the different properties of static charges
CO5: Apply the concepts of current electricity in studying different bridge circuits.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M				H
CO2		M	M			H
CO3		M	M			H
CO4						H
CO5		M	M			H

Unit I: Optics **(15 Hours)**

Dispersion-dispersive power – deviation without dispersion-achromatic combination of prisms-formula derivation-dispersion without deviation-formula derivation- directvision spectroscope-chromatic aberration in lenses-derivation-achromatic combination of lenses-spherical aberration-explanation-Eyepieces Huygen&Ramsden- differences .

Unit II: Laser **(15 Hours)**

Stimulated emission- absorption –spontaneous emission –population inversion-optical pumping-working principles of LASER - Ruby LASER- uses - He-Ne laser –applications.

Unit III: Fibre optics & holography **(15 Hours)**

Introduction- propagation of light-optical fibres-NA-graded index fibres- advantages of optic fibres in communications-principles of Hologram.

Unit IV: Electrostatics **(15 Hours)**

Inverse square law-electric field-potential difference-proof of E = dv/dx - volt-definition of Gauss law-proof-applications-mechanical stress-soap bubble - equi potential surface-Capacity-

principle of capacitor-spherical & cylindrical capacitor-parallel plate capacitor with & without dielectrics-combination of capacitors in series & in parallel-energy of a charged capacitor.

Unit V: Current electricity (15 Hours)

Ohm's law-standard unit of current-definition of ampere-units of voltage & resistance - Kirchoff's I & II law-applications-Wheatstone's network-condition for balance-condition for sensitiveness-application to Wheatstone's bridge-principles of Carey Foster's bridge-theory-Potentiometer-measurement of current & resistance-calibration of low & high range voltmeter.

Text Book(s):

1. Optics,Brijlal&Subramaniam, S. Chand Publication, 2014.
2. Electricity and Magnetism R Murugesan, S. Chand & Co. 1995

Reference(s):

1. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
3. Electricity and Magnetism, J.H. Fewkes& J. Yarwood. Vol. I, 1991, Oxford Univ.Press.

Allied laboratory

Optics and electricity

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c)DC Current, and (d) checking electrical fuses.
2. To compare capacitances using De'Sauty's bridge.
3. To study the Characteristics of a Series RC Circuit.
4. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b)Quality Factor
5. To determine a Low Resistance by Carey Foster's Bridge.
6. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ2 – T Law.
7. To determine the Refractive Index of the Material of a given Prism using SodiumLight.
8. To determine Dispersive Power of the Material of a given Prism using MercuryLight
9. To determine wavelength of sodium light using Newton's Rings.
10. To determine the wavelength of Laser light using Diffraction of Single Slit.
11. To determine wavelength of (1) Sodium & (2) spectrum of Mercury light usingplane diffraction Grating
12. To determine the particle size by using LASER

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, AsiaPublishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition,2011, KitabMahal, New Delhi.
4. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, AsiaPublishing House.

MAT17R221 THREE DIMENSIONAL ANALYTICAL GEOMETRY AND THEORY OF EQUATIONS	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** Core **Course Type:** Theory			

Course Objective(s):

To enable the students to acquire the basic knowledge in three dimensional Analytical Geometry and Theory of Equations.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: understand the basic concept of direction ratios and direction cosines, planes and lines in three dimension.

CO2: know about the sphere and section of a sphere.

CO3: know about the cone and cylinder.

CO4: know the relation between the roots and coefficients and find the sum of the powers of the roots of the equation.

CO5: know the method of finding the solution of reciprocal equations and nature of the roots of the equation.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1	L	M		M		
CO2		H				L
CO3	M		H	L		
CO4		M			L	
CO5			M			L

UNIT-I: **Planes and Straight lines** **(15 Hours)**

Direction cosines, direction ratios- Planes – angle between two planes – perpendicular distance from a point to the plane –equation of angle bisector of planes- Straight lines – symmetric form – coplanar lines – skew lines – shortest distance and its equation between two skew lines.

UNIT-II: Sphere **(15 Hours)**

Sphere – touching of spheres - Section of a sphere by a plane- Tangent plane, Orthogonal spheres.

UNIT-III: Cone and Cylinder **(15 Hours)**

Cone - Right Circular Cone - Cylinder- Right Circular Cylinder- Equation of a Cylinder.

UNIT IV: Relation between roots and coefficients **(15 Hours)**

Introduction – Formation of equation – Division Algorithm (Statement Only) – Fundamental theorem of Algebra – Relation between roots and coefficients – Sum of power of roots – Newton's theorem (Statement only).

UNIT V: Reciprocal equations **(15 Hours)**

Transformation of equation – Removal of terms – Multiple roots – Nature and position of roots – Descarte's rule of signs - Rolle's theorem.

Text Book(s):

1. T.K. Manickavachagom Pillay and T. Natarajan, Text Book of Analytical Geometry (Part II-Three Dimensions) S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai, 2004.
2. S. Arumugam and A. Thangapandi Isaac, Algbra: Theory of Equations, Theory of Numbers and Trigonometry, New Gamma Publishing House, 2011.

Unit I: Text Book 1: Chapter 2 (sections 3.1 to 3.8)
Unit II: Text Book 1: Chapter 4
Unit III: Text Book 1: Chapter (Section 5.1 to 5.8)
Unit IV: Text Book 2: Chapter 5 (Section 5.1 to 5.4)
Unit 5: Text Book 2: Chapter 5 (Section 5.4 to 5.7)

Reference(s):

1. T. K. Manickavasagam Pillay, Natarajan and Ganapathy, Algebra, Volume II, S.Viswanathan Pvt. Ltd., 2004.

BCS17R271	**PROGRAMMING IN C**	**L**	**T**	**P**	**Credit**
		4	**0**	**2**	**6**
Pre-requisite: NIL	**Course Category:** Core **Course Type:** Theory with Practical component				

Course Objective(s):

- To provide students with the means of writing efficient, maintainable, and portable code using C Language.
- To learn and acquire art of computer programming.
- To know about advanced programming concepts in C and how to choose programming concepts for solving a problem.

Course Outcome(s):

Upon successful completion of this course, students will be able to

1. Use different data types in a computer program and Design programs involving decision structures, loops and functions.
2. Explain the concept of Arrays and Functions in C.
3. Handle multiple data of different type under a single name using structures and union.
4. Understand the dynamics of memory by the use of pointers and function pointer.
5. Use different data structures and create/update basic data files.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M			L	
CO2		L	H			
CO3	H		M			L
CO4		M			L	
CO5				M		L

UNIT-I **(15 Hours)**

History of C - Characteristics of C - C Program Structure - Data Types - Variables and Constants - Operators - Conditional Statements - Looping and Iteration

UNIT-II **(15 Hours)**

Single Dimensional Array - Multi Dimensional Array - Types of functions - Functions and Arrays - String Functions - Recursive Functions

UNIT-III **(15 Hours)**

Basics, Structures and functions - Arrays of structures - Pointers to structures - Self referential structures - Typedef - Union - Bitfields - Enum Data Types

UNIT-IV **(15 Hours)**

Introduction - Pointer Types - Pointers to Strings - Pointers to Array - Pointers to Structure Pointers and Dynamic Allocation of Memory - Pointers to function.

UNIT V **(15 Hours)**

File management and Console input and output – Functions for file management - Standard I/o, Formatted output - Formatted input - File access - Error handling

Text Book(s):

1. Herbert Schildt, The Complete Reference C, 4th Edition, Tata Mc - Graw Hill, 2000.

Reference(s):

1. Byron C Gottfried, Programming with C, Schaums' outline series, 2nd Edition, Tata Mc - Graw Hill, 2006.
2. Brian Kernighan, W., Dennis Ritchie, M., The C Programming Language, 2nd Edition, Prentice Hall of India Pvt. Ltd., 2005

PROGRAMMING IN C LABORATORY

COURSE OBJECTIVES

- To write, compile and debug programs in C language.
- To formulate problems and implement algorithms in C.
- To effectively choose programming components that efficiently solve computing problems in real-world.

COURSE OUTCOME

Upon successful completion of this lab Course, student will be able to

1. Understand the basic terminology used in computer programming.
2. Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming
3. Write algorithm for different scenario.
4. Implement the code using the pertinent techniques to solve the given problem.
5. Display the output in a neat format and discuss the results.

PROGRAMS

1. To demonstrate use of data types, simple operators (expressions)
2. To demonstrate decision making statements (if and if-else, nested structures)
3. To demonstrate decision making statements (switch case)
4. To demonstrate use of simple loops
5. To demonstrate use of nested loops
6. To demonstrate menu driven programs and use of standard library functions.
7. To demonstrate writing C programs in modular way (use of user defined functions)
8. To demonstrate recursive functions.
9. To demonstrate use of arrays (1-d arrays) and functions
10.To demonstrate use of multidimensional array(2-d arrays) and functions
11 To demonstrate use of pointers
1. To demonstrate concept of strings (strings and pointers)
13.To demonstrate array of strings.
14. To demonstrate structures (using array and functions)
15. To demonstrate nested structures and Unions
16. To demonstrate file handling (text files

PHY17R241 **Thermodynamics, Electromagnetism & Modern Physics**	**L**	**T**	**P**	**Credit**
	4	**0**	**2**	**6**
Pre-requisite: NIL	**Course Category:** Core **Course Type:** Theory with Practical component			

Course Objective(s):

The aim of this paper is to expose the students with the knowledge in Heat and thermodynamics and make them to understand the basics of electromagnetism and modern physics

Course Outcome(s):

Upon successful completion of this course, students will be able to
CO1: Understand the basic concepts of thermal conductivity.
CO2: Apply the basic thermodynamic properties in thermal systems
CO3: Understand the concepts in electromagnetism
CO4: Understand the basics of X-rays and its applications
CO5: Learn the basic concepts of nuclear radioactivity

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M	M			H
CO2			M			H
CO3					M	H
CO4		M	M		M	H
CO5		M	M			H

Unit I: Heat (15 Hours)

Conduction in solids: Thermal conduction - thermal conductivity of a good conductor - theory and determination - Forbe's method - thermal conductivity of a poor conductor - theory and determination - Lee's disc method - relation between thermal and electrical conductivities - Wiedmann-Franz law - practical applications of conduction of heat.
solar constant - temperature of the Sun - solar spectrum.

Unit II: Thermodynamics (15 Hours)

Statements of I and II law – Carnot's Engine- Carnot's cycle of operations- Calculation of efficiency- Carnot's theorem – statement and proof-Concept of entropy – change of entropy in a reversible and irreversible cycle – change of entropy when ice is converted into steam Newton's law of cooling – theory – concepts of specific heat of liquids , solids and gases- Dulong and Petit's law – Einstein's theory – drawback – Debye theory.

Unit III : Electromagnetism (15 Hours)

Force on a current carrying conductor – Force between two parallel conductors in free space – definition of Ampere – Torque on a current carrying loop in a magnetic induction – Ballistic galvanometer – construction and theory - experiments to find C1/C2 & E1/E2 – Aperiodic galvanometer – construction - theory – experiment – figure of merit – difference between periodic and aperiodic galvanometer. Faraday's laws of electromagnetic induction – Lenz's law - definition of self induction, mutual induction – units – L of solenoid – mutual inductance between two coils.

Unit IV : Atomic physics and Laser (15 Hours)

X rays – Coolidge tube - shortest wavelength – Bragg's law and Bragg X ray spectrometer – X ray spectra – characteristic X ray spectrum – Mosley's law – explanation- derivation - Compton effect formula derivation - experimental verification. Lasers: Principle – Ruby lasers – He-Ne lasers – uses.

Unit V: Nuclear Physics (15 Hours)

Half-life and mean life of radioactive element – relation – derivation – radioactive equilibrium – secular equilibrium – radio-carbon dating – neutron – discovery – properties – transmutation by neutrons – betatron – construction and working – artificial radioactivity – radio-isotopes – uses (tracers in medicine and agriculture) – elementary particles.

Text Book(s):

1. Heat, Thermodynamics and Statistical Mechanics, Brijlal&Subramaniam, S. Chand Publication, 2012
2. Modern Physics, R. Murugesan, S. Chand Publications, 2003.

Reference(s):

1. Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill.
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
3. Fundamentals of Modern Physics, Duggal and Chhabra, ShobanlanNagin, Chand & Co., 1997.

Allied laboratory
Thermodynamics and Modern Physics

1. To determine the coefficient of thermal conductivity of copper by Searle'sApparatus.
2. To determine the coefficient of Thermal Conductivity of Cu by Angstrom'sMethod.
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee's disc method.
4. To study the variation of thermoemf across two junctions of a thermocouple with temperature.
5. Specific heat of liquid – Newton's law of cooling
6. Determine the Latent Heat of Steam.
7. Determination of Rydberg constant using Microsoft excels.
8. Determination of e/m using Microsoft excels.
9. Study of absorption spectra of Iodine and determination of its wavelength using grating.
10. To determine the wavelength of LASER source.

Reference Books:

1. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition,2011, KitabMahal, New Delhi.
4. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal,1985, Vani Publication.

SKILL ENHANCEMENT COURSE – A

MAT17R222	Integral Calculus	L	T	P	Credit
		3	0	0	2
Pre-requisite: NIL		**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to understand basic concepts in integral calculus.

Course Outcome(s):

CO1: Understand the basic concept of Properties of definite integrals and Reduction formulae for integrals.
CO2: Know the concept of Double and triple integrals and Volumes and surfaces of solids of revolution.
CO3: know about the concept of the Reduction formulae.
CO4: Study about the basic concepts of Area and Volume**.**
CO5: learn the topic about Multiple Integrals.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M			L	
CO2	L			M		
CO3			M			L
CO4		M	H		L	
CO5	M					

UNIT-I Methods of Integration **(5 Hours)**
Integration by partial fractions, Integration of rational and irrational functions.
UNIT-II Definite Integrals **(5 Hours)**
Properties of definite integrals and problems of definite integrals
UNIT-III Reduction Formulae **(5 Hours)**
Reduction formulae for integrals of rational, Trigonometric, Exponential and Logarithmic functions and of their combinations.
UNIT-IV Area and Volume **(5 Hours)**
Areas and lengths of curves in the plane, Volumes and surfaces of solids of revolution.
UNIT-V Multiple Integrals **(5 Hours)**
Double and triple integrals.

Text Book(s):

1. S.Arumugam, A.Thangapandi Isaac, Calculus, New Gamma publishing House, 2014
2. S. Narayanan & T.K. Manicavachagom Pillay, Calculus, Volume – II, 2014.
Text Book 1: UNIT-I, II, III : Chapter 1
Text Book 2: UNIT-IV, V : Chapter 2

MAT17R223 Application of Ordinary Differential Equations	L	T	P	Credit
	3	0	0	2
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to apply the concepts of ordinary differential equations to real world problems, like planetary motions, falling bodies etc**.**

Course Outcome(s):

Upon successful complete of the course, students will be able to

CO1: Understand the meaning of trajectory, growth and decay.
CO2: To know what is brachistochrone problem.
CO3: To understand the SHM and periodic time.
CO4: To understand the concept of central force.
CO5: To know what do you mean by dynamical problem.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M		M		
CO2			M			L
CO3	L		H		L	
CO4	M	M		L		
CO5		H				

UNIT I : (5 Hours)

Orthogonal trajectory, growth and decay - Definition – Working rule to find orthogonal trajectories – Introduction to growth and decay.

UNIT II: (5 Hours)

The brachistochrone problem and simple electric circuits and falling bodies

Explanation of the brachistochrone problem – Simple electric circuits – Falling bodies.

UNIT III: (5 Hours)

Simple Harmonic Motion- Equation of SHM – Damped Oscillation – Simple pendulum.

UNIT IV: (5 Hours)

Central forces and planetary motions- Kepler's second law – Kepler's third law – Periodic time.

UNIT V: (5 Hours)

Dynamical problem with variable mass.

Text Book(s):

S. Arumugam, A. Thangapandi Isaac, Differential equations and Applications, New Gamma Publications Home – 199 – B/2, Palayamkottai, Edn., 2011.

MAT17R224 Pure Geometry	L	T	P	Credit

	3	**0**	**0**	**2**

Pre-requisite: NIL **Course Category:** SEC
Course Type: Theory

Course Objective(s):

To make the students to understand the basic concepts in geometry.

Course Outcome(s):

Upon successful completion of this course**,** Students will be able to
CO1: Understand the basic concepts of Geometry.
CO2:learn about the topic Stability of a Harmonic range.
CO3:know about the topic of cirles and theorems on circles.
CO4:understand the concepts of Coaxial systems.
CO5:study about the Complete quadrangles and quadrilaterals.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M				
CO2		M		L		
CO3	L		H			L
CO4					L	
CO5		H	M			

UNIT I : (5 Hours)

Loci - Theorems 1, 2 (Appolonius circles) - Basic properties of a triangle.

UNIT II : (5 Hours)

Harmonic Ranges and pencils - definitions - cross ratio - Harmonic range - theorems 1, 2, 3, 4, 5.

UNIT III : (5 Hours)

Properties of circles - Orthogonal circles - theorems 1, 2 - Inverse points - theorem 3.

UNIT IV : (5 Hours)

Properties of circles - Theorems 8, 9, 10 - Coaxial circles - Orthogonal circles of Coaxial systems.

UNIT V : (5 Hours)

Complete quadrangles and quadrilaterals - Theorem 1 to 5.

Text Book(s):

Pure Gometry by TKM, The National Publishing Co., Madras - 1.

Unit I: Chapter 1
Unit II: Chapter 2
Unit III: Chapter 3 (up to Theorem 7).
Unit IV: Chapter 4 (Theorem 8 to 16)
Unit V: Chapter 4 (Theorem 1 to 5)

Reference(s):

R. Gupta, Quantitative aptitude, Unique Publishers Pvt. Ltd., 2013.

MAT17R228 MODERN ALGEBRA	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** Core **Course Type:** Theory			

Course Objective(s):

To enable the students to acquire the basic knowledge in groups, rings and fields.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1 Understand the concept of groups and its applications.

CO2 Understand the concept of normal subgroup and Quotient groups.

CO3 Understand the concept of Homomorphisms and automorphisms.

CO4 Understand the concept of Rings.

CO5 Understand the concept of Fields.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M	H		L	
CO2		H				
CO3	H		M	M		L
CO4		M			L	
CO5			M			L

UNIT I : **(15 Hours)**

Groups – Subgroups-properties- Permutation Groups- cosets – Lagrange's theorem – order of the an element – Euler's theorem – Fermat's theorem

UNIT II : **(15 Hours)**

Cyclic groups – Normal subgroups – Properties - Quotient groups.

UNIT III : **(15 Hours)**

Isomorphism Cayley's theorem – Automorphism – Homomorphism – Fundamental theorem of homomorphism

UNIT IV : **(9 Hours)**

Rings – Elementary properties of Rings – types of rings- Zero divisor – Integral domain – Characteristic of a ring

UNIT V : **(15 Hours)**

Maximal and prime ideals – Quotient rings – Homomorphism of rings – Field – Field of quotients of an integral domain

Text Book(s):

S. Arumugam and A.Thangapandi Isaac, Modern Algebra, Sci- Tech publication, Reprint 2011.
Unit-I

Chapter 3(Sections 3.1 to 3.5)
Unit-II:
Chapter 3(Sections 3.6 to 3.9)
Unit-III:
Chapter 3(Sections 3.10, 3.11)
Unit-IV:
Chapter 4(Sections 4.1 to 4.4)
Unit-V:
Chapter 4(Sections 4.5 to 4.6)

Reference(s):

1. A.R.VAsista, Modern Algebra, Kedarnath Ramnath Publications, 2001
2. A.R.Vasista, Linear Algebra, East- west Publications, 2002

BSC17R272	**OBJECT ORIENTED PROGRAMMING WITH C++**	**L**	**T**	**P**	**Credit**
		4	**0**	**2**	**6**
Pre-requisite:	NIL	**Course Category:** Core **Course Type:** Theory with Practical component			

Course Objective(s):

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.

Course Outcome(s):

Upon successful completion of this course, Student will be able to

1. Gain the basic knowledge of oops concept & understand the fundamentals of C++ programming
2. Understand the class structure, memory allocation of objects, arrays and pointer in C++
3. Apply virtual functions and overloading techniques in C++ applications
4. Handle files and exceptions in C++ effectively
5. Demonstrate the concept of string, stream and templates in C++

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M				
CO2	L			M	L	
CO3			H			L
CO4		M			L	
CO5		H				

UNIT I : **(15 Hours)**

OOP concept, Procedural vs OOP programming, OOP terminology and features, Tokens, Character set, Keywords, Data-types, Data Types declarations, Constants and variables, expressions, Standard Library and header files. Operator and Expressions: Arithmetic Operator, Increment/Decrement Operator, Relational Operator, Logical Operator and conditional operators, library functions, Logical Expressions, C++ shorthand operators-Enumerated Data Types.

UNIT II : (15 Hours)

Flow of control statements: Selection statements, Iteration statement, Jump statement, Construction of loops and implementation, Classes and Objects: Need for Classes, Declaration of Classes, referencing class Members, Scope of class and its members Nested Classes, Functions in a class: Inline Functions, Constant Member functions, Nesting of Member Functions, friend function, Memory allocation of objects, Arrays of objects, Static Class Member -Arrays two dimensional and multidimensional arrays, Arrays of Pointers, Pointers and functions.

UNIT III: (15 Hours)

Constructors and Destructor: Declaration, Definition and characteristics, Function Overloading, Inheritance:Need, Different forms of inheritance – Virtual functions, this pointer- Operator Overloading :Overloading Unary Operators, Overloading Binary Operators

UNIT IV : (15 Hours)

File Handling: Classes for file stream operations, opening and closing a file, detecting end of file, file modes, file pointers and their manipulations, sequential input and output operations, random access, file operations error handling, command line argument, Exception Handling- try, catch statements, Multiple catch ststements.

UNIT-V (15 Hours)

Strings and Streams: the string class and functions,stream classes, the ios class, ios format flags, ios state , variables ,the istream and ostream classes, unformatted input functions , unformatted output functions, stream manipulators. Templates and Iterators: function templates, class templates, container classes, subclass templates, passing template classes to template parameters, iterator classes.

Text Book(s):

1. E Balagurusamy, “Object oriented Programming with C++”, Tata McGraw-Hill Publishing Company, Edition 5 ,June 2011
2. D.Ravichandran, “Programming with C++”, Tata McGraw Hill, Edition 4, 2011.

Reference(s):

1.HM Deitel and PJ Deitel “C++ How to Program”, Prentice Hall ,Seventh Edition, 2010
2.Herbert Schildt, “The Complete Reference in C++”, Tata McGraw Hill.Fourth Edition, 2003.
3.Y.P.Kanetkar, “Let us C++” , BPB publication,2013.
4.Bjarne Stroustrup, “The C++ Programming language”, Addison-Wesley, 2013.

OBJECT ORIENTED PROGRAMMING IN C++ LABORATORY

COURSE OBJECTIVE

- To make the student learn an object oriented way of solving problems.
- To make the student to identify and practice the object-oriented programming concepts and techniques.
- To practice the use of C++ classes and class libraries, modify existing C++ classes.
- To develop C++ classes for simple applications

COURSE OUTCOME

Upon successful completion of this course, students will be able to

1. Understand the basic concept of C++ Programming, and its different modules that include class and objects, encapsulation, inheritance, polymorphism, templates and file and exception handling.
2. Choose and apply appropriate advanced object-oriented programming concepts.
3. Write algorithm for different scenario.
4. Implement the code using the pertinent techniques to solve the given problem.
5. Display the output in a neat format and discuss the results.

PROGRAMS

1. Programs using Control Structures
2. Programs using Functions
3. Programs using Arrays
4. Programs using Inline Functions
5. Programs using Classes
6. Programs using Constructors and Destructors
7. Programs using Friend Functions
8. Programs using Operator Overloading
9. Programs using Inheritance
10. Programs using Virtual Functions
11. Programs using Files
12. Programs using Strings

SKILL ENHANCEMENT COURSE – B

MAT17R225 **SEQUENCES AND SERIES**	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	**2**
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the basic concepts in Sequences and series.

Course Outcome(s):

Upon successful completion of this course**,** students will be able to

CO1: gain knowledge about sequences and nature of a sequence
CO2: know about subsequence, Cauchy sequence and behavior of sequence.
CO3: test the convergence of infinite series using some important test.
CO4: test the convergence of series using various tests.
CO5: test the convergence of alternative series.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	M			L	
CO2		H	M			
CO3	M		H	L		L
CO4		M			L	
CO5	M			M		

UNIT – I: **(5 Hours)**

Sequences – Bounded - Monotonic – Convergent – Divergent and Oscillating sequences.

UNIT – II: **(5 Hours)**

Behavior of monotonic sequences – Cauchy's first limit theorem – Cesaro's theorem – Cauchy's second limit theorem (only statements to all the above three theorems, no proof) - Subsequences and Cauchy sequences.

UNIT – III: **(5 Hours)**

Series of positive terms – Infinite series – Theorems – Cauchy's general principle of convergence – Comparison test – Harmonic series.

UNIT – IV: **(5 Hours)**

Kummer's test – D'Alembert's ratio test – Raabe's test – De Morgan and Bertrand's test – Gauss's test (only statements to all the above five tests, no proof) – Applications to simple problems – Cauchy's root test – Cauchy's condensation test.

UNIT – V: **(5 Hours)**

Series of arbitrary terms – Alternating series – Leibnitz's test – Absolute convergence – Test for convergence – Dirichlet's test – Abel's test.

Text Book(s):

S. Arumugam, A. Thangapandi Issac, Sequences and Series, New Gamma Publishing House, 2014.

Reference(s):

1. T.K. Manicavachagam pillay, T. Natarajan, K. S. Ganapathy, Algebra Volume 1, S. Viswanathan Pvt. Ltd, Chennai, 2004.

2. M.K. Singal & Asha Rani Singal, A First course in Real Analysis, Chand & Co, 1999.

MAT17R226 **FOURIER SERIES AND LAPLACE TRANSFORMS**	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	**2**
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To make the students to understand the basic concepts in Fourier series and Laplace transforms of standard functions.

Course Outcome(s):

Upon successful completion of this course**,** Students will be able to

CO1: Understand the basic concepts of Fourier series and Fourier expansion.
CO2: Learn about the half range Fourier cosine and sine series.
CO3: Know about the concept of Laplace transforms.
CO4: Learn about the Laplace transforms of periodic functions and its inverse.
CO5: Know about the applications of Laplace transforms.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M			L	
CO2		H		H		H
CO3	M		H			
CO4		M			L	
CO5		L		M		

UNIT I: **(5 Hours)**

Fourier series – Definition – Fourier series expansion of periodic functions with period 2π.

UNIT II: **(5 Hours)**

Even and odd functions definition-properties-use of these functions in fourier series– Half range Fourier series.-Development in cosine series-Development in sine series.

UNIT III: **(5 Hours)**

Laplace Transforms – Sufficient conditions for the existence of the Laplace transforms – Properties of Laplace transforms .

UNIT IV **(5 Hours)**

Laplace transforms of Periodic functions – Some general theorems – Evaluation of integrals. The inverse Laplace transforms.

UNIT V **(5 Hours)**

Application of Laplace transforms – Solution of ODE with constant coefficients – Solution of ODE with variable coefficients – Solution of simultaneous ODE.

Text Book(s):

1. T.K. Manickavasagam Pillai and S. Narayanan, "Differential Equations" by S. Viswanathan Printers and Publishers Pvt. Ltd., Chennai.

2. S. Narayanan and T. K. Manicavachagom Pillay, Differential Equations and its Applications, S. Viswanathan Publishers Pvt Ltd, Ninth edition, 1996.

Unit I and II Text Book 1
Unit III, IV and V Text Book 2

MAT17R227 **FOURIER TRANSFORM AND Z –TRANSFORM**	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	**2**
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the basic concepts in various transforms.

Course Outcome(s):

Upon Successful completion of this course, students will be able to
CO1 understand basic concepts in Fourier Transform.
CO2 understand the concept of Fourier Transform sine Transform and Cosine Transform.
CO3 know the concept Finite Fourier transform, finite Sine transform, Finite Cosine Transform.
CO4 understand the basic Concepts in Z-transform.
CO5 apply Z-transform for difference Equation .

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M			L	
CO2		H		H		H
CO3	M		H			
CO4		M			L	
CO5		L		M		

UNIT - I: **(5 Hours)**

Dirichlet's conditions , (without proof),Integral transform – definition – simple problems – Fourier integral formula , Fourier sine and cosine integrals

UNIT - II: **(5 Hours)**

Fourier transforms - Fourier transform, Inverse Theorem for Fourier transform – related problems ,Fourier sine and cosine transforms and their inversion formulae. Linearity property of Fourier transforms

UNIT - III: **(5 Hours)**

Change of scale property, Shifting theorem, Modulation theorem, Convolution theorem of Fourier transforms, Parseval's identity. Finite Fourier sine transform -Inversion formula for sine transform, Finite Fourier cosine transform, Inversion formula for cosine transform

UNIT - IV: **(5 Hours)**

Z-transform - elementary properties - Inverse Z-transform –Initial and Final value Theorems

UNIT – V **(5 Hours)**

Convolution theorem - formation of difference equation - Solution of difference equation using Z-transform

Text Book(s):

1. T.Veerarajan, Engineering mathematics -2nd edition,Tata mcgraw hill publication,2003
2. Dr.P.Kandasamy,Dr.Thilagavathy,Dr.Gunavathey, Engineering mathematics-vol3, S,Chand publication. 2004.
   Unit 1, Chanpter 8
   Unit 2. Chanpter 8
   Unit 3. Chanpter 8
   Unit 4 Chanpter 5
   Unit 5. Chanpter 5

Reference(s):

1. R.V. Chuchil, Operational Mathematics, McGraw Hill Company

DISCIPLINE SPECIFIC ELECTIVE – A1

MAT17R331 LINEAR ALGEBRA	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to acquire the basic knowledge of vector spaces and linear transformation.

Course Outcome(s):

Upon successful completion of this course, students will be able to,

CO1: understand the concept of Vector Space and sub spaces.
CO2: understand the concept of dimension of vector space.
CO3: understand the concept of Inner product spaces and Orthogonalization process.
CO4: learn and apply the concepts of Linear Transformation.
CO5: transforms a matrix into diagonal/triangular form.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M			L	
CO2		H				
CO3	M		H	M		L
CO4		M				
CO5			M			L

UNIT - I: **(15 Hours)**

Vector spaces - properties – Subspaces -Linear transformation.

UNIT - II: **(15 Hours)**

Span of a set – Linear independence – Linear dependence –Basis and dimension –Rank and nullity-Matrix of a linear transformation.

UNIT- III: **(15 Hours)**

Inner product space - Orthogonality- Gram-Schmidt orthogonalisation process – Orthogonal complement.

UNIT- IV: **(15 Hours)**

Matrices- Algebra of matrices – Types of matrices-The inverse of a matrix-Rank of a matrix-Simultaneous linear equation – Characteristic equation – Cayley-Hamilton theorem-Eigen values and Eigen vectors.

UNIT - V: **(15 Hours)**

Bilinear forms - Quadratic forms.

Text Book(s):

Text Book: S. Arumugam and A. Thangapandi. Isaac. Modern Algebra, Scitech Publications, 2006.

Unit I: Chapter 5 (Sections 5.1 to 5.3)
Unit II: Chapter 5 (Sections 5.4 to 5.8)
Unit III: Chapter 6 (Sections 6.1 to 6.3)
Unit IV: Chapter 7 (Sections 7.1 to 7.3 and 7.5 to 7.8)
Unit V: Chapter 8(Sections 8.1 to 8.2)

Reference(s):

M.K Venkataraman, Linear Algebra, The National publishing Company, 1999.

MAT17R332 AUTOMATA THEORY	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to acquire basic knowledge in automata theory.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: identify with the essential notion of finite automata.
CO2: master regular languages and finite automata.
CO3: understand the basic results of context-free languages and push-down.
CO4: realize the properties of context-free grammars and languages.
CO5: analyze and design Turing machines

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M	M		L	
CO2		H				
CO3	M		H	L		
CO4		M			L	
CO5			M			L

UNIT I: FINITE AUTOMATA AND REGULAR EXPRESSIONS (15 Hours)

Finite state systems – Basic definitions –Nondeterministic finite automata – Regular expressions – Two way finite automata – Finite automata with output.

UNIT II: PROPERTIES OF REULAR SETS (15 Hours)

The pumping lemma for regular sets – Closure properties of regular sets – Decision algorithms for regular sets – The Myhil-Nerode theorem and minimizations of finite automata.

UNIT III: CONTEXT-FREE GRAMMERS (15 Hours)

Context free grammars – Derivation trees – Simplification of context-free grammars – Chomskey normal form – Greibach normal form

UNIT IV: PUSHDOWN AUTOMATA AND PROPERTIES OF CONTEXT-FREE LANGUAGES (15 Hours)

Informal description – Definitions – pushdown automata and Context-free languages – The pumping lemma for CFLs – Closure properties of CFLs.

UNIT V: TURING MACHINES (15 Hours)

The Turing machine – Computable languages and functions – Techniques for Turing machine construction – Modifications of Turning machines – Churchs hypothesis – Turning as enumerators.

Text Book(s):

1. J. H. Hopcrof, and J. D. Ullman, Introduction to Automata Theory, Languages, and Computation, Narosa Publishing House, Reprint 2002.

   Unit-I : Chapter 2 (Section 2.1 to 2.7),
   Unit-II: Chapter 3 (Sections 3.1 to 3.4),
   Unit-III: Chapter 4 (Sections 4.1 to 4.6),
   Unit-IV: Chapter 5 (Section 5.1 to 5.3), Chapter 6 (Sections 6.1 to 6.2)
   Unit-V: Chapter 7 (Sections 7.1 to 7.7)

Reference(s):

M. Sipser, Introduction to the theory of computation, 2nd Ed, Thomson Course Technology, Reprint 2007.

MAT17R333 **ENCRYPTION AND CRYPTOGRAPHY**	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the concepts of coding and decoding.

Course Outcome(s):

Upon successful completion of this course, students will be able to
CO1: know the methods of conventional encryption.
CO2: understand the concepts of Block Ciphers and the Data Encryption
CO3: know Number theory concepts used for advanced encryption
CO4: understand Advanced encryption standard
CO5: know the methods of public key cryptography

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M			L	
CO2	L		H			M
CO3				H		
CO4		M	L		M	
CO5		H				H

UNIT -I: Introduction and Classical Encryption (15 Hours)

Computer Security Concepts - The OSI(Open Systems Interconnections) Security Architecture - Security Attacks –Security Services - Security Mechanisms -A Model for Network Security - Symmetric Cipher Model - Substitution Techniques -Transposition Techniques -Rotor Machines – Steganography.

UNIT -II: Block Ciphers and the Data Encryption Standard (15 Hours)

Block Cipher Principles - The Data Encryption Standard (DES) -A DES Example -The Strength of DES -Differential and Linear Cryptanalysis -Block Cipher Design Principles.

UNIT- III: **Number Theory and Finite Fields (15 Hours)**

Divisibility and the Division Algorithm -The Euclidean Algorithm - Modular Arithmetic -Groups- Rings- and Fields -Finite Fields of the Form GF(p) -Polynomial Arithmetic -Finite Fields of the Form GF(2^n).

UNIT- IV: Advanced Encryption Standard (15 Hours)

The Origins AES(Advanced Encryption Standard) -AES Structure -AES Round Functions -AES Key Expansion -An AES Example -AES Implementation.

UNIT - V: Public-Key Cryptography and RSA (15 Hours)

Fermat's and Euler's Theorems- The Chinese Remainder Theorem – Discrete Logarithms- Principles of Public-Key Cryptosystems - The RSA Algorithm

Text Book(s):

William Stallings- Cryptography and Network Security- Fifth Edition- Prentice Hall- 2011.
(Chapters 1-2-3-4-5-8 and 9)
Unit I – Chapters 1 and 2(Full)
Unit II – Chapter 3(Full)
Unit III – Chapter 4(Full)
Unit IV – Chapter 5(Full)
Unit V – Chapters 8 and 9(Full)

Reference(s):

1. Atulkahate- "Cryptography and Netwok security"- Tata McGraw – Hill- 2003.
2. Bruce Schneier- "Applied cryptography"- John wiley and sons Inc- 2001.
3. Charles B. Pfleeger- Shari Lawerencepfleeger- "Security in computing"- third edition- Pearson Education- 2003.

DISCIPLINE SPECIFIC ELECTIVE – A2

MAT17R334 REAL ANALYSIS	L	T	P	Credit
	4	2	0	6

Pre-requisite: NIL **Course Category:** DSE
Course Type: Theory

Course Objective(s):

To enable the students to understand basic concepts of Analysis.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: understand the concept of countable, uncountable sets and Metric spaces.
CO2: understand the concept of open sets, closed sets and dense sets.
CO3: understand the concept of completeness in a Metric space.
CO4: understand the concept of uniform continuity and connectedness on real line R.
CO5: understand the concept of compactness.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1	H	M			L	
CO2		H		M		
CO3	M		H			L
CO4		M			L	
CO5		H	M			

UNIT – I: **(15 Hours)**

Introduction of countable and uncountable sets - Holder's and Minkowski's – Inequalities- Metric spaces- Bounded sets.

UNIT – II: **(15 Hours)**

Open balls – Open sets- Subspaces – Interior of a set - Closed sets - Closure – Limit point – Dense sets.

UNIT – III: **(15 Hours)**

Completeness - Cantor's Intersection Theorem- Baire's Category Theorem – Continuity.

UNIT – IV: **(15 Hours)**

Homeomorphism - Uniform continuity (Discontinuous functions on R are not included) – Connectedness - Connected subsets of real line R- Connectedness and Continuity - Intermediate Value Theorem.

UNIT – V: **(15 Hours)**

Compactness – Compact subsets of real line R– Equivalent Characterization of Compactness – Compactness and Continuity.

Text Book(s):

S. Arumugam, A. Thangapandi Isaac, Modern Analysis, New Gamma Publishing House, 2013

Unit-I: Chapter 1 (Sections 1.2, 1.3, 1.4) and Chapter 2 (Sections 2.1 and 2.2)
Unit-II: Chapter 2 (Sections 2.3 to 2.10)
Unit III: Chapter 3 (Sections 3.1, 3.2) and Chapter 4 (Sections 4.1)
Unit IV: Chapter 4 (Sections 4.2, 4.3) and Chapter 5 (Sections 5.1, 5.2, 5.3)
Unit V: Chapter 6 (Sections 6.1, 6.2, 6.3, 6.4)

Reference(s):

1. Goldberg, Methods of Real Analysis, Oxford and IBH, 2001
2. E. T. Copson., Metric Spaces, Cambridge Publications,1999.

MAT17R335 **STOCHASTIC PROCESSES**	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the basic concepts in stochastic process.

Course Outcome(s):

Upon successful completion of this course**,** Students will be able to
CO1: understand the basic concept of Stochastic Process.
CO2: learn about the topic Stability of a Markov system.
CO3: know about the topic of Poisson process.
CO4: understand the concept of Renewal process
CO5: study about the Queuing system.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M		M	H	
CO2		H				
CO3	M		M	H		L
CO4		M			M	
CO5			L			

UNIT I **(15 Hours)**

Stochastic Process:Some notions-Introduction-Specification of Stochastic Process-Stationary processes-Markov chains:Definition and examples- Higher transition probilities.(sec2.1-2.3,3.1and 3.2)

UNIT II **(15 Hours)**

Classification of states and chains- Determination of higher transition probabilities-Stability of a Markov system.(sec 3.4 and 3.6)

UNIT III **(15 Hours)**

Markov Process with discrete state space: Poisson process and its extension-Poisson process-Poisson process and related distribution-Generalization of Poisson process- Birth and death process (sec4.1-4.4)

UNIT IV **(15 Hours)**

Renewal process and Theory: Renewal processes- Renewal processes in continuous time-Renewal equation- Stopping Time: Wald's equation(sec 6.1- 6.4)

UNIT V **(15 Hours)**

Stochastic process in Queueing and Reliability: Queuing system: General concepts-The Queuing model M/M/1: Steady state behavior-Transient behavior of M/M/1 model.(sec 10.1-10.3).

Text Book(s):

Stochastic Process by J. Medhi, Second edition, 1994.

Reference(s):

1. First course in Stochastic Process by Samuel Karlin, 3rd edition, 1975.
2. Stochastic Process by Srinivasan and Metha (TATA McGraw Hill),1978

MAT17R336 CLASSICAL OPTIMIZATION	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To make the students to solve the real world problem using Classical Optimization.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: Classify optimization problem and to solve using Lagrange's Multiplier method
CO2: Solve non-linear problems using Kuhn-Tucker method
CO3: Solve non-linear problems using Steepest Descent method
CO4: Solve non-linear problems using Conjugate gradient method
CO5: Solve non-linear problems using Newton's method

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M			L	
CO2		H		M		
CO3	M		H			L
CO4		M			M	
CO5	L		M			L

UNIT I: Lagranges method **(15 Hours)**

Statement of an optimization problem – Classification of Optimization problems – single variable optimization – multivariable optimization with no constrains – multivariable optimization with equality constraints – direct substitution method – Lagrange's multiplier method – problems.

UNIT II: Kuhn-Tucker method **(15 Hours)**

Multivariable optimization with inequality constraints – Kuhn-Tucker conditions - Constraint qualification – problems

UNIT III: Steepest Descent method **(15 Hours)**

Unconstrained optimization techniques – Indirect search method – Gradient of a function – Evaluation of gradient – Rate of change of a function along a direction – Steepest descent (Cauchy) method – problems

UNIT IV: Conjugate gradient method **(15 Hours)**

Indirect search method - Conjugate gradient (Fletcher-Reeves) method – Development of the Fletcher-Reeves method – Fletcher-Reeves method – problems

UNIT V: Newton's method **(15 Hours)**

Indirect search method - Newton's method – Marquardt method - problems

Text Book(s):

Singaresu S. Rao, Engineering Optimization (Theory and Practice), New Age International (P) Ltd, Publishers, New Delhi, 4th Edn., 2013
Unit I: Chapter 1 (1.4,1.5), Chapter 2(2.2,2.4)
Unit II: Chapter 2 (2.5)
Unit III: Chapter 6 (6.10, 6.11)
Unit IV : Chapter 6 (6.12)
Unit V : Chapter 6 (6.13,6.14)

Reference(s):

1. Operations Research: An introduction, Hamdy A. Taha, Pearson Education, 10th Edn., 2016.
2. L.R. Foulds, Optimization Techniques: An Introduction , Springer-Verlag, 1st Edition., 1981

DISCIPLINE SPECIFIC ELECTIVE – A3

MAT17R337 MECHANICS	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the basic concept in dynamics and statics.

Course Outcome(s):

Upon successful completion of this course, Students will be able to

CO1: Understand the basic concept of forces and its equilibrium.

CO2: Find the resultant of forces acting at a body.

CO3: Study about the concept of motion of a particle projection from a point.

CO4: Understand the basic concept of simple harmonic motion and its application in physical situation.

CO5: Understand the concept of central forces.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M			L	
CO2		H		L		M
CO3	M		H			
CO4		M		M	L	
CO5	L					H

UNIT I: **(15 Hours)**

Forces acting at a point - Resultant and components - Parallelogram law of a forces - Triangle law of forces - Converse of Triangle law of forces - Lami's theorem.

UNIT II: **(15 Hours)**

Resolution of a force – Theorems of resolved parts - Resultant of any number of coplanar forces -Conditions of equilibrium.

UNIT III: **(15 Hours)**

Projectiles – Path of a projectile – Maximum height –Time taken by a particle – Time of flight – Horizontal Range – Simple problems.

UNIT IV: **(15 Hours)**

Simple Harmonic Motions – Equation of motion – Composition of two Simple Harmonic Motions.

UNIT V: **(15 Hours)**

Central orbits – Components of velocities and accelerations along and perpendicular to radius vector – Differential equation of a central orbit – Pedal equations.

Text Book(s):

1. M.K.Venkatraman, Dynamics, Agasthiyar publications, 12thedition, Jul 2006.
2. M. K. Venkataraman, Statics, Agasthiyar Publications, 11thedition, July 2012.

Text Book 2:Unit-I: Chapter 2(Sections 1 to 9)

Text Book 2:Unit-II:Chapter 2(Sections 11 to 16)

Text Book 1: Unit-III: Chapter 6(Sections 6.1 to 6.8)

Text Book 1: Unit-IV: Chapter 10(Sections 10.1 to 10.7)

Text Book 1: Unit-V: Chapter 11(Sections 11.1 to 11.9)

Reference(s):

1. N. P. Bali, Golden Dynamics, Lakshmi Publications, New Delhi, 2002.

MAT17R338 ASTRONOMY	L	T	P	Credit
	4	2	0	6

Pre-requisite: NIL **Course Category:** DSE
Course Type: Theory

Course Objective(s):

To enable the students to acquire the knowledge of celestial bodies.

Course Outcome(s):

Upon successful completion of this course, Students will be able to

CO1: Understand the basic concepts of spherical trigonometry.

CO2: Know about the twilight and astronomical refraction.

CO3: know about the Kepler's law of motion and Newton's deductions.

CO4: Understand the concepts of geocentric and annual parallax.

CO5: Learn the topic of phases of moon and earth shine.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M			L	
CO2		H				
CO3	M		H			H
CO4		M			L	
CO5		L		M		

UNIT – I: **(15 Hours)**

Relevant properties of a sphere and relevant formulae of Spherical trigonometry (Relevant properties and formulae without proofs) - Celestial Sphere – Diurnal motion.

UNIT – II : **(15 Hours)**

Earth – Dip of the horizon – Twilight – Astronomical refraction – Tangent and Cassinie's formulae – Properties and simple problems applying them.

UNIT – III: **(15 Hours)**

Kepler's laws of Planetary motion (Statement only) – Newton's deductions from them (Statements only) – Three anomalies of the earth and relations between them – Times – Equation of time – Seasons.

UNIT – IV: **(15 Hours)**

Geocentric parallax – Annual parallax – Aberration of light – Simple problems in the above.

UNIT – V: **(15 Hours)**

Moon – Phases of Moon – Harvest Moon – Metonic cycle – Lunar Mountain – Earth shine – Tides – Eclipses

Text Book(s):

1. S. Kumaravelu and Susila Kumaravelu, Astronomy, SKV Publications, 2007 edition.

Unit I: Chapter I and II

Unit II: Chapter III (Sections 1, 5 and 6) & Chapter IV

Unit III: Chapter VI (Articles 146, 153, 158 to 164) and Chapter VII (Sections 1, 2)

Unit IV: Chapters V, VIII and IX

Unit V: Chapter XII (Articles 229 – 242 and 249 – 255) and Chapter XIII.

Reference(s):

1. John Frederick and William Herschel, "A Treatise on Astronomy", Cambridge University Press, 2009 (First Edition).
2. B.A. Vorontsov and Veliaminov, Astronomical Problems. An Introductory course in Astronomy, Pergamon Press, Oxford, 1969.

MAT17R339 **FRACTAL GEOMETRY**	**L**	**T**	**P**	**Credit**
	4	**0**	**2**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to be capable of doing simple application of Fractal geometry.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: Understand the concepts of Hausdorff measure and dimension.

CO2: Realize the Properties and problems of box counting dimension

CO3: Know about the techniques for calculating dimensions

CO4: Understand the concepts of fractal projections.

CO5: Analyze products and intersection of fractals

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M			L	
CO2						L
CO3	M		H			
CO4		M			L	
CO5		H				M

UNIT-I: Hausdorff measure and dimension (15 Hours)

Hausdorff measure, Hausdorff dimension, Calculation of Hausdorff dimension-Simple examples, Equivalent definitions of Hausdorff dimension, Finer definitions of dimension.

UNIT-II: Alternative definitions of dimension (15 Hours)

Box counting dimension, Properties and problems of box counting dimension, Modified box counting dimension, Packing measures and dimension.

UNIT-III: Techniques for calculating dimensions (15 Hours)

Basic methods, Subsets of finite measure, Potential theoretic methods, Fourier transform methods.

UNIT-IV: Fractal Projections (15 Hours)

Densities, Structure of 1-sets, Tangents to s-sets - Projections of arbitrary sets, projections of s- sets of integral dimension

UNIT-V: Products and intersection of fractals (15 Hours)

Product formulae- Intersection formulae for fractals, Sets with large intersection

Text Book(s):

Kenneth Falconer, FRACTAL GEOMETRY Mathematical Foundations and Applications, John Wiley & Sons, New York.

Reference(s):

1. Falconer K.J, The Geometry of Fractal sets, Cambridge University Press, Cambridge.
2. Barnsley M.F, (1988), Fractals every where, Academic press, Orlando, FL.
3. Mandelbrot B.B, (1982), The Fractal Geometry of Nature, Freeman, San Francisco.

SKILL ENHANCEMENT COURSE – C

MAT17R321 CLASSICAL ALGEBRA	L	T	P	Credit
	3	0	0	2
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the basic concepts in classical algebra.

Course Outcome(s):

Upon successful completion of this course**,** students will be able to
CO1:understand the basic concepts of Binomial theorem.
CO2:learn about the topic binomial coefficients.
CO3:know about the topic of multinomial theorem.
CO4: understand the concepts of exponential series.
CO5: Study about the Logarithmic series.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M			L	
CO2		H				M
CO3	M		H			
CO4		M			L	
CO5			M			L

UNIT I **(5 Hours)**

Binomial theorem – positive integral index – General term.

UNIT II **(5 Hours)**

The greatest coefficient in the expansion of $(1+x)^n$ - The greatest term in the expansion of $(1+x)^n$- Summation of various series involving Binomial coefficients.

UNIT III **(5 Hours)**

Multinomial theorem- expansion of product $(a+b+c+d+\cdots)^n$ – Vandermonde's theorem- Binomial theorem for a rational index- particular cases of the binomial expansion.

UNIT IV **(5 Hours)**

Exponential series – exponential limit- exponential theorem – summation.

UNIT V **(5 Hours)**

The Logarithmic series – modification of the logarithmic series – Euler's constant

Text Book(s):

"Algebra Vol I" by T.K. M. Pillai , T. Natarajan and K. S. Ganapathy . S. Viswanathan Printers and Publishers Pvt. Ltd., 2007.

Unit 1- page no.99-111
Unit 2- page no.111-120
Unit 3- page no.120-130
Unit 4- page no.188-200
Unit 5- page no.213-224

Reference(s):

Introductory Algebra by Edward W.pitzer, 1st edition.

MAT17R322 NUMBER THEORY	L	T	P	Credit
	3	0	0	2
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the basic concepts in Number Theory

Course Outcome(s):

Upon successful completion of this course**,** Students will be able to
CO1: Understand the basic concepts of numbers.
CO2:Study about the mobius functions and inversion formula.
CO3: know about the concept of the Fermat numbers
CO4: Study about the basic concepts of congruence
CO5: learn the topic about Quadratic residues and non residues

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M			L	
CO2		H				
CO3	M		H			
CO4		M		L	L	
CO5	L		M			H

UNIT I: **(5 Hours)**

Prime and composite numbers-Coprimes-Sieve of Eratothenes Euclid's theorem-Unique factorization-Fundamental theorem of Arithmetic –Positional representation of integers- Number of divisors-Sum of divisors-Symbols -Arithmetic functions.

UNIT II: **(5 Hours)**

Perfect number-Greatest integer function-Mobious function-Inversion formula and its converse

UNIT III: **(5 Hours)**

Distribution of Primes-Fermat conjecture-Fermat numbers-Gold Bach"S conjecture-Mersenne numbers Gap theorem-Infinitly of primes.

UNIT IV: **(5 Hours)**

Congruence- Definition –Residue classes-Completeand least residue system- Linear congruences-Solution of congruences-Chinese remainder theorem.

UNIT V: **(9 Hours)**

Quadratic reciprocity-Quadratic residues and non residues-Eulers criterion- Primitive roots is a quadraticnon residues-Legendre symbol-Gauss lemma-Quadratic resiprocity law.

Text Book(s):

Elements of Number Theory by Prof. S.Kumaravelu and Susheela Kumaravelu, Raja Sankar offset Printers ,Sivakasi, 2002.

Reference(s):

1. Elementary Number Theory, David M. Burton W.M.C. Br
own Publishers, Dubuque, Lawa, 1989.
2. Number Theory, George Andrews, Courier Dover Publications,1994.

MAT17R323 MATHEMATICAL MODELLING	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	**2**
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To make the students to be capable of doing simple mathematical modelling in differential equations and dynamic programming.

Course Outcome(s):

Upon successful completion of this course**,** Students will be able to

CO1: understand the mathematical modelling of ordinary differential equation of first order.

CO2: know about the concepts of mathematical modelling in difference equations and Linear difference equations.

CO3: make the mathematical modelling through partial differential equation and study about the balance equations.

CO4: Study about the mathematical modelling through delay differential and functional equations.

CO5: know about the concepts of mathematical modelling in calculus of variations and dynamic programming.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	L		M	
CO2		H				
CO3	M		M	M		H
CO4		M			L	
CO5			L			

Unit I: **(5 Hours)**

Mathematical modelling of through systems of ordinary differential equations of the first order-Mathematical modelling in population dynamics-Epidemics through systems of ODE of first order-Compartment models through systems of Ordinary differential equation.

Unit II: **(5 Hours)**

Mathematical modelling through difference equations - The need for mathematical modeling through difference equations some simple models-Basic theory of linear difference equations with constant coefficients.

Unit III: **(5 Hours)**

Mathematical modelling through Partial differential equation -Situation giving rise to Partial differential equation models-Mass-balance equations first method of getting Partial differential equation models-Momentum balance equations the second method of obtaining PDE models.

Unit IV: **(5 Hours)**

Mathematical modelling through functional integral, delay differential and differential-difference equations-Functional equations-integral equations.

Unit V: **(5 Hours)**

Mathematical modelling through calculus of variations and dynamic programming-optimization principles and techniques-Calculus of variations.

Text Book(s):

J.N. Kapur, Mathematical modelling, New age international publishers, 2005 (Reprint).

1. Unit 1 : chapter 3 (sections 3.1-3.3).
2. Unit 2 : chapter 5 (sections 5.1, 5.2).
3. Unit 3 : chapter 6 (sections 6.1-6.3).
4. Unit 4 : chapter 8 (sections 8.1, 8.2).
5. Unit 5 : chapter 9 (sections 9.1, 9.2).

Reference(s):

Frank R. Giordano, William P. Fox, Steven B. Horton , A First Course in Mathematical Modelling , Cengage Learning Publishers,5th Edition, 2013.

DISCIPLINE SPECIFIC ELECTIVE-B

DISCIPLINE SPECIFIC ELECTIVE – B1

MAT17R341 OPERATIONS RESEARCH	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to acquire the knowledge of optimization techniques to solve the real world problems.

Course Outcome(s):

Upon successful completion of this course, Students will be able to

CO1: Understand the basic concepts of Linear Programming Problem
CO2: Solve the linear programming problem using simplex method
CO3: Know the concept of Duality and its applications
CO4: Understand the concept of transportation problem and assignment problem.
CO5: Understand the concept of game theory

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1		M			L	M
CO2		H				M
CO3	M		M			
CO4		M		H	L	
CO5						H

Unit I: **(15 Hours)**

Linear Programming Problem - Mathematical formulation of a problem-Graphical solution.

Unit II: **(15 Hours)**

The simplex method – Artificial variable technique-Charner's method of penalties –Two phase method.

Unit III: **(15 Hours)**

Duality – general primal-dual pair-formulation of a dual problem-primal-dual problem in matrix form-duality theorems and complementary theorems(statements only)-Dual simplex method.

Unit IV: **(15 Hours)**

Transportation Problem - Initial solution by North West corner method, Vogel's approximation method, Matrix minima method - Solution by Modified distribution method for both Balanced and Unbalanced Problem – Assignment problem.

Unit V: **(15 Hours)**

Game Theory- Two person zero sum game –some basic terms –The maxima and minima principle (proof of theorems, not expected)- saddle points- game with saddle points – solutions of games without saddle points by the following method. 1. Using formulae. 2. Graphical Method 3. Method of Dominance

Text Book(s):

Kanthi Swarup and others, Operations Research, Sulthan Chand & Sons, Ninth Edition, Reprint 2001.

Unit I: Chapter 2 (section 2.1 and 2.2) Chapter 3 (Sections 3.1 to 3.3),
Unit II: Chapter 4(sections 4.1 ,4.3 4.4)
Unit III: Chapter 5 (sections 5.2 - 5.4 and 5.9)
Unit IV: Chapter 10(sections 10.1to 10.4 and 10.8 to 10.11),
Chapter 11(sections 11.1 - 11.3)
Unit V: Chapter 21(section-21.1 - 21.5 and 21.7)

Reference(s):

P. R.Vittal, Introduction to operations Research, MarGham Publications, 2013.

MAT17R342 **NUMERICAL METHODS**	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To make the students to solve the real world problems using Numerical methods.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: Solve by Direct methods and Iteration methods for solving system of equations.
CO2: To know different types of difference operators.
CO3: To solve physical problems using different types of operators.
CO4: To find derivatives of functions using operator.
CO5: To know different rules of Numerical integration.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M		M	L	
CO2		H				
CO3	M		H			L
CO4		M		L	L	
CO5		L	M			L

UNIT–I: Numerical solutions of equations (15 Hours)

Errors in Numerical Computation - Iteration method – Regula Falsi Method -Newton-Raphson Method - Simultaneous Equations-Back Substitution-Gauss Elimination Method-Gauss- Jordan Elimination Method-Iterative methods- Gauss Jacobi Iteration Method – Gauss–Seidel Iteration Method.

UNIT–II: Difference Operators (15 Hours)

Difference Operators- Forward difference Table- Properties of the Operator - Backward Differences – Central Difference Operator - Other Difference Operators.

UNIT–III: Interpolation Formulas (15 Hours)

Newton's Interpolation Formulae-Central Difference Interpolation Formulae –Lagrange's Interpolation Formula -Divided Differences - Newton's Divided Difference Formula.

UNIT–IV: Numerical differentiation (15 Hours)

Derivatives using Newton's Forward Difference Formula and Newton's Backward Difference Formula – Derivatives using Central Difference Formulae.

UNI -V: Numerical Integration (15 Hours)

Numerical Integration - Newton-Cote's quadrature formula – Trapezoidal rule –Simpson's one third rule – Simpson's three eight rule –Weddle's rule – Romberg's method.

Text Book(s):

S. Arumugam, A.Thangapandi Isaac, and A. Somasundaram, Numerical Methods, Scitech Publications Pvt. Ltd., 2012.

Unit-I: Chapter 3 (Sections 3.1, 3.2, 3.4 and 3.5, Chapter 4 (Sections 4.1 to 4.4, 4.7, 4.8)
Unit II: Chapter 6 (Sections 6.1 and 6.2)
Unit III: Chapter 7 (Sections 7.1 to 7.5)
Unit IV: Chapter 8 (Sections 8.1 to 8.3)
Unit V: Chapter 8 (Section 8.5)

Reference(s):

S.S. Sastry Introduction Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., 2000.

MAT17R343 **QUEUEING THEORY**	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To make the students to be capable of doing simple application in coding theory.

Course Outcome(s):

Upon successful completion of this course- Students will be able to

1) Understand the types of Queueing systems and Queueing models.
2) Understand the characteristics of Model I and solve problems using Little's formula.
3) Grasps the concept of Model II and solve problems using that.
4) Grasp the characteristics of Model III and solve problems using that.
5) Remember the concept of Model IV and solve problems using that.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1		M			H	
CO2	L			L		
CO3			M			
CO4	H				H	
CO5		H				M

UNIT I: Introduction **(15 Hours)**

Types of Queueing systems- Arrival pattern- Service pattern- Queue discipline and System capacity- Transistent and Steady states- Symbolic representation of a Queueing model (kendal's notation)- difference equations related to Queueing models with Poisson input- Exponential service (Birth-Death process).

UNIT II: Model I: (M/M/I):(∞/FIFO) **(15 Hours)**

Explanation of Model I- Characteristics of Model I- Little's formulae (Relations between L_s- L_q- W_s and W_q)- Problems based on Model I.

UNIT III: Model II: (M/M/S):(∞/FIFO) **(15 Hours)**

Explanation of Model II- Characteristic of Model II- Problems based on Model II.

UNIT IV: Model III: (M/M/I):(K/FIFO) **(15 Hours)**

Explanation of Model III- Characteristic of Model III-Problems based on Model III.

UNIT V: **Model IV: (M/M/S):(K/FIFO)** **(15 Hours)**

Explanation of Model IV- Characteristic of Model IV- Problems based on Model IV.

Text Book(s):

Kandasamy- P.- Thilagavathy- K.- Gunavathy- K.- Probability Statistics and Queueing Theory- S. Chand & Company Ltd- New Delhi- 2007.

Unit I: (526-536)
Unit II: (536-559)
Unit III: (559-582)
Unit IV: (583-594)
Unit V: (594-605)

Reference(s):

1) Moorthy- M. B. K.- Subramani- K.- Santha- A.- Probability Random Processes and Queueing Theory- Scitech Publications (India) Pvt. Ltd- Chennai- Second edition- 2009.
2) Sundarapandian- V.- Probability Statistics and Queueing Theory- PH1 Learning Private Limited- New Delhi- 2009.

DISCIPLINE SPECIFIC ELECTIVE – B2

MAT17R344 COMPLEX ANALYSIS	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the basic concept of Complex variables.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: Analyze Analytic functions and continuous functions.
CO2: Understand Local properties of Analytic functions.
CO3:. Apply Cauchy's theorem for disk and the Integral formula.
CO4: Differentiate the Taylor's series and Laurent series.
CO5: Study Residue theorem and the argument principle.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1				L	H	
CO2	L		H			
CO3			M			M
CO4		M			H	
CO5		H				L

UNIT – I: Analytic Function (15 Hours)

Complex Numbers (Not for the examination)- Limits – continuous functions – Differentiability – Cauchy- Riemann equations– Analytic function –Necessary and Sufficient conditions – Harmonic functions.

UNIT – II: Transformations (15 Hours)

Elementary Transformations – Bilinear Transformations – Cross ratio – Fixed points –Special Bilinear Transformation which map real axis onto itself, the unit circle onto itself and the real axis onto the unit circle.

UNIT – III: Complex Integration **(15 Hours)**

Definite Integrals - Cauchy's theorem – Cauchy's integral formula - Higher derivatives –Cauchy's inequality – Lioville's theorem –Fundamental theorem of algebra - Morera's theorem.

UNIT – IV: Expansion of Series **(15 Hours)**

Taylor's series– Laurent's series- Zero of an analytic function – singularities.

UNIT – V: Calculus of Residues **(15 Hours)**

Residues – Cauchy's Residue Theorem -Evaluation of definite integrals.

Text Book(s):

S.Arumugam, A.Thangapandi Isaac and A. Somasundram, Complex Analysis, Scitech publications, 2011.
Unit-I: Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8)
Unit-II: Chapter 3 (Sections 3.1, 3.2, 3.3, 3.4, 3.5)
Unit-III: Chapter 6 (Sections 6.1, 6.2, 6.3, 6.4)
Unit-IV: Chapter 7 (Sections 7.1, 7.2, 7.3, 7.4)
Unit-V: Chapter 8 (Sections 8.1, 8.2, 8.3)

Reference(s):

S Narayanan and T.K. Manickavasagam Pillay, Complex Analysis, S. Viswanathan Printers and Publihsers, 2006.

MAT17R345 **FUZZY LOGIC AND ITS APLICATIONS**	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To make aware of the student that the laws of impreciseness governing the real life and to enrich their knowledge of fuzzy sets.

Course Outcome(s):

CO1 : know about the concepts of crisp sets and fuzzy sets
CO2 : understand operations on fuzzy sets
CO3 : understand the concepts of fuzzy arithmetic
CO4 : know about the fuzzy relations.
CO5 : know about the fuzzy logic.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H			L		
CO2			H			H
CO3	H	L				
CO4			M		H	
CO5						

UNIT I: CRISP SETS AND FUZZY SETS: (15 Hours)

Introduction – Crisp sets : An overview – the notion of Fuzzy sets –Basic types of fuzzy sets - Basic concepts of fuzzy sets – Additional properties of α-cuts – Representations of fuzzysets – Extension principle for fuzzy sets.

UNIT II:OPERATIONS ON FUZZY SETS (15 Hours)

Types of operations – Fuzzy complements – Fuzzy intersections – Fuzzy unions – Combinations of operations – Aggregation operations.

UNIT III: FUZZY ARITHMETIC (15 Hours)

Fuzzy Numbers – Linguistics Variables – Arithmetic operations on Intervals – Arithmetic operations on fuzzy numbers – Lattice of fuzzy numbers – Fuzzy equations.

UNIT IV: FUZZY RELATIONS (15 Hours)

Crisp versus fuzzy relations – Projections and cylindrical extensions – Binary fuzzy Relations – Binary relations on a single set – Fuzzy equivalence relations- Fuzzy compatibility relations – Fuzzy ordering relations – Fuzzy morphisms – Sup-i compositions of fuzzy relations -inf-ω_i compositions of fuzzy relations

UNIT V:FUZZY LOGIC (15 Hours)

Classical Logic : An overview – multi-valued logics – Fuzzy propositions – Fuzzy quantifiers – Linguistic Hedges – Inference from conditional fuzzy propositions – Inference from conditional and qualified Propositions - Inference from quantified Propositions.

Text Book(s):

George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, Theory and Applications, PHI Learning Private Limited, New Delhi - 110001, 2009.

Unit I: Chapters - 1 and 2, Sections – 1.1to 1.4, 2.1 to 2.3.
Unit II: Chapter –3 , Sections– 3.1 to 3.6
Unit III: Chapter - 4 , Sections – 4.1to 4.6
Unit IV: Chapter -5, Sections – 5.1 to 5.10
Unit V: Chapter -8, Sections – 8.1 to 8.8

Reference(s):

Zimmer Mann.H.J,Fuzzy sets theory and it's applicatians,Kluwar-NijhoffBostom, 1985.

MAT17R346 SPECIAL FUNCTIONS	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to acquire the basic knowledge of some Special function.

Course Outcome(s):

On successful completion of this course, the students will be able to ,

CO1: Know about the Beta, Gamma functions and related functions and integrals
CO2: Solve the hyper geometric differential equation
CO3: Understand the method of orthogonal polynomials
CO4: Understand the concept of separation of variables
CO5: Analyze the different form of integrals

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1	L			M		
CO2		H			L	
CO3			L			
CO4	M			M		H
CO5						

Unit – I Gamma and Beta functions (15 Hours)

Introduction - Gamma function - Beta function - Other beta integrals - Second beta integral - Third (Cauchy's) beta integral - A complex contour for the beta integral – The Euler reflection formula - Double-contour integral.

Unit – II Hyper geometric functions (15 Hours)

Introduction - Euler's integral representation - Two functional relations - Contour integral representations - The hyper geometric differential equation - The Riemann-Papperitz equation - Barnes' contour integral for F(a,b;c;x).

Unit – III Orthogonal polynomials (15 Hours)

Introduction - General orthogonal polynomials - Zeros of orthogonal polynomials - Gauss quadrature - Classical orthogonal polynomials - Hermite polynomials

Unit – IV Separation of variables and special functions (15 Hours)

Introduction - Separation of variables for the heat equation - Separation of variables for a quantum problem - Separation of variables and integrability - Another Separation of variables for the quantum problem

Unit – V Integrable systems and special functions (15 Hours)

Introduction - Calogero-Sutherland system - Integral transform - Separated equation - Integral representation for Jack polynomials

Text Book(s):

1. PG course on special functions and their symmetries by Vadim KUZNETSOV (e-Book), University of Leeds, 2003.
Chapter I : Unit I, Chapter II : Unit II, Chapter III : Unit III, Chapter IV : Unit IV, Chapter V : Unit V

Reference(s):

1. George E. Andrews, Richard Askey, and Ranjan Roy. Special functions. Cambridge University Press, Cambridge, 1999.
2. Willard Miller, Jr. Lie Theory and Special Functions. Academic Press, New York, 1968. Mathematics in Science and Engineering, Vol. 43.

DISCIPLINE SPECIFIC ELECTIVE – B3

MAT17R347 GRAPH THEORY	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to acquire the basic knowledge and proof techniques in graph theory.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: Understand the basic concepts in graph theory.
CO2: Learn the concepts of degree sequence and connectivity in graphs.
CO3: Understand the concept of Hamiltonian and Eulerian graphs and trees .
CO4: Understand the concept matching and planarity in graphs
CO5: Know about chromatic number in graphs and digraphs

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1			H			L
CO2		L		M		
CO3		H				
CO4	M		L		M	
CO5						L

UNIT-I : Graphs and Subgraphs (15 Hours)

Graphs – Degrees –Subgraphs- Isomorphism- Ramsey Numbers – Independent sets and Coverings – Intersection graphs and line graphs – Matrices of graphs – Operations on Graphs.

UNIT-II : Degree sequences and connectedness (15 Hours)

Degree sequences – Graphic Sequences – Walks, Trails and Paths – Connectedness and Components – Blocks – Connectivity.

UNIT-III: Eulerian, Hamiltonian graphs and Trees (15 Hours)

Eulerian Graphs - Hamiltonian Graphs - Trees – Characterization of Trees – Centre of a Tree.

UNIT-IV : Matchings and Planarity (15 Hours)

Matchings– Matchings in Bipartite Graphs – Planarity – Properties – Characterization of Planar Graphs.

UNIT-V : Colourability (15 Hours)

Chromatic number and Chromatic index - The Five colour theorem – Four colour problem – Digraphs.

Text Book(s):

S. Arumugam and S. Ramachandran, Invitation to Graph Theory, Sci-Tech Publications 2nd edition, 2003.

Unit-I : Chapter 2
Unit-II:Chapter 3 and Chapter 4
Unit-III:Chapter 5 and Chapter 6
Unit-IV:Chapters 7 and Chapter 8 (Sections 8.1 and 8.2)
Unit-V:Chapter 9 and Chapter 10 (Sections 10.1)

Reference(s):

1. S.A.Choudam, First Course in Graph Theory , Macmillian India Ltd-new Delhi,2000
2. John Clark,Derek Allan Holton ,A First Look at Graph Theory World Scientific Publishing Company ,1991.

MAT17R348 **COMBINATORICS**	**L**	**T**	**P**	**Credit**
	4	**2**	**0**	**6**
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To enable the students to understand the concepts of permutation, combination and Inclusion and Exclusion principle.

Course Outcome(s):

Upon successful completion of this course, students will be able to

1. understand the rules of Sum and Product of Permutations and Combinations.
2. analyze the concepts of Pigeonhole Principle and its applications.
3. identify Solutions by the technique of Generating Functions and Recurrence Relations with Two Indices.
4. understand the concepts of Pascal's Triangle, the Binomial Theorem and unimodality of Binomial Coefficients.

5. understand the concepts of the Principle of Inclusion-Exclusion and their applications.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L				L	
CO2			H	M		
CO3						L
CO4	M					
CO5				M		L

Unit I - Permutations and Combinations (15 Hours)

Four Basic Counting Principles, Permutations of sets, Combinations (Subsets) of Sets, Permutations of Multi-sets, Combinations of Multi-sets, Finite Probability.

Unit II - The Pigeonhole Principle (15 Hours)

Pigeonhole Principle: Simple Form, Pigeonhole Principle: Strong Form, A Theorem of Ramsey.

Unit III - Generating Permutations and Combinations (15 Hours)

Generating Permutations, Inversions in Permutations, Generating Combinations, Generating r-Subsets, Partial Orders and Equivalence Relations**.**

Unit IV - The Binomial Coefficients (15 Hours)

Pascal's Triangle, The Binomial Theorem, Unimodality of Binomial Coefficients, The Multinomial Theorem, Newton's Binomial Theorem, More on Partially Ordered Sets.

Unit V - The Inclusion-Exclusion Principle and Applications (15 Hours)

The Inclusion-Exclusion Principle, Combinations with Repetition, Derangements, Permutations with Forbidden Positions, Another Forbidden Position Problem, Mobius Inversion.

Text Book(s):

Richard A. Brualdi, Introductory Combinatorics, Pearson Education, Inc, China machine press, Fifth Edition, 2009.

Unit I: Chapter 2
Unit II: Chapter 3
Unit III: Chapter 4
Unit IV: Chapter 5
Unit V: Chapter 6

Reference(s):

1. Miklos Bona, A walk through Combinatorics, (Second Edition), World Scientific Publ. Co., 2008.
2. C. L. Liu, Introduction to Combinatorial Mathematics, Mc Graw Hill Book Company, New York, 1968.
3. C. L. Liu, Introduction to Combinatorial Mathematics, Mc Graw Hill Book Company, New York, 1968.

MAT17R349 CODING THEORY	L	T	P	Credit
	4	2	0	6
Pre-requisite: NIL	**Course Category:** DSE **Course Type:** Theory			

Course Objective(s):

To make the students to be capable of doing simple application in coding theory.

Course Outcome(s):

Upon successful completion of this course- students will be able to

CO1: Understand the basic concepts of error detecting and correcting codes.

CO2: Know about the Maximum Likelihood De-coding (MLD) and Incomplete Maximum Likelihood De-coding (IMLD) for linear codes.

CO3: Know about the concepts of different codes.

CO4: Know about the basic concepts of cyclic and Dual cyclic codes.

CO5: Learn the topic about Decoding 2 error correcting BCH codes.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1			M		M	
CO2		L		L		H
CO3			H		M	
CO4		M		L	L	
CO5	M					

UNIT I: **(15 Hours)**

Detecting and correcting error patterns - Information rate - The effects of error detection and correction - Finding the most likely code word transmitted - Weight and distance- MLD -Error detecting and correcting codes.

UNIT II: **(15 Hours)**

Linear codes- bases for $C = \langle S \rangle$ and $C^{\perp}$ - generating and parity check matrices- Equivalent codes - Distance of a linear code- MLD for a linear code - Reliability of IMLD for linear codes.

UNIT III: **(15 Hours)**

Perfect codes - Hamming code - Extended codes - Golay code and extended Golay code - Red Hulles Codes.

UNIT IV: **(15 Hours)**

Cyclic linear codes - Polynomial encoding and decoding - Dual cyclic codes.

UNIT V: **(15 Hours)**

BCH Codes - Cyclic Hamming Code- Decoding 2 error correcting BCH codes

Text Book(s):

D.J Hoffman etal.- Coding Theory The Essentials- Published by Marcel Dekker Inc 1991

Unit I : Chapter 1
Unit II : Chapter 2
Unit III : Chapter 3
Unit IV : Chapter 4
Unit V : Chapter 5

Reference(s):

1. E.R Berlekamp- Algebriac Coding Theory- Mc Graw-Hill- 1968.
2. P.J Cameron and J.H Van Lint- Graphs- Coded and Designs CUP
3. H. Hill- A First Course in Coding Theory- OUP 1986.
4. Introduction to Cryptography with coding theory (2nd edition) - by Trappe & Washington- Prentice Hall- 2006.

SKILL ENHANCEMENT COURSE – D

MAT17R324 VECTOR CALCULUS	L	T	P	Credit
	3	0	0	2
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to understand solenoidal, irrotational vectors, line integrals and surface integrals and applications to Green's theorem, Gauss Divergence theorem and Stoke's theorem.

Course Outcome(s):

Upon successful completion of this course, students will be able to

CO1: understand the basic concepts of Gradient, Divergence and Curl.

CO2: study about the Solenoidal and irrotational vectors and identities involving divergence and curl.

CO3: understand the concept of the Line integrals.

CO4: solve the problems using Green's Theorem**.**

CO5: solve the problems using Stokes Theorem.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1	L				L	
CO2			H	L		H
CO3		H			M	

CO4		M		L		
CO5			H			M

Unit I: **(5 Hours)**

Introduction – Vector Algebra: Basic concepts – Differentiation of vectors - Theorem identities (without proof) –Gradient - Some simple problems.

Unit II: **(5 Hours)**

Divergence and Curl: Solenoidal and irrotational vectors – Theorems on identities (without proof) - simple problems.

Unit III: **(5 Hours)**

Introduction – Line integrals: Simple problems –Surface integral: Some simple problems.

Unit IV: **(5 Hours)**

Green's Theorem (without proof) – Gauss Divergence Theorem: (without proof) – simple problems.

Unit V: **(5 Hours)**

Stokes Theorem (without proof) – Simple problems.

Text Book(s):

S. Arumugam and Thangapandi Issac, Analytical Geometry of three dimensions and vector calculus, New Gamma Publishing House, 2003.

Unit I - Chapter 5: 5.1-5.18
Unit II - Chapter 5: 5.18-5.30
Unit III - Chapter 7: 7.1 – 7.10
Unit IV - Chapter 7: 7.11 – 7.18
Unit V - Chapter 7: 7.18 – 7.30

Reference(s):

1. S.Narayanan and T.K.Manickavasagam pillai, Analytical geometry of three dimensions [partII] S. Viswanathan (Printers & Publishers) Pvt. Ltd, 1999.

2. S.Narayanan and T.K. Manickavasagam Pillai, Vector Calculus, S. Viswanathan (Printers & Publishers) Pvt. Ltd, 1999.

MAT17R325 **BOOLEAN ALGEBRA**	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	**2**
Pre-requisite: NIL	**Course Category:** SEC **Course Type:** Theory			

Course Objective(s):

To enable the students to know basic knowledge lattice and its application to digital circuits

Course Outcome(s):

Upon successful completion of this course**,** students will be able to

CO1: understand the basic concepts inclusion and exclusion principle.
CO2: understand the basic concepts of partially ordered sets and chains.
CO3: know about the concept of distributive and complemented lattices.
CO4: know about the basic concepts of Uniqueness of finite Boolean algebras.
CO5: apply Boolean algebra to digital Networks and switching circuits.

Mapping of Course Outcome(s):

CO / PO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L			M		
CO2			L		L	L
CO3		H		L		
CO4	M			H	H	M
CO5			L			

Unit-I: **(5 Hours)**

Mathematical induction-principle of Inclusion and Exclusion.

Unit-II: **(5 Hours)**

Properties of binary relation-Equivalence Relation and Partitions-Partial ordering Relation and Lattices-Chains and Antichains.

Unit-III: **(5 Hours)**

Lattices and Algebraic Systems-Principle of duality-Basic properties of algebraic systems defined by Lattices-Distributive and Complemented lattices

Unit-IV: **(5 Hours)**

Boolean Lattice and Boolean algebra-Uniqueness of finite Boolean algebras—Boolean Function and Boolean Expression-Propositional Calculus

Unit-V: **(5 Hours)**

Design and Implementation of Digital Networks-Switching circuits.\

Text Book(s):

1. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill International Editions, 1985.

Unit I: Chapter 1 –Section 1.5 to 1.6
Unit II: Chapter 4 - Section 4.3 to 4.6
Unit III: Chapter 12 - Section 12.1 to 12.4
Unit IV: Chapter 12 - Section 12.5 to 12.8
Unit V: Chapter 12 - Section 12.9 to 12.10

Reference(s):

J. P. Trembley and R. Manohar, Discrete Mathematical Structure with applications to Computer Science, Mc Graw Hill Book Company, 2001.

MAT17R326 MATHEMATICAL FINANCE	L	T	P	Credit
	3	0	0	2

Pre-requisite: NIL **Course Category:** SEC
Course Type: Theory

Course Objective(s): To enable the students to know methods of applying mathematical concept in financial management.

Course Outcome(s): Upon successful completion of this course**,** Students will be able to

CO1: understand the basic concepts of simple interest.
CO2: understand the basic concepts of binomial tree model.
CO3: know about the concept of investment Strategies.
CO4: know about the basic concepts of european options in the binomial tree model.
CO5: learn the topic about investment in single bonds.

Mapping of Course Outcome(s):

CO / PO	PO					
	1	2	3	4	5	6
CO1			M		L	
CO2		H		L		L
CO3	L		L			M
CO4		L	H	M		
CO5					H	

Unit-I: **(5 Hours)**

Simple interest-Periodic compounding-Streams of payments-Continuous compounding.

Unit-II: **(5 Hours)**

Binomial Tree Model - Risk Neutral Probability- Continuous-Time Limit.

Unit-III: **(5 Hours)**

Investment Strategies - The Principle of No Arbitrage -Application to the Binomial Tree Model.

Unit-IV: **(5 Hours)**

European Options in the Binomial Tree Model – Cox Ross Rubinstein Formula- American Options in the Binomial Tree Model- Black–Scholes Formula.

Unit-V: **(5 Hours)**

Investment in Single Bonds- Duration- Portfolios of Bonds -Dynamic Hedging

Text Book(s): 1. C M. Capinski and T. Zastawniak, Mathematics for Finance, Springer, London, 2003

Unit I: Chapter2 - Section 2.1.1 -2.1.4
Unit II: Chapter 3- Section 3.2, 3.2.1 and 3.3.2
Unit III: Chapter4- Section 4.1.1 - 4.1.3
Unit IV: Chapter 8 - Section 8.1 – 8.3
Unit V: Chapter 10 - Section 10.1.1-10.1.4

Reference(s): 1. J. Hull, Options, Futures, and Other Derivatives, Pearson Prentice Hall, Upper Saddle River, 2015.

2. R. McDonald, Derivative Markets, Second Edition, Addison-Wesley, Boston, 2006.