QUEEN MARY'S COLLEGE(A)

Chennai 600004

PG & RESEARCH DEPARTMENT OF MATHEMATICS

B.Sc MATHEMATICS SYLLABUS

2019-20 ONWARDS

(CO-K, PO mapping adopted in 2019-20 and implemented from 2021-22 onwards)

CONTENTS

QUEEN MARY'S COLLEGE (A), CHENNAI -04.

PG & RESEARCH DEPARTMENT OF MATHEMATICS

B. Sc. SYLLABUS – WITH CO-PO MAPPING

Sem	Course No.	Title of the Course	Pg No.	Subject Code	UE	IA	Total	Credits
I	I	Algebra and Trigonometry I	17	MA151	75	25	100	5
I	II	Differential Calculus	20	MA152	75	25	100	5
II	III	Algebra and Trigonometry I1	23	MA153	75	25	100	5
II	IV	Differential Equations	27	MA154	75	25	100	5
III	V	Analytical Geometry of Two and Three Dimensions	31	MA155	75	25	100	5
III	VI	Integral Calculus and Fourier Series	35	MA156	75	25	100	5
IV	VII	Programming in C	38	MA157	75	25	100	5
IV	VIII	Vector Analysis and Laplace Transforms	42	MA158	75	25	100	5
V	IX	Algebraic Structures I	46	MA159	75	25	100	5
V	X	Real Analysis I	50	MA160	75	25	100	5
V	XI	Mechanics I	54	MA161	75	25	100	5
V	XII	Operations Research	57	MA162	75	25	100	5
V	XIII	Elective I Graph Theory	61	MA163	75	25	100	5
VI	XIV	Algebraic Structures II	65	MA164	75	25	100	5

VI	XV	Real Analysis II	68	MA165	75	25	100	5
VI	XVI	Complex Analysis	72	MA166	75	25	100	5
VI	XVII	Mechanics II	76	MA167	75	25	100	5
VI	XVIII	Elective II Discrete Mathematics	79	MA168	75	25	100	5
I	I	Allied I Paper – I Calculus of Finite Differences and Numerical Analysis-I	83	MAA27	75	25	100	5
II	II	Allied I Paper – II Calculus of Finite Differences and Numerical Analysis-II	86	MAA28	75	25	100	5
III	I	Allied II Paper-I Mathematical Statistics- I	89	MAA29	75	25	100	5
IV	II	Allied II Paper-II Mathematical Statistics - II	93	MAA30	75	25	100	5
I	I	Allied Mathematics I (for Physics, Chemistry, Comp.Science, B.C.A.)	97	MAA31	75	25	100	5
II	II	Allied Mathematics II (for Physics, Chemistry, Comp.Science, B.C.A.)	101	MAA32	75	25	100	5
III	I	Allied Mathematics(for Geography) Statistical methods I	105	MAA33	75	25	100	5
IV	II	Allied Mathematics (for Geography) Statistical methods II	108	MAA34	75	25	100	5
III	I	NME -1 Fundamentals of statistics	112	MANM5	75	25	100	2
IV	II	NME-2 Applications of Mathematics and Statistics	115	MANM6	75	25	100	2

Part IV Courses

Semester	Courses	Title of the Course	Subject Code	Credits
I	SBE I	LIFE SKILLS I	SBE09	3
II	SBE II	LIFE SKILLS II	SBE10	3
III	SBE III	SKILLS FOR THE WORK PLACE	SBE11	3
IV	SBE IV	EMPLOYABILITY SKILLS	SBE12	3
I	EVS	ENVIRONMENTAL STUDIES	EVS02	2
II	VEDU3	VALUE EDUCATION	VEDU3	2
III	NME -1	FUNDAMENTALS OF STATISTICS	MANM5	2
IV	NME-2	APPLICATIONS OF MATHEMATICS AND STATISTICS	MANM6	2
	EXTENSION ACTIVITIES	NSS/ NCC/ NSO ACTIVITIES		1

CHOICE BASED CREDIT SYSTEM FOR U.G
2019 - 2020

TOTAL NO. OF COURSES IN PARENT DEPARTMENT -22 ; 110 CREDITS			
TYPE OF COURSE	**NO.OF COURSES**	**CREDITS PER COURSE**	**CREDITS**
PART –III CORE	16	5	80
PART III CORE ELECTIVE I & II (SEM V & VI)	2	5	10
PART III SELF ALLIED	4	5	20
OTHER COURSES FROM OTHER DEPARTMENTS – 20; 45 CREDITS			
PART II – ENGLISH (SEM I –IV)	4	3	12
PART –I LANGUAGE (SEM I – IV)	4	3	12
PART- IV EVS (SEM I)	1	2	2
PART- IV VALUE EDUCATION (SEM II)	1	2	2
PART –IV NON MAJOR ELECTIVE (SEM III & IV)	2	2	4
PART –IV SOFT SKILS (SEM I,II,III & IV)	4	3	12
PART –V EXTENSION ACTIVITY	1	1`	1
TOTAL	**38**		**155**

Allied Coursesoffered by the Department of Mathematics for B.Sc Physics, Chemistry , Computer ScienceandB.C.A

Semester	Course No	Title of Course	Subject Code	U.E 75	I.A 25	Total 100	Credit
I	I	**Allied Mathematics I**	MAA31	**75**	**25**	100	5
II	II	**Allied Mathematics II**	MAA32	**75**	**25**	100	5

Allied Courses offered by the Department of Mathematics for B.Sc Geography

Semester	Course No	Title of Course	Subject Code	U.E 75	I.A 25	Total 100	Credit
III	I	**Statistical Methods I**	MAA33	**75**	**25**	100	5
IV	II	**Statistical Methods II**	MAA34	**75**	**25**	100	5

Non Major Elective Courses Offered by the Department of Mathematics

Semester	Course No	Title of Course	Subject Code	U.E 75	I.A 25	Total 100	Credit
III	I	**Fundamentals of Statistics**	MANM5	**75**	**25**	100	2
IV	II	**Applications of Mathematics and Statistics**	MANM6	**75**	**25**	100	2

*Week - 6 working day order Semester – 15 such weeks

S.No	CORE/ELECTIVE	HRS/WEEK*	NO.OF WEEKS*	TOTAL HOURS/SEMESTER
1	Core	06	15	90
2	Elective	05	15	75

- Number of Units in the syllabus of core courses 05
- Number of Units in the syllabus of elective courses 05
- Maximum marks per course 100
- **Total marks in Part III 2200**

QUANTIFICATION OF END SEMESTER EXAMINATION

QUESTION PAPER PATTERN
(EFFECTIVE FROM THE ACADEMIC YEAR 2019 - 2020)

CORE and ELECTIVE COURSES **Maximum Marks: 100**

Internal Assessment: 25* **External Valuation: 75**

***No passing minimum in internal. Overrall Aggregate should be 40%**

Part – A
5 x 2 = 10 marks
Answer all the 5 questions

Question	Unit
1	I
2	II
3	III
4	IV
5	V

Part – B
5 x 4 = 20 marks
Answer all the questions

Question	Unit
6(a) or 6(b)	I
7(a) or 7(b)	II
8(a) or 8(b)	III
9(a) or 9(b)	IV
10(a) or 10(b)	V

Part - C
3 x 15 = 45 marks
Answer any 3 out of 5

Question	Unit
11	I
12	II
13	III
14	IV
15	V

INTERNAL EVALUATION METHODOLOGY FOR ALL THE PROGRAMS:

- ✓ Quiz programme
- ✓ Periodical class tests
- ✓ Objective type assignments
- ✓ Problem solving assignments (INDIVIDUAL / GROUP)
- ✓ Seminar based on lecture notes available online / USING POWERPOINT
- ✓ Online exercises from open source/resource
- ✓ e-quiz
- ✓ Group Discussion or debate
- ✓ Question session
- ✓ Descriptive assignments with creative questions

QUANTIFICATION OF INTERNAL EVALUATION - UG THEORY

- Minimum 5 tests – 2 best out of 5
- Minimum 3 assignments – 2 best out of 3
- Model Examination for 75 marks reduced to 10 marks

TEST	ASSIGNMENT	ATTENDANCE	MODEL EXAM	TOTAL	CONTINUOUS INTERNAL ASSESSMENT
10	**10**	**5**	**75**	**100**	**-**
Reduced To					
5	**5**	**5**	**10**		**25**

Passing minimum

End Semester Examination 40%

Aggregate (CIA+UE) 40%

Grade Points and Cumulative Grade Point Average are awarded in the mark sheet

TEACHING METHODOLOGIES ADOPTED FOR THE UG PROGRAM

1. CHALK TALK
2. TEXT BOOK LEARNING
3. DIGITAL LEARNING- ONLINE PPT - LECTURE NOTES
4. VIDEO LECTURE – ONLINE – YOU TUBE
5. INTERACTIVE SESSIONS
6. STUDENT SEMINAR
7. LECTURE BY EXPERTS IN FIELD – INVITED TALKS
8. GOOGLE CLASSROOM, GOOGLE MEET

PROGRAM EDUCATIONAL OBJECTIVES (PEO):

On par with the institutional vision and mission, B.Sc Mathematics Programme aims at imparting knowledge and skills to the students enabling them to

PEO 1: Build a solid foundation in basic mathematical concepts which leads to proficiency in analytical reasoning and logical thinking. Apply the problem solving technique in real life situation also.

PEO 2: Choose teaching profession as a career and also get employment in banks, insurance, investment sectors, public and private sectors etc.

PEO 3: Make vague ideas precise which develops the leadership qualities with self confidence and scientific thinking.

PROGRAM SPECIFIC OUTCOMES (PSO):

After completing B.Sc. Mathematics Program, the student would be able to

PSO 1: Be equipped with fundamental concepts in every area of Mathematics. Apply the acquired knowledge to analyse the problem and evaluate the solution in various fields. **(PO1)**

PSO 2: Get acquainted with more computational techniques, the method of approaching problems , critical way of analysing and evaluating the problems. **(PO3)**

PSO 3: Communicate various concepts of Mathematics effectively using examples and their geometrical visualisation . Formulate vague ideas to clear ideas, precisely and interestingly**(PO2)**

PSO 4: Adopt objective, unbiased and truthful actions in all aspects. Identify the unethical behaviours in the subject concerned such as misrepresentation of data, falsification , etc. **(PO8)**

PSO 5: Get the habit of self learning . Apply the knowledge and skills of Mathematics in newer domains and uncharted areas .**(PO 10)**

PROGRAM OUTCOME (PO):

UG program in Mathematics is designed to equip an individual with fundamental basic concepts of mathematics, nurture the problem solving skills and logical thinking. It prepares and motivates the students to be self learner and effective communicator of mathematical ideas. The program also gives abundant opportunity for students to pursue disciplinary cum systematic learning **(PO1)**, enhance and explore her communication skill set **(PO2)**, undergo thorough training in analyzing problems**(PO3)**, motivated to learn through questions and updated topics **(PO4)**, work in teams **(PO5)** to take initiatives **(PO6)**, become digitally efficient **(PO7)**, embrace moral values **(PO8)**, be aware of e resources available to equip knowledge **(PO9)**, earnest to be self-learner **(PO10)**. However, it is up to the student to take her thought initiative forward to reach her goal. The skill levels are checked on a scale of 3 and correlated as low (1), moderate (2) and strong (3) for each Unit of the course to arrive at the total correlation of skills for the program. Any level of skill below 30 % is not correlated and left as blank.

Graduate Attributes for B.Sc Mathematics Programme:

PO1: Disciplinary knowledge and skills

Build profound knowledge in various Mathematical concepts to construct a solid base for understanding in Mathematics.

PO2: Skilled communicator

Develop excellence in teaching and interact with people from various range of literacy.

PO3: Critical thinker and problem solver

Develop analytical and computational skills to involve students in various projects which will expand their subject interest, and improve their analytical and logical thinking skills.

PO4: Sense of inquiry

Widen situations to get knowledge in Mathematics through inquiry, share ideas while seeking and benefitting from knowledge and insight of others

PO5: Team player/worker

Motivate group discussions to evolve new concepts by sharing one's idea there by developing Unity among students.

PO6: Skilled project manager

Exposure to latest computational techniques by learning software in the field.

PO7: Digitally Efficient

Inculcate the interest to search for e-resources and mathematical softwares and update technical information and skills through ICT tools.

PO8: Ethical awareness / reasoning

Continue to acquire relevant knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in the subject concerned. Ability to identify unethical behaviour such as fabrication, falsification or misrepresentation of data and adoptive objective, unbiased and truthful actions in all aspects.

PO9: National and international perspective

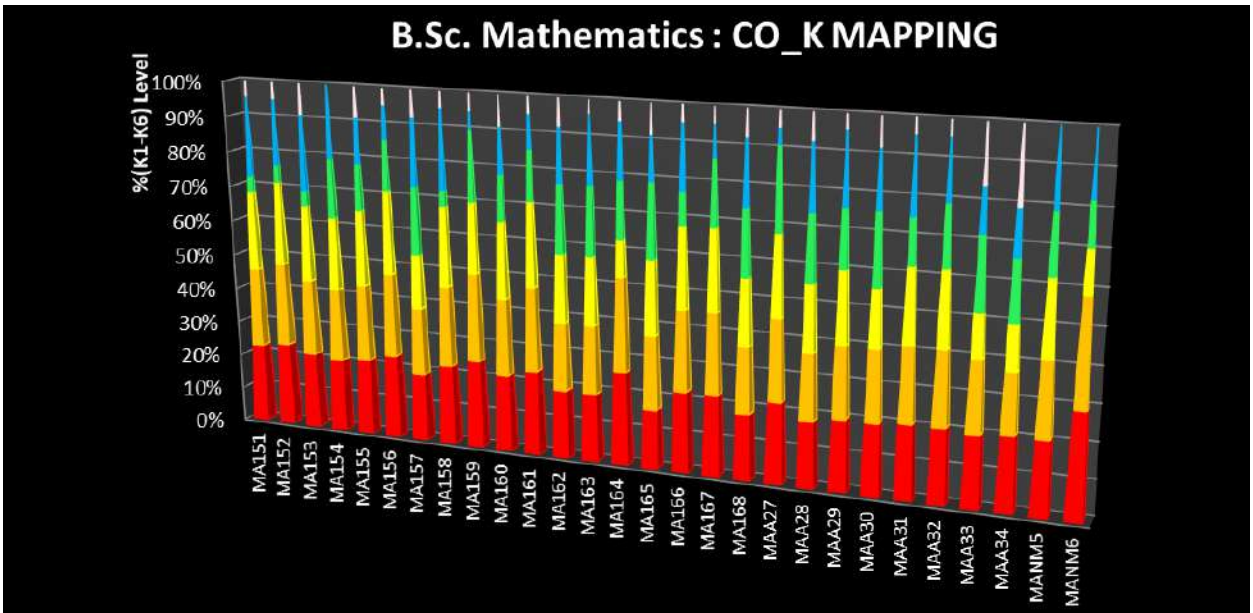
Encourage Participation in Workshop / Seminar / competitions in Mathematics in college and state level in order to bring out their ability in the field of Mathematics and exhibit their talents.

PO10: Lifelong learners

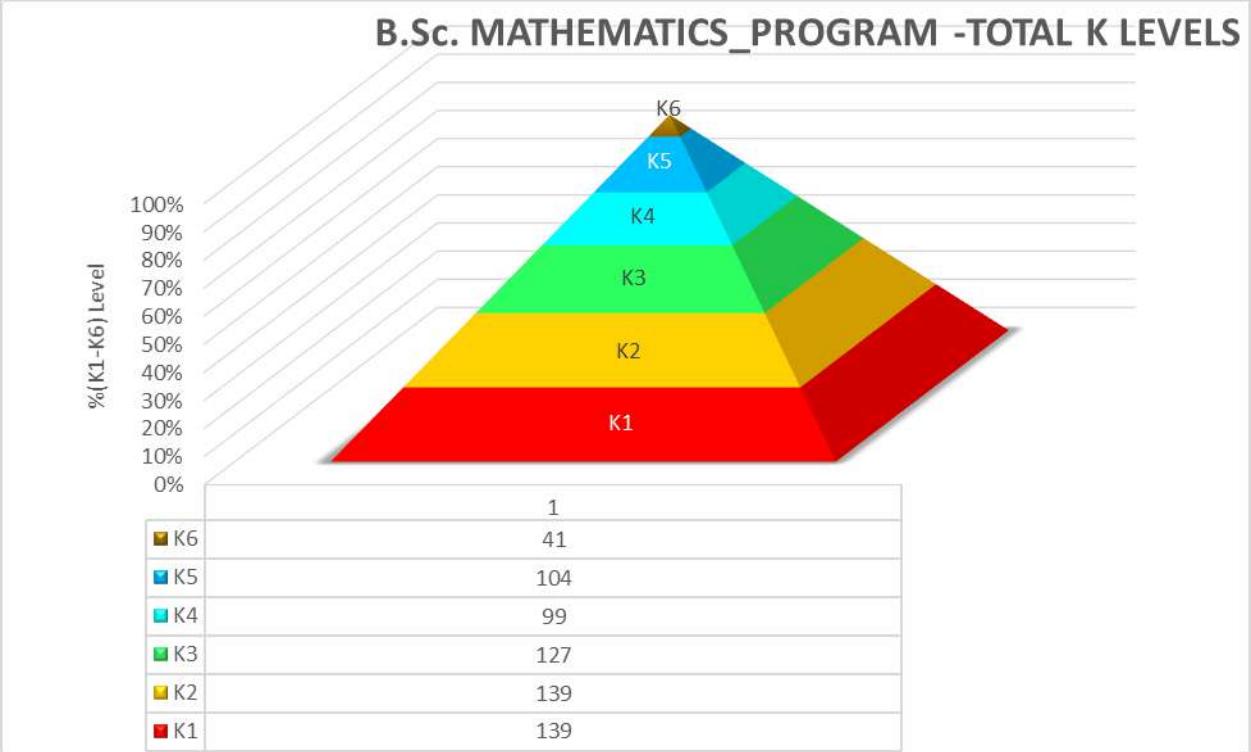
Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning throughout life and adapting to changing academic demands of work place through knowledge/ skill development.

COURSE OUTCOME (CO):

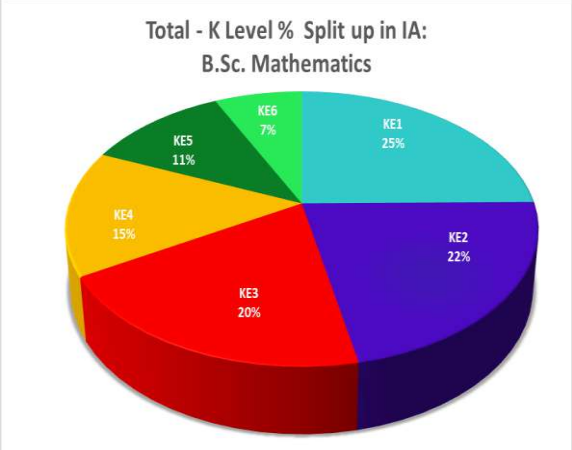
UG Mathematics curriculum is the culmination of in-depth basic knowledge of Algebra, Analysis, Calculus, Geometry, Differential equations and several other branches of Mathematics. The courses were designed such that remembering the facts and understanding the concepts play a vital role. The courses in Pure Mathematics bring out the analyzing capacity of the students. The courses in Applied Mathematics contribute to the application and evaluation part. The allied and elective courses motivate the students to do creative group activities. Knowledge level imparted in the curriculum are categorized as per Blooms taxonomy under six levels K1, K2, K3, K4, K5 & K6 and mapped to check their presence or absence or not scaled.

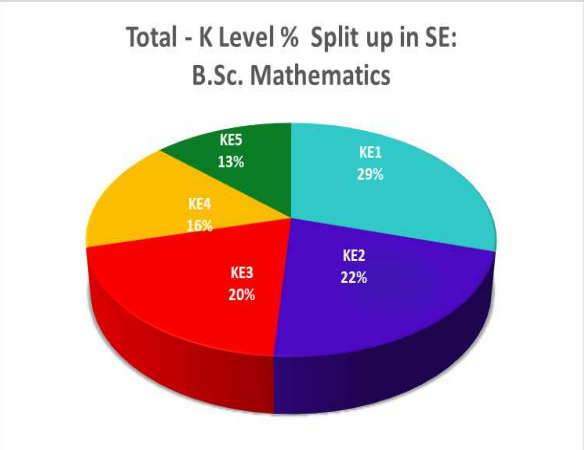


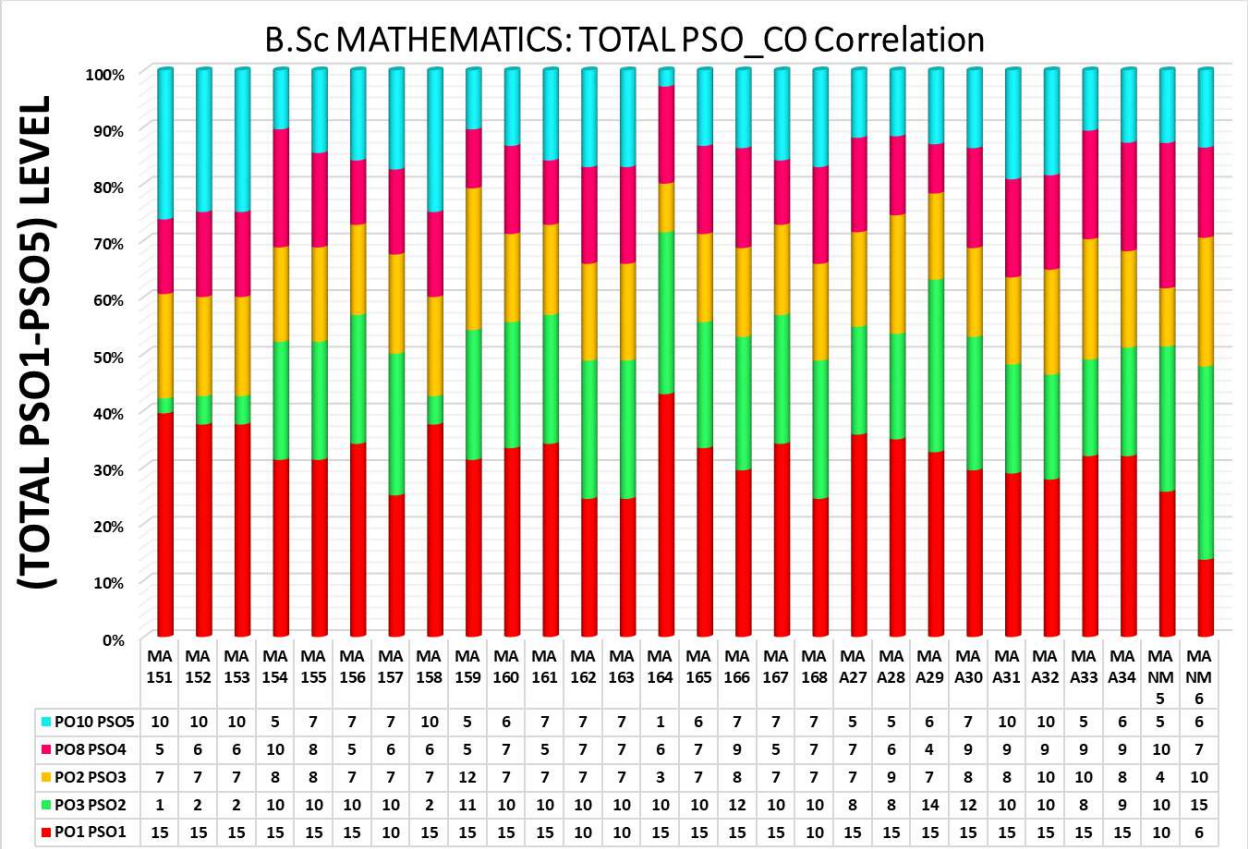
	MA151	MA152	MA153	MA154	MA155	MA156	MA157	MA158	MA159	MA160	MA161	MA162	MA163	MA164	MA165	MA166	MA167	MA168	MAA27	MAA28	MAA29	MAA30	MAA31	MAA32	MAA33	MAA34	MANM5	MANM6
K6	1	1	2	0	2	1	2	1	1	2	1	2	1	1	2	1	1	2	1	2	1	2	1	1	4	5	0	0
K5	5	4	5	5	3	2	5	5	1	3	2	4	5	3	3	4	2	5	1	5	5	4	5	4	3	3	5	3
K4	1	1	1	4	3	3	5	1	4	3	3	5	5	3	5	2	4	5	5	5	4	5	3	4	5	4	4	2
K3	5	5	5	5	5	5	4	5	4	5	5	5	5	2	5	5	5	5	5	5	5	4	5	5	3	3	5	2
K2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5
K1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5



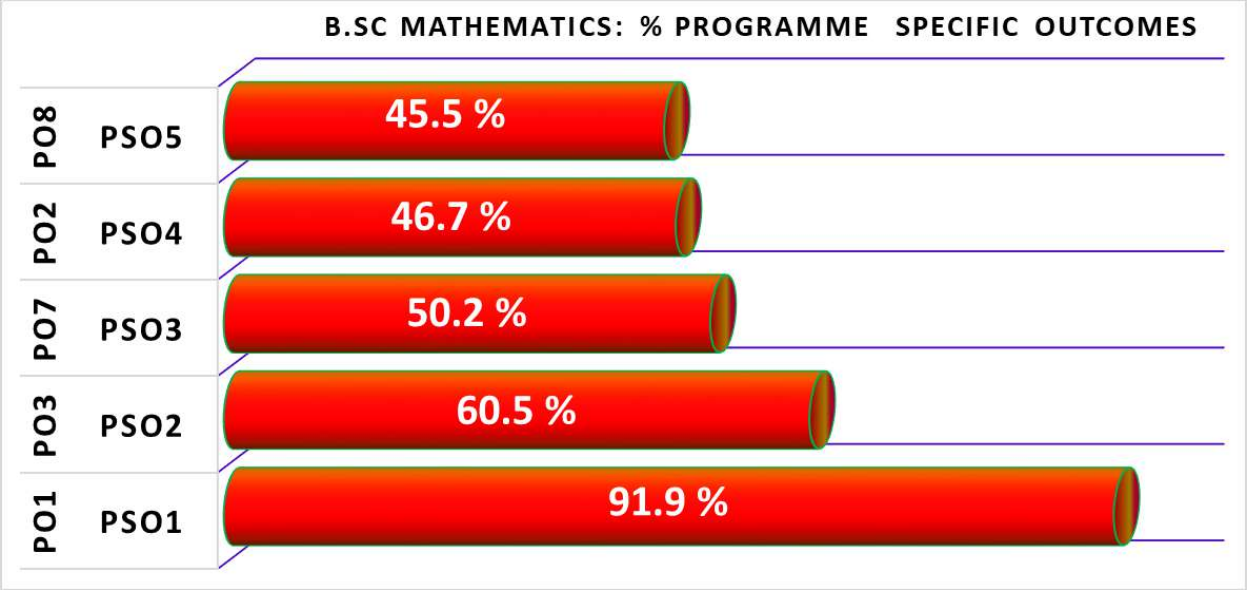
	1
K6	41
K5	104
K4	99
K3	127
K2	139
K1	139

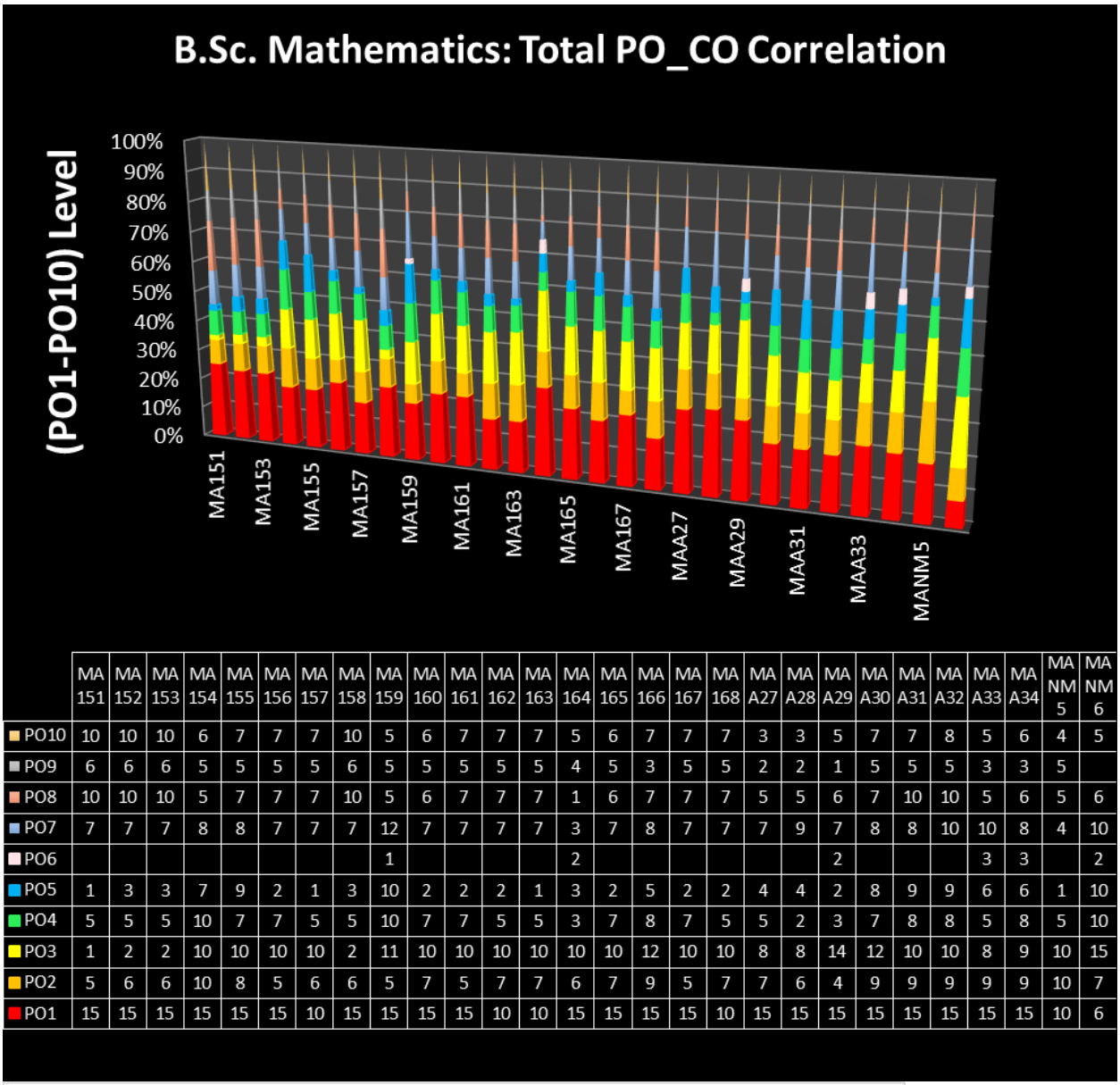






	MA 151	MA 152	MA 153	MA 154	MA 155	MA 156	MA 157	MA 158	MA 159	MA 160	MA 161	MA 162	MA 163	MA 164	MA 165	MA 166	MA 167	MA 168	MA A27	MA A28	MA A29	MA A30	MA A31	MA A32	MA A33	MA A34	MA NM 5	MA NM 6
PO10 PSO5	10	10	10	5	7	7	7	10	5	6	7	7	7	1	6	7	7	7	5	5	6	7	10	10	5	6	5	6
PO8 PSO4	5	6	6	10	8	5	6	6	5	7	5	7	7	6	7	9	5	7	7	6	4	9	9	9	9	9	10	7
PO2 PSO3	7	7	7	8	8	7	7	7	12	7	7	7	7	3	7	8	7	7	7	9	7	8	8	10	10	8	4	10
PO3 PSO2	1	2	2	10	10	10	10	2	11	10	10	10	10	10	10	12	10	10	8	8	14	12	10	10	8	9	10	15
PO1 PSO1	15	15	15	15	15	15	10	15	15	15	15	10	10	15	15	15	15	10	15	15	15	15	15	15	15	15	10	6





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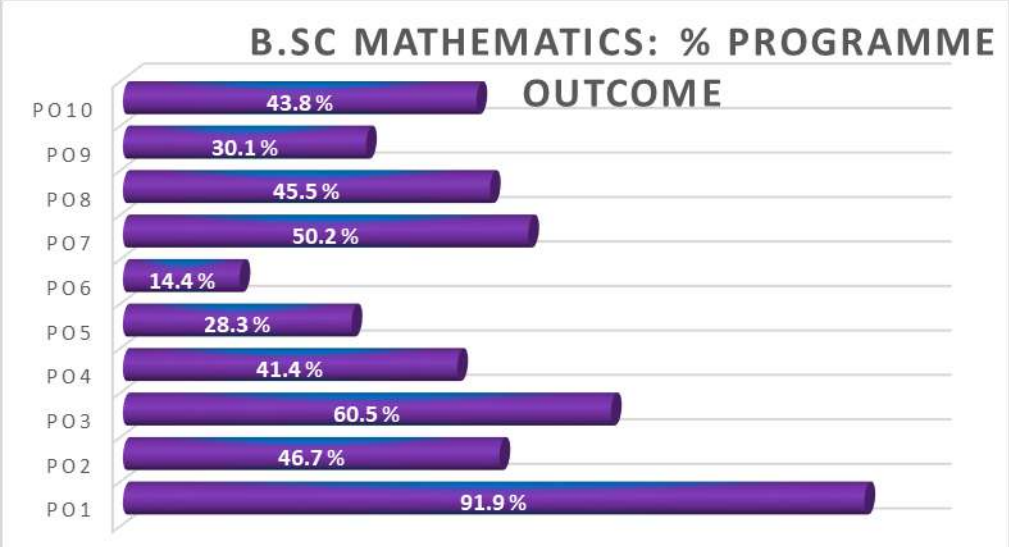
PO10	10	10	10	6	7	7	7	10	5	6	7	7	7	5	6	7	7	7	3	3	5	7	7	8	5	6	4	5
PO9	6	6	6	5	5	5	5	6	5	5	5	5	5	4	5	3	5	5	2	2	1	5	5	5	3	3	5	
PO8	10	10	10	5	7	7	7	10	5	6	7	7	7	1	6	7	7	7	5	5	6	7	10	10	5	6	5	6
PO7	7	7	7	8	8	7	7	7	12	7	7	7	7	3	7	8	7	7	7	9	7	8	8	10	10	8	4	10
PO6									1					2							2				3	3		2
PO5	1	3	3	7	9	2	1	3	10	2	2	2	1	3	2	5	2	2	4	4	2	8	9	9	6	6	1	10
PO4	5	5	5	10	7	7	5	5	10	7	7	5	5	3	7	8	7	5	5	2	3	7	8	8	5	8	5	10
PO3	1	2	2	10	10	10	10	2	11	10	10	10	10	10	10	12	10	10	8	8	14	12	10	10	8	9	10	15
PO2	5	6	6	10	8	5	6	6	5	7	5	7	7	6	7	9	5	7	7	6	4	9	9	9	9	9	10	7
PO1	15	15	15	15	15	15	10	15	15	15	15	10	10	15	15	15	15	10	15	15	15	15	15	15	15	15	10	6



ALGEBRA AND TRIGONOMETRY – I

Semester : I **Code : MA151**
Course: I **Credit: 5**

Learning Objectives: In this course students are exposed to topics like Summation of series, Matrices, Theory of Numbers and Expansions of trigonometric functions. The stress is on the development of problem solving skills.

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions . At the end of the course, students will be able to

CO1	**Acquire** knowledge about Binomial, Exponential and Logarithmic series and **evaluate** the summation of the series	**K1, K2, K3,K4,K5**
CO2	**Determine** whether the given matrix satisfies the Cayley – Hamilton theorem and **finding** the characteristic equation, Eigen values, Eigen vectors of a given matrix and determines its diagonalization process.	**K1, K2, K3,K5**
CO3	**Demonstrate** the knowledge of topics such as prime and composite numbers. Eulers function – finding divisors Of N and integral part of a real number. **Develop**ing knowledge about congruences and **apply** the techniques to **solve** the problems in number theory-www.nptel.com**[PO 3, PO7]**	**K1, K2, K3,K5,K6**
CO4	**Distinguish** the powers of sines and cosines of θ in terms of multiples of θ and **compute** expansions of cosnθ, sinnθ ,$\cos^n$ θ, $\sin^n$ θ, sin θ, cos θ and tan θ, when n is a positive integer-quiz **[PO5]**	**K1, K2, K3,K5**
CO5	**Understanding** and **evaluating** the summation of series of sines and cosines of angles of θ in AP and Gregory's series-Assignment in Google Classroom **[PO7]**	**K1, K2, K3,K5**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	1	-	1	-	-	1	2	-	2
CO2	3	1	-	1	-	-	1	2	-	2
CO3	3	1	1	1	-	-	2	2	3	2
CO4	3	1	-	1	1	-	1	2	-	2
CO5	3	1	-	1	-	-	2	2	3	2
AVG	3	1	-	1	-	-	1	2	1	2
TOTAL	15	5	1	5	1	-	7	10	6	10

Unit – I

Summation of series using Binomial, Exponential and Logarithmic series. (simple problems)

Chapter: 3 Section 10 &Chapter: 4 Section 3, 5, 6 and 9

Unit – II

Matrices– Symmetric – Skew symmetric – Hermitian – Skew Hermitian– Orthogonal matrices

Eigen values, Eigen Vectors, Cayley – Hamilton theorem (statement only) and its applications Diagonalization of a matrix.

Chapter: 2 Section 6.1, 6.2, 6.3, 9.1 & 16 [Pg: 110]

Unit - III (THEORY OF NUMBERS)

Divisors of a given number N – Euler's function – Integral part of a real number – Congruences – Basic properties of congruences (simple problems)

Chapter: 5 Section 7,8,9,10, 11,12 and 13

Unit – IV

Expansions– Expansion of cos nθ, sin nθ and tan nθ– Expansion of $\cos^n\theta$, $\sin^n\theta$ in a series of sines and cosines of multiples of θ– Expansion of cos θ, sin θ in powers of θ (θ given in radians),– Euler's formula for $e^{i\theta}$.

Chapter III: Section – 1,2,4,5.

Unit – V

Summation of trigonometric series by Telescopic method. Sum of sines of n angles in arithmetic progression – Sum of cosines of n angles in arithmetic progression- Gregory series for $\tan^{-1}x$

Chapter VI: Section – 1 , 2, 3.1(only)

Books for study:

1. Algebra Volume I& II – S. Narayanan & T.K.Manicavachagom Pillay, S.Vishvanathan(Printers and Publishers), Pvt. Ltd. -2018

2. Trigonometry– S. Narayanan and T.K. Manicavachagam Pillay, S.Vishvanathan (Printers and publishers), Pvt. Ltd. -2018

Books for reference:

1. S.Arumugam, Thangapandi Issac , Classical Algebra, New Gamma Publishing House, Palayamkottai.

2 .S.Sudha(1998), Algebra and Trigonometry, Emerald Publishers, Chennai.

3. Plane Trigonometry – S.L.Loney, A.K Publications, Agra

4. A.Singaravelu (2003) Algebra and Trigonometry, vol 1 & 2 Meenakshi agency, Chennai

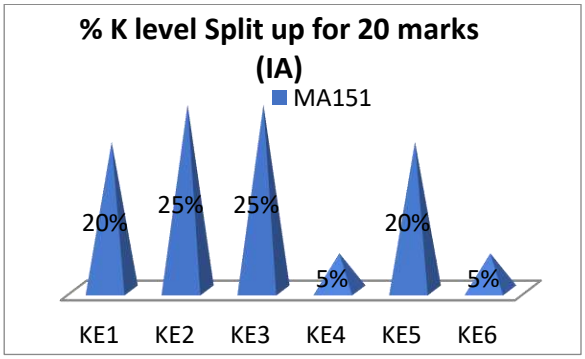
Web references:

1. www.nptel.com
2. www.mathsforum.org
3. tutorial.math.lamar.edu

ASSESSMENT PATTERN

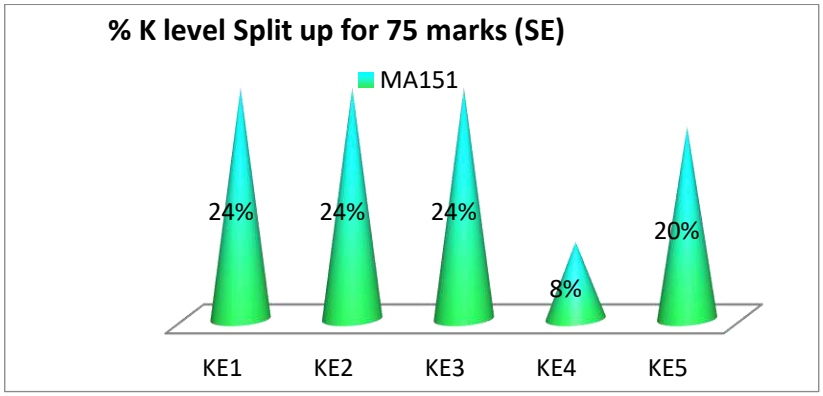
CIE – Continuous Internal Evaluation (25 Marks)

MA151				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (4)	1	1		2
Understand (5)	1	1		3
Apply (5)	2	2		1
Analyse (1)	0	0		1
Evaluate (4)	1	0		3
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA151	
Bloom's Taxonomy	**Weightage %**
Remember	24%
Understand	24%
Apply	24%
Analyze	8%
Evaluate	20%



DIFFERENTIAL CALCULUS

Semester : II **Code : MA152**
Course: II **Credit: 5**

Learning Objectives: The course introduces the students the fundamental principles, concepts and knowledge in the area of Differential Calculus. This prepares the students to apply the fundamental concepts and working knowledge in various fields

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions . At the end of the course, students will be able to

CO1	**Acquiring** knowledge of Successive differentiation, nth derivative, Standard result, Leibnitz formula for the nth derivative of a product and **solving** problems.	**K1, K2,K3, ,K5**
CO2	**Understanding** the concepts of Total differential coefficient, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers and **developing** problem of **solving** skill..	**K1. K2, K3, K5**
CO3	**Developing** the knowledge about Polar co-ordinates, Envelopes, Method of **finding** Envelopes and evaluating the problems-quiz**[PO5]**	**K1, K2, K3,K5**
CO4	**Demonstrating** the concepts circle,radius and centre of curvature. **Derive** Cartesian formula for radius of curvature.**Finding** evolute of any given curve - www.nptel.com**[PO3, PO7]**	**K1, K2,K3,K4, K5**
CO5	**Gaining** knowledge about asymptotes and its classifications and **finding** asymptotes of any given curve-Assignment in Google Classroom**[PO7]**	**K1, K2, K3, K5, K6**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

CO/PO/ PSO	**PO**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Disciplinary Knowledge and skills	**Skilled Communicator**	**Critical thinker and problem solver**	**Sense of inquiry**	**Team player/worker**	**Skilled project manager**	**Digitally Efficient**	**Ethical awareness/ reasoning**	**National and international perspective**	**Lifelong learners**
CO1	3	1	-	1	-	-	1	2	-	2
CO2	3	1	-	1	-	-	1	2	-	2
CO3	3	2	2	1	3	-	1	2	-	2
CO4	3	1	-	1	-	-	1	2	3	2
CO5	3	1	-	1	-	-	3	2	3	2
AVG	3	1	-	1	-	-	1	2	1	2
TOTAL	15	6	2	5	3	-	7	10	6	10

Unit I:

Successive differentiation – nth derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the nth derivative of a product - Simple problems only.

Chapter: III : Section – 1.1 to 2.1

Unit II:

Total differential coefficient – Implicit functions – Partial derivatives of a function of two functions – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers -Simple problems only.

Chapter: VIII : Section – 1.3 to 1.5, 1.7 Section 4 & 5

Unit III:

Polar co-ordinates – Angle between the radius vector and tangent – Angle of intersection of two curves – Envelopes - Method of finding Envelopes - Simple problems only.

Chapter IX:Section-4.1 to 4.4&Chapter X :Section-1.1 to 1.4

Unit IV:

Curvature and Radius of curvature in Cartesian and polar Co-ordinates- Circle,Radius and Center of Curvature - Evolute and Involute – p-r equations: Pedal equation of a curve. Simple problems only.

Chapter X :Section-2.1 to 2.8

Unit V

Linear asymptotes – asymptotes parallel to the axis – special cases – another method of finding asymptotes – asymptotes by inspection - simple Problems only.

Chapter XI :Section-1 to 6

Book for Study:

Calculus Volume-I , Differential Calculus: S. Narayanan and T.K. Manicavachagam Pillay, S. Viswanathan(Printers & Publishers), Pvt. Ltd., 2018.

Books for Reference:

1. Kandasamy P and K. Thilagavathi, Mathematics for B.Sc. – Vol II-2004, S.C. Chand & C0, New Delhi
2. Calculus and its applications, Goldstein Lay Schmeider Asmar
3. Shanthi Narayanan ,Differential Calculus. Shyamlal Charitable trust, New Delhi, 2001.

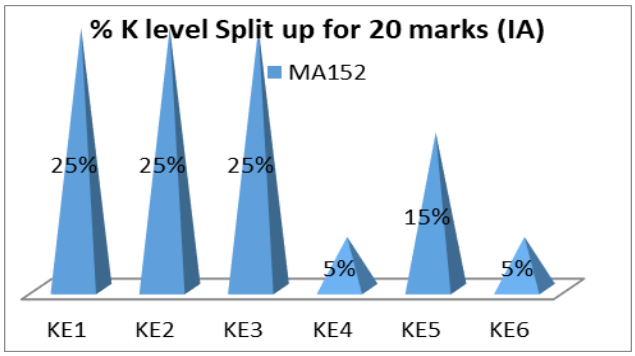
Web References:

1. www.nptel.com
2. www.mathsforum.org
3. **Tutorial.math.lamar.edu**

ASSESSMENT PATTERN

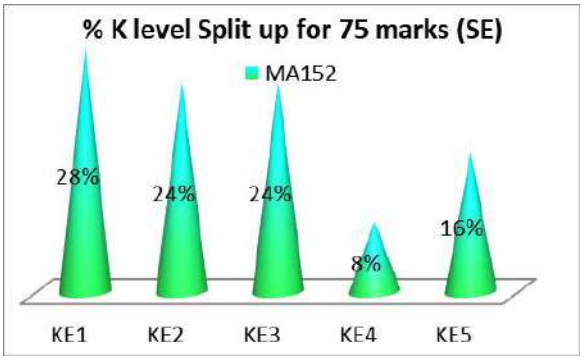
CIE – Continuous Internal Evaluation (25 Marks)

MA152				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	1	2		2
Understand (5)	1	0		4
Apply (5)	2	2		1
Analyse (1)	0	0		1
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks)

MA152	
Bloom's Taxonomy	**Weightage %**
Remember	28%
Understand	24%
Apply	24%
Analyze	8%
Evaluate	16%



ALGEBRA AND TRIGONOMETRY - II

Semester : II **Code : MA153**
Course: III **Credit: 5**

Learning Objectives: This course is a fundamental one for many courses of this Degree Programme. This covers topics on theory of equations including algebra , expansions of trigonometric functions, hyperbolic functions, inverse hyperbolic functions and it aims to develop computational skills.

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions . At the end of the course, students will be able to

CO1	Students will **understand** the technique of **solving** polynomial equations and **evaluating** the problems related to symmetric function of roots	**K1,K2K3,K5**
CO2	**Demonstrate** the **concepts** of transformation of equations and reciprocal equations and to **find** the nature of roots of a given equation using Descarte's rules and **developing** problem solving skills - www.nptel.com**[PO3, PO7]**	**K1,K2K3,K4,K5**
CO3	**Acquire** knowledge about Hyperbolic functions Relation between circular and hyperbolic functions, Expansions of sinhx, coshx, tanhx – quiz**[PO5]**	**K1,K2K3, K5**
CO4	**Develope** the knowledge of inverse hyperbolic functions and logarithm of complex numbers and **able** to solve the problems	**K1,K2 K3,K5, K6**
CO5	**Recognize** and **find** summation of series of Binomial, Exponential and Gregory's series using C+iS method and capable of solving problems-Assignment in Google Classroom**[PO7]**	**K1,K2K3,K5**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

CO/PO/ PSO	**PO**									
	1 Disciplinay Knowledge and skills	**2 Skilled Communicator**	**3 Critical thinker and problem solver**	**4 Sense of inquiry**	**5 Team player/ worker**	**6 Skilled project manager**	**7 Digitally Efficient**	**8 Ethical awareness/ reasoning**	**9 National and international perspective**	**10 Lifelong learners**
CO1	3	1	-	1	-	-	1	2	-	2
CO2	3	1	-	1	-	-	1	2	3	2
CO3	3	2	2	1	3	-	1	2	-	2
CO4	3	1	-	1	-	-	1	2	-	2
CO5	3	1	-	1	-	-	3	2	3	2
AVG	3	1	-	1	-	-	1	2	1	2
TOTAL	15	6	2	5	3	-	7	10	6	10

Unit I

Theory of Equations: Polynomial equations – Imaginary roots of the equations occur in pairs, irrational root of the equations occur in pairs – Relation between the roots and its coefficients – Value of the symmetric functions of the roots in terms of the coefficients.

Chapter: 6 Section 9–12.

Unit II

Transformation of Equations: Equation whose roots are

1. Roots with sign changed
2. Roots multiplied by a given number
3. Roots increased or decreased by h
4. Reciprocal of the roots

Reciprocal equations – Descarte's rule of signs for finding an upper limit to the number of positive / negative roots of an equation (only explanation of the rule).

Chapter: 6 Section 15–19, 24.

Unit III

Hyperbolic functions– Definition of hyperbolic functions– Relations between circular and hyperbolic functions– Formula involving hyperbolic functions – Expansions of sinhx and coshx in powers of x.

Chapter IV :Section –5

Unit IV

Inverse hyperbolic functions in terms of logarithmic functions – Separation into real and imaginary parts of trigonometric functions – Logarithm of a complex number– Definition – Principal value.

Chapter V:Section –5

Unit V

Summation of trigonometric series which can be expressed in the form C+iS: Binomial, Exponential and Gregory series

ChapterVI:Section – 3 (omit section 3.2)

Books for Study:

1. Algebra Volume I – S. Narayanan & T.K. Manicavachagom Pillay, S. Vishvanathan (Printers and Publishers), PVT LTD -2018

2. Trigonomety – S. Narayanan & T.K. Manicavachagom Pillay, S. Vishvanathan (Printers and Publishers), PVT LTD -2018

Books for References:

1. S.Arumugam, Thangapandi Issac , Classical Algebra, New Gamma Publishing House, Palayamkottai

2. S.Sudha(1998), Algebra and Trigonometry, Emerald Publishers, Chennai

3. Plane Trigonometry – S.L.Loney, A.K Publications, Agra

4. A.Singaravelu (2003) Algebra and Trigonometry, vol 1 & 2 Mennakshi agency, Chennai

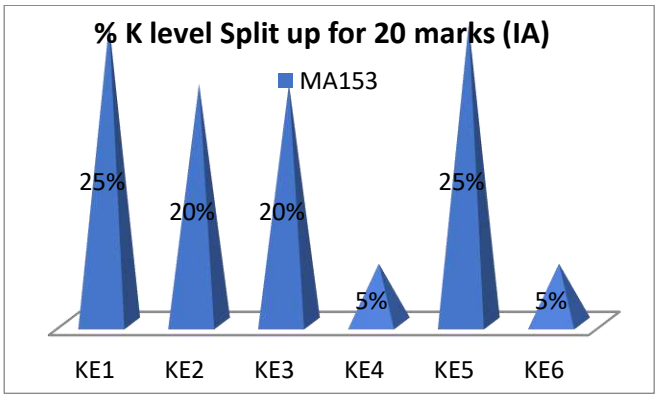
Web References:

1.**www.nptel.com**
2.**www.mathsforum.org**
3.tutorial.math.lamar.edu

ASSESSMENT PATTERN

CIE – Continuous Internal Evaluation (25 Marks)

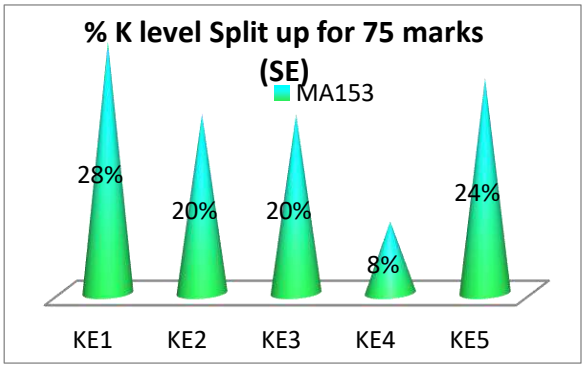
MA153				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	2		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (1)	0	0		1
Evaluate (5)	1	1		3
Create (1)	0	1		0



ESE – End Semester Evaluation

(75 Marks; Weightage 75%)

MA153	
Bloom's Taxonomy	**Weightage %**
Remember	28%
Understand	20%
Apply	20%
Analyze	8%
Evaluate	24%



DIFFERENTIAL EQUATIONS

Semester II **Code :MA154**
Course:IV **Credit: 5**

Learning Objectives: This course aims to provide logical skills in the formation of differential equations and to expose the students to different techniques of finding solutions to various types of differential equations.

Course Outcomes:Knowledge levelK1(Remember),K2(Understand),K3(Apply), K4(Analyze), K5(Evaluate),K6(Create) Throughout the course, retention of all concepts is emphasized after thoroughunderstanding through interactive sessions At the end of the Course, the student will be able to:

CO1	**Understand** and **Analyse** the knowledge of solving first order differential equation of higher degree in solvable for p, x and y and solve them. Also **identify** the Clairaut's form of differential equation. Submit exercise problems as assignments (PDF format) in GC.**[PO2,PO3,PO4,PO7]**	**K1, K2, K3, K4, K5**
CO2	**Evaluate and Compare** the problem of linear differential equations of second order with constant coefficients and variable coefficients. **[PO3,PO4,PO5,PO7]**	**K1, K2,K3, K4,K5**
CO3	**Understand** the condition of exact differential equation and **acquire** the knowledge of solving it using various techniques. **Analyse** various method for **solving** any given differential equations. Group discussions to solve exercise problems.**[PO3,PO4,PO5,PO7,PO9]**www.nptel.ac.in	**K1, K2,K3, K4,K5**
CO4	**Deal** with various techniques of eliminating arbitrary constants and arbitrary functions in Partial differential equation. **Understand** the concept of Complete solution , Singular solution and General solution. Prepare a PPT on **Comparitive** study of ordinary differential equation and partial differential equation and present it in Google Classroom.**[PO2,PO4,PO5,PO7,PO9]**	**K1, K2,K3, K4,K5,K6**
C05	**Identify** the standard types of Partial differential equation and **solve** it to get Complete solution, Singular solution and General solution. Group seminar in application of differential equation in GOOGLE MEET thorough PPTs **[PO2,PO4,PO5,PO7]**	**K1, K2,K3, K4,K5**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	2	2	1			2	1		1
CO2	3	2	2	1	1		1	1		1
CO3	3	2	2	2	2		1	1	3	2
CO4	3	2	2	3	2		2	1	1	1
CO5	3	2	2	3	2		2	1	1	1
AVG	5	2	2	2	1		2	1	1	1
TOTAL	15	10	10	10	7		8	5	5	6

Unit –I:

Differential Equations of the first order but of Higher Degree– Equations solvable for x, y and dy/dx, Clairaut's form

Chapter: IV Section– 1, 2.1, 2.2, 3.1

Unit- II :

Linear Differential Equations of the second order with constant coefficients of the form$(aD^2 + bD + c)\ y = e^{ax}\ V$ (V is any function of the form cos bx, sin bx, x^n), and $(aD^2 + bD + c)\ y = x^m$ (m being a positive integer), Linear Differential Equations with variable coefficients (Reducible to θ form)

Chapter: V Section– 1– 5.1

Unit- III:

Exact Differential Equations –Equations reducible to the Linear homogenous Equations– method of variation of parameters – Simple problems.

Chapter:II Section– 6 , Chapter : V Section– 6 , Chapter: VIII Section– 4

Unit- IV:

Partial Differential Equations: Formation of Equation by elimination of arbitrary constants and arbitrary functions. General, Particular,Complete and Singular solutions. Lagrange's method of solving the Differential Equations Pp + Qq = R.

Chapter: XII Section– 1 – 4

Unit-V: Solution of the first order Equations of the standard form

(i)F(p,q) = 0 (ii) F(x,p,q) = 0, F(y,p,q) = 0 , F(z,p,q) = 0 (iii) $F_1(x,p) = F_2(y,q)$ (iv) Clairaut's form.

Chapter:XII Section– 5.1- 5.4

Book for study :
Differential Equations and its Applications– S. Narayanan and T.K. Manicavachagom Pillay. S. Viswanathan (Printers & Publishers) Pvt. Ltd. 2016

Books for reference :

1.Boyce W.E and R.C.DiPrima- Elementary Differential Equations and Boundary value problems (7^{th} Edition), John Wiley and Sons,Inc,Newyork 2001.
2.Arumugam and Issac - Differential Equations and Applications, New Gamma Publishing House, 2014.
3.Kandasamy. P. and Thilagavathi – Mathematics for B.Sc., Vol III -2004 –S. Chand and Co., New Delhi.
4.Grewal. B.S, Higher Engineering Mathematics, Khanna Publishers ,New delhi, 2002.

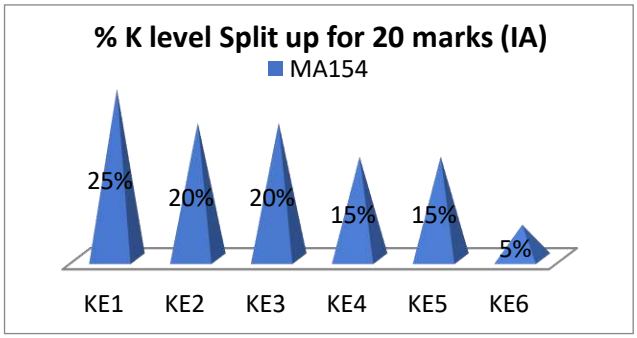
Web references:

1. www.nptel.com
2. www.mathforum.org
3.www.quora.com
4.www.coursera.com

ASSESSMENT PATTERN

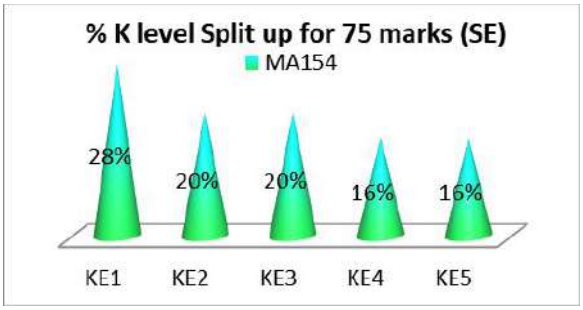
CIE – Continuous Internal Evaluation (25 Marks)

MA154				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	2		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (3)	0	1		2
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA154	
Bloom's Taxonomy	**Weightage %**
Remember	28%
Understand	20%
Apply	20%
Analyze	16%
Evaluate	16%



ANALYTICAL GEOMETRY OF TWO AND THREE DIMENSIONS

Semester: III **Code: MA155**

Course: V **Credit: 5**

Learning Objectives: To make the students understand the concept of pole, polar, p-r equations in two dimensional geometry & planes, straight lines, spheres, cone and cylinder in three dimensional geometry.

Course Outcomes: Knowledge level- K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze),K5(Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions. At the end of the course, students will be able to

CO NUMBER	COURSE OUTCOME STATEMENT	KNOWLEDGE LEVEL
CO 1	**Recall** the basic concepts of parabola and ellipse .**Understand and analyze** Parabola and Ellipse with respect to equations of tangents, chord of contacts of tangents, polar, pole, conjugate condition.	**K1, K2,K3,K4**
CO 2	Demonstrating Polar co-ordinates, **distinguishing** them with Cartesian. Also **interpreting** area of triangle, equation of straight lines, conic and tracing of curves. **Submit assignment [PDF format] in GC [PO7]** https://www.youtube.com/watch?v=PLrgwD9TleU	**K1,K2,K3,K4, K5,K6**
CO 3	**Analysing** various concepts of straight lines in symmetrical form, coplanarity condition. Also **evaluating** shortest distance between 2 skew lines.	**K1, K2,K3, K4, K5**
CO 4	Developing the knowledge about Sphere, **Understand and analyse** about Plane section of a sphere and related tangent planes. **Team work and Interactive problem solving in groups [PO5,PO7,] Written pdf file was uploaded in Google classroom**	**K1,K2,K3,K4, K6**
CO 5	**Categorize** and **assess** the concept of properties of cone and cylinder Understanding of Cone and Cylinder and evaluate problems related to cone and cylinder. **Submit assignment [PDF format] in GC[PO7].**	**K1, K2,K3,K4, K5**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated –1

CO/PO	PO									
	1 Disciplinary Knowledgeand skills	**2 Skilled Communicator**	**3 Critical thinker and problem solver**	**4 Sense of inquiry**	**5 Team**	**6 Skilled project**	**7 Digitally Efficient**	**8 Ethical**	**9 National and international**	**10 Lifelong learners**
CO1	3	1	3	1	1	_	1	1	1	1
CO2	3	2	2	2	2		2	2	1	2
CO3	3	1	1	1	2		2	1	1	1
CO4	3	3	3	2	3		3	2	1	2
CO5	3	1	2	1	1		1	1	1	1
Avg	3	2	2	1	2		2	1	1	1
Total	15	8	10	7	9		8	7	5	7

Unit I

Parabola: The equation to the tangent- chord of contact of tangents- polar- pole- equation of the chord having (x_1, y_1) as its middle point of the parabola.

Ellipse: The equation to the tangent- chord of contact of tangents- polar- pole- the condition for the lines to be conjugate- equation of the chord in terms of its middle point.

Chapter: VI (Sections 4,5,6 and 13), Chapter VII (Sections 5,6,7 and 14) of [1]

Unit II

Polar Equations: Polar Co-ordinates- Distance between the points- Transformation of Polar Coordinates into Cartesian Coordinates - Area of Triangle when the Polar Coordinates of the angular points are known- Equation of a straight line- parallel and perpendicular straight lines – Circle- The Chord joining the points whose vectorial angles are given- Polar equation of a Conic-Tracing of the Curves.

Chapter: IX (Sections 1 – 9) of [1]

Unit III

Straight Lines: Symmetricalform – Equations of Line passing through two given points –. Condition for a line to be parallel to the plane – Angle between the plane and straight line– Coplanar lines - Shortest distance between two given lines.

Chapter: III: Sections 1- 8 (8.1, 8.2 not included) of [2]

Unit IV

Sphere: Equation of a sphere with given Centre and radius – The Lengthof the tangent from the given point -Plane section of a sphere – Equationof a circle on a sphere — Intersection of two spheres-The equation of the tangent plane to the sphere.

Chapter: IV: Sections 1 – 8 of [2]

Unit V

Cone: Cone- Right circular cone – Intersection of a straight line and a quadric cone.

Cylinder: Equation of a cylinder with a given generator and a guiding curve– Right circular cylinder- Enveloping cylinder.

Chapter: V (Sections 2, 3 and 8) of [2]

Books for study:

1. T.K. Manicavachagom Pillay and T.Natarajan , Analytical Geometry (Part I – Two Dimensions),– S. Viswanathan (Printers & Publishers),, Pvt. Ltd., Chennai, 2007.
2. T.K. Manicavachagom Pillay and T.Natarajan , Analytical Geometry (Part II – Three Dimensions),– S. Viswanathan (Printers & Publishers),, Pvt. Ltd., Chennai, 2007.

Books for reference:

1. P. Duraipandian, Laxmi Duraipandian, D. Muhilan, Analytical Geometry 2 Dimensional, Emerald Publishers, Chennai, Reprint 2003.

2. . Shanthi Narayanan and Mittal P.K., Analytical Solid Geometry, 16th Edition, S.Chand & Co., New Delhi, 1969

3. N. Saran and R. S. Gupta, Analytical Geometry of 3D, Pothishala Pvt. Ltd., Allahabad, 2001.

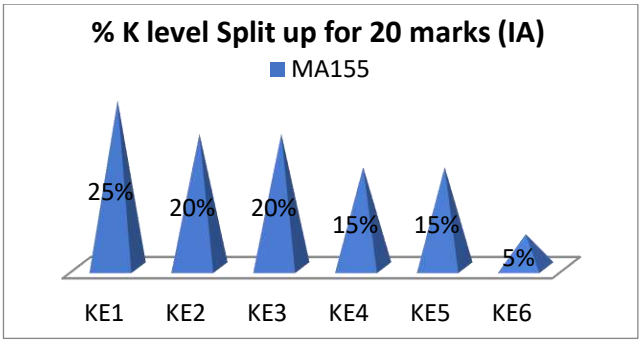
Web references:

1. www.nptel.ac.in
2. www.mathforum.org
3. https://www.youtube.com/watch?v=PLrgwD9TleU
4. www.khanacademy.org

ASSESSMENT PATTERN

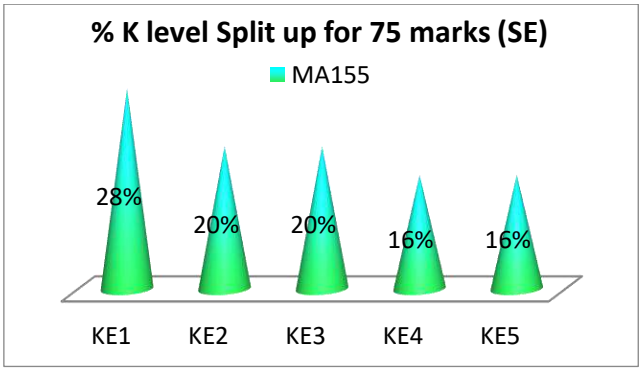
CIE – Continuous Internal Evaluation (25 Marks)

MA155				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (4)	1	1		2
Apply (4)	1	1		2
Analyse (3)	0	1		2
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA155	
Bloom's Taxonomy	**Weightage %**
Remember	28%
Understand	20%
Apply	20%
Analyze	16%
Evaluate	16%



INTEGRAL CALCULUS AND FOURIER SERIES

Semester: III **Code: MA156**
Course: VI **Credit: 5**

Learning Objectives: The course introduces to the students the fundamental principles, concepts and knowledge in the area of Integral Calculus and Fourier series. This prepares the students to apply the fundamental concepts and working knowledge in various fields.

Course Outcomes with K- Level Mapping:K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create. At the end of the Course, the students would be able to refer E-Resources and discuss some important topics in the class as group discussions:

CO1*	**Study** the basic concept of Integral calculus and associated properties. **Discuss** and **solve** the problems connect to reduction formulae and Bernoulli's formula.	K1, K2, K3
CO2*	**Explain**and **apply** the ideas about multiple integrals and its theorems. **Solve** the problem using Change of order of integration, cartesianand Polar coordinates	K1, K2, K3, K4
CO3*	**Study** and **Evaluate**the concept of triple integrals and calculate area, centroid and volume of the solids. **Apply**the various applications **relate** to double and triple integral. **Students are given group assignment/seminar on to find area and volume of solids. [PO3, PO4, PO7,PO8,PO10]** https://nptel.ac.in/content/storage2/courses/122104014/lecture8/8_2.htm	K1, K2, K3, K5, K6
CO4*	**Define** and **discuss** the β and Γ Functions,recurrenceformula for Γ functions and properties of β functions. **Compare**β and Γ functions and **solve** simple problems using β and Γ functions.	K1, K2, K3, K4
CO5*	**Define** Fourier Series and **calculate** Fourier coefficient for periodic functions, odd and even functions and **extend** to Half range series.**Group Seminar/assignment** as a team.**[PO3, PO4 ,PO7, P08,PO10]**	K1, K2, K3 , K4, K5

CO/PO	**PO**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Disciplinary Knowledge and skills	**Skilled Communicator**	**Critical thinker and problem solver**	**Sense of inquiry**	**Team player/worker**	**Skilled project manager**	**Digitally Efficient**	**Ethical awareness / reasoning**	**National and international perspective**	**Lifelong learners**
CO1	3	1	2	1			1	1	1	1
CO2	3	1	2	1			1	1	1	1
CO3	3	1	2	2	1		2	2	1	2
CO4	3	1	2	1			1	1	1	1
CO5	3	1	2	2	1		2	2	1	2
Avg	**3**	**1**	**2**	**1**			**1**	**1**	**1**	**1**
Total	**15**	**5**	**10**	**7**	**2**		**7**	**7**	**5**	**7**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

Unit I:Integral calculus

Definite integral and its properties– Integration by parts – Reduction formulae– Bernoulli's formula
Chapter: I :Section – 11 to 14 and 15.1 : Page Number 66– 100

Unit II:Multiple integrals

Double integration – Evaluation of double integral in Cartesian and Polar coordinates– Change of order of integration (double) (Problems only).
Chapter: V :Section – 2 and 3 : Page Number 203– 217.

Unit III:Triple integrals

Application of double and triple integral – Area – Centroid – Volume of solids of revolution in double and triple integrals .
Chapter: V : Section – 4 , 5 and 6 : Page Number 219– 241.

Unit IV:β and Γ Functions

Definitions of β and Γ Functions – Recurrence formula for Γ functions – Properties of β functions– Relation between β and Γ functions – Simple problems.
Chapter: VII :Section – 2.1 to 5 : Page Number 278– 292.

Unit V:Fourier Series

Definition , finding Fourier coefficient for given periodic functions with period 2π, odd and even functions– Half range series.
Chapter: VI : Section – 1 to 5.2 : Page Number 202 – 226.

Books for study:

1.Calculus Volume – II (2018), Integral Calculus : S.Narayanan and T.K.Manicavachagam Pillay,S.Viswanathan (Printers & Publishers),,PVT.LTD
2. Calculus Volume– III (2018), Fourier series: S.Narayanan and T.K.Manicavachagom Pillay, S.Viswanathan (Printers & Publishers),, PVT.LTD.

Books for reference:

1.G.B Thomas and R.L Finney (1998), Calculus and Analytic Geometry, Addison Wesley (Ninth edition), Mass(India Print).
2.Shanti Narayan (2001),Differential Calculus, Shyamdal charitable Trust, New Delhi.

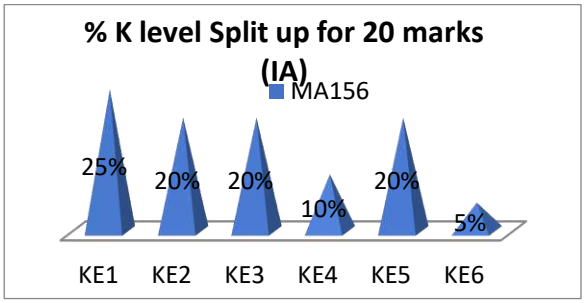
Web references:

1.www.nptel.com
2. www. mathsforum.org

ASSESSMENT PATTERN

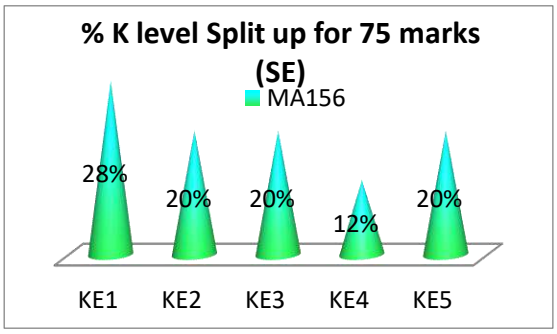
CIE – Continuous Internal Evaluation (25 Marks)

MA156				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (4)	1	0		3
Apply (4)	1	2		1
Analyse (2)	0	1		1
Evaluate (4)	1	0		3
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA156	
Bloom's Taxonomy	**Weightage %**
Remember	28%
Understand	20%
Apply	20%
Analyze	12%
Evaluate	20%



PROGRAMMING IN C

Semester : IV **Code: MA157**

Course: VII **Credit: 5**

Learning Objectives: To instill the knowledge of programming language in the students which will enable them to write meaningful programs in C language ,on the other hand lay a foundation stone to learn and write higher programming languages.

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). At the end of the Course, the Student will be able to**:**

CO1	**Define** a programming languagewhich is designed to help process certain kinds of data consisting of numbers , characters and strings. **Explain** character set, c tokens, keywords, identifiers, constants, variables and data types**. Make use of** declaration statements to declare the variable names and data types to the compiler. **Analyze** the use of the input statement, scanf function for interactive computing. Program is constructed for problems such as **evaluation** of average of numbers, temperature conversion problem etc.http://www.cprogramming.com	**K1,K2,K3,K4,K5**
CO2	An operator is a symbol **which** tells the computer to perform certain mathematical or logical manipulations. **Classified** operators into eight different types which perform various operations. **Organize** and manage input and output operations. **Analyze** the precedence of arithmetic operators and there are two distinct priority levels of arithmetic operators in C. Expression are **evaluated** using an assignment statement**. Solve** new problems in the Exercise.**[PO7]** **Activity: Individual Assignment in Review questions from the prescribed text book** **Digital Tool : Google classroom.** **C PROGRAMMING FOR BEGINNERS - FULL COURSE - Theory + 101 Programs Video tutorials - by kodegod - Bing video**	**K1,K2,K3,K4,K5, K6**
CO3	Decision making statements are **defined** to control the flow of execution. Able to **compare** the efficacies of different decision making statements. **Solve** very difficult problems by its conditions and operations. **Examine** whether the loop termination requires counter- based control or sentinel - based control**. Evaluate** many mathematical problems through C Programs using loop structures. **Construct** codes for the programs to new problems. **Activity : Team work is assigned to write programs given in the Exercise in the prescribed text book and present. [PO5, PO7]** **Digital Tool : Microsoft power point** https://m.youtube.com/watch?v=-CpG3oATGIs	**K1,K2,K3,K4,K5, K6**
CO4	Cdefines a derived data type known as array, **which** process large amount of data. **Demonstrate** the ability of array that use a single name to represent a collection of items and refer to an item by specifying the item number.The concept of an array can be **applied** to group like type data .**Analyze** two dimensional and multidimensional arrays. Programs to **evaluate** median and standard deviation is done. www.learn-c.org	**K1,K2,K3,K4,K5**
CO5	String is **defined** as a sequence of characters that is treated as a single data item**. Illustrate** declaring and initializing string variables ,reading strings from terminals, writing strings to screen etc. Character strings are used to **build** meaningful and readable programs. **Simplify** reading a single character from the terminal using getchar and gets functions. C library supports a large number of string handling function that can be used to **interpret** many of the string manipulations. http://www.cprogramming.com	**K1,K2,K3,K4,K5**

	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness / reasoning	National and international perspective	Lifelong learners
CO1	2	1	2	1			1	1	1	1
CO2	2	1	2	1			2	2	1	2
CO3	2	2	2	1	1		2	2	1	2
CO4	2	1	2	1			1	1	1	1
CO5	2	1	2	1			1	1	1	1
Avg	**2**	**1**	**2**	**1**			**1**	**1**	**1**	**1**
Total	**10**	**6**	**10**	**5**	**1**		**7**	**7**	**5**	**7**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

Unit I:

Constants, Variables and Data types : Introduction- Character set– C Tokens -Key words identifiers– Constants – Variables– Data types– Declaration of Variables– Declaration of Storage class - Assigning Values to variables- Defining Symbolic Constants.

Chapter 2: Section 2.1– 2.11

Unit II:

Operators and Expressions : Introduction - Arithmetic operators– Relational operators– Logical operators– Assignment operators– Increment and decrement operators– Conditional operators – Bitwise Operators – Special Operators - Arithmetic expressions– Evaluation of expressions– Precedence of Arithmetic Operators – Some Computational Problems – Type Conversions in Expressions – Operator Precedence and associativity– Mathematical functions. Managing input and Output operations : Introduction - Reading a character– Writing a character– Formatted input and output.

Chapter 3: Section 3.1 – 3.16 &Chapter 4: Section 4.1– 4.5

Unit III:

Decision Making and Branching: Introduction –Decision making with IF statement– Simple IF statement - The IF….ELSE statement – Nesting of IF….ELSEstatement – The ELSE IF ladder – The Switch statement– The ?: Operator– The GOTO Statement. Decision Making and Looping: Introduction – The WHILE Statement– The DO statement – The FOR statement– Jumps in loops.

Chapter 5: Section 5.1– 5.9 &Chapter 6: Section 6.1– 6.5

Unit **IV:**

Arrays: Introduction– One dimensional arrays – Declaration of One dimensional arrays – Initialization of One dimensional arrays - Two dimensional arrays – Initializing Two dimensional arrays.Multi – dimensional arrays.

Chapter 7: Section 7.1 – 7.7

Unit V:

Character arrays and strings : Introduction– Declaring and Initializing string variables– Reading strings from terminal– Writing strings to screen. Pointers: Introduction - Understanding pointers– Accessing the address of a variable – Declaring pointer variables – Initialization of pointer variables (Exclude programs from pointers).

Chapter 8 : 8.1– 8.4

Chapter 11: 11.1– 11.5

Book for Study:

Programming in Ansi C by E. Balagurusamy, Tata Mcgraw Hill, Fourth edition 2008.

Books for Reference:

1. Programming with C by Byron S. Gottfried, Tata McGraw – Hill Publishing Company Limited, New Delhi,Third Edition, 2017.
2. C Programming by Madhumangal Pal, Narosa Publishing House, 2009.

Web references:

1.www.nptel.ac.inwww.learn-c.org

2.http://www.cprogramming.com

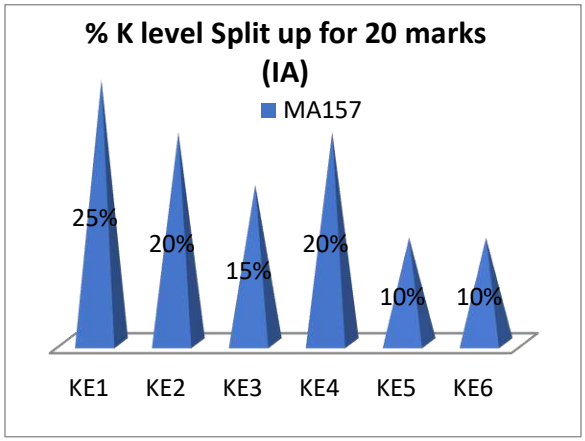
3.**C PROGRAMMING FOR BEGINNERS - FULL COURSE - Theory + 101 Programs Video tutorials - by kodegod - Bing video**

4.https://m.youtube.com/watch?v=-CpG3oATGIs

ASSESSMENT PATTERN

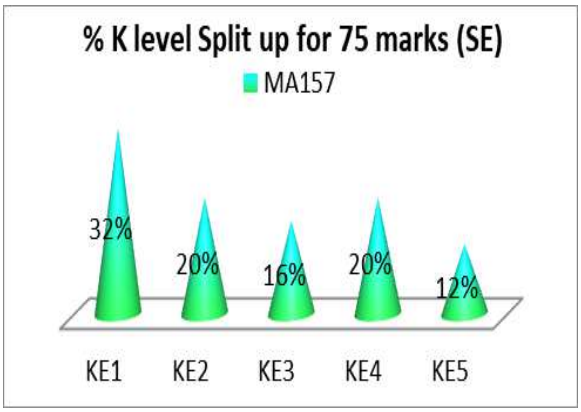
CIE – Continuous Internal Evaluation (25 Marks)

MA157				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (4)	1	0		3
Apply (3)	1	1		1
Analyse (4)	0	1		3
Evaluate (2)	1	0		1
Create (2)	0	2		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA157	
Bloom's Taxonomy	**Weightage %**
Remember	32%
Understand	20%
Apply	16%
Analyze	20%
Evaluate	12%



VECTOR ANALYSIS AND LAPLACE TRANSFORM

Semester : III **Code : MA158**
Course: VIII **Credit: 5**

Learning Objectives:

The Course objective is to develop the skills of the students in the areas of Vectors and Laplace Transforms which will be necessary for their effective studies in a large number of Applied Subjects like Engineering, Physics, Chemistry etc. The course will also serve as a prerequisite for Post graduate and specialized studies.

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions . At the end of the course, students will be able to

CO 1	**Understand** the basic concepts of directional derivative and gradient and illustrate geometric meaning	**K1, K2,K3,K5**
CO 2	Discuss the **concepts** of Divergence,curl,solenoidal,,irrotational vectors of a vectors and **solving** problems- quiz**[PO5]**	**K1, K2, K3,K5**
CO 3	**Compute** line Integrals,volume and surface line, surface and volume integrals. **Applying** the concepts of vector integration to solve Stoke's theorem, Gauss divergence theorem and Green's theorem -www.nptel.com**[PO3, PO7]**	**K1, K2, K3,K5,K6**
CO 4	**Determine** the solution of Differential equations using Laplace Transforms - Assignment in Google Classroom**[PO7]**	**K1, K2, K3,K5**
CO 5	**Extending** the knowledge about Inverse Laplace Transforms and **develops** problem solving skills.	**K1, K2,K3,K4,K5**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness / reasoning	National and international perspective	Lifelong learners
CO1	3	1	-	1	-	-	1	2	-	2
CO2	3	2	2	1	3	-	1	2	-	2
CO3	3	1	-	1	-	-	1	2	3	2
CO4	3	1	-	1	-	-	3	2	3	2
CO5	3	1	-	1	-	-	1	2	-	2
AVG	3	1	-	1		-	1	2	1	2
TOTAL	15	6	2	5	3	-	7	10	6	10

Unit I

Vector Analysis: Vector point function – Scalar point function – derivative of a vector and derivative of a sum of vectors – derivative of a product of a scalar and a vector point function – derivative of a scalar product and vector product – The vector operator 'del' (only in Cartesian), – Gradient of a scalar point function – Problem involving the determination of Unit normal vector to the given surfaces.

Chapter:2 Sections 2.1, 2.2, 2.3, 2.4, 2.5

Unit II

Divergence of a vector – Curl of a vector – definitions of solenoidal and irrotational vectors – formulae involving operator – Laplacian operator – Formulae involving the operator twice.

Chapter: 2 Sections 2.6, 2.7, 2.8

Unit : III

Integration**:** Line integral – Surface integral – Volume integral – Stoke's theorem(statement only) – Gauss – divergence theorem(statement only) – Verification of the theorem in simple cases – Green's theorem in two dimensions (statement only).

Chapter: 3 Section 3.4, 3.5, 3.6

Chapter: 4 :Sections 4.2, 4.4, 4.5

Unit IV:

Laplace Transform: Definition– transform of e^{at}, e^{-at}, cos at, sin at and t^n where n is positive integer – First shifting theorem– Laplace transform of e^{-at} sin bt , e^{-at} cos bt, e^{at} sin bt, e^{at} cos bt, $e^{at}\, t^n$, $e^{-at}\, t^n$– transform of f'(t), f''(t),

Chapter: 5 Sections 5.1, 5.4

Unit V

Inverse Laplace Transforms relating to above standard forms – Applications to the solution of ordinary differential equations with constant coefficient up to second order – solving simultaneous differential equation.

Chapter: 5 Sections 5.6, 5.8, 5.9

Books for Study:

1.Vector Analysis by P.Duraipandian and Laxmi Duraipandian, Emerald Publishers,1998.

2.Calculus , Volume III , S. Narayanan & T. K. Manicavachagam Pillay, S.Viswanathan Publishers and Printers Pvt. Ltd.,2019.

Books for Reference:

1.Vector Calculus – S. Narayanan & T. K. Manicavachagam Pillay, S.Viswanathan Publishers and Printers Pvt. Ltd.

2 .Integral Calculus – T.Natarajan & T. K. Manicavachagam Pillay, S.Viswanathan Publishers and Printers Pvt. Ltd.,2008.

3.Laplace and Fourier transform - Goyal, Gupta , A pragathi edition, 2016.

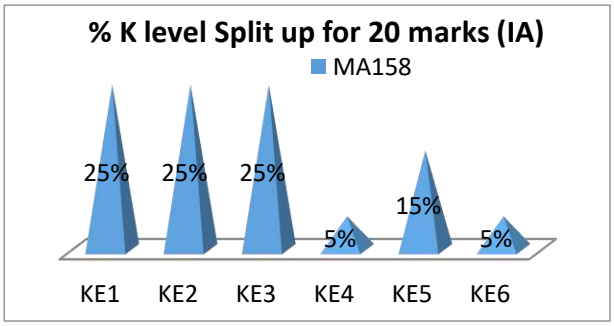
Webreferences:

1.www.nptel.com
2.www.mathsforum.org
3.tutorial.math.lamar.edu

ASSESSMENT PATTERN

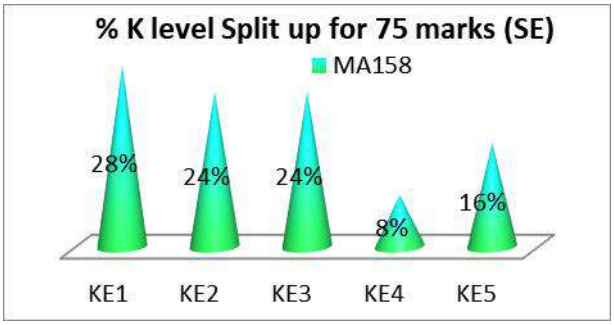
CIE – Continuous Internal Evaluation (25 Marks)

MA158				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	1	2		2
Understand (5)	1	0		4
Apply (5)	2	2		1
Analyse (1)	0	0		1
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA158	
Bloom's Taxonomy	**Weightage %**
Remember	28%
Understand	24%
Apply	24%
Analyze	8%
Evaluate	16%



ALGEBRAIC STRUCTURES I

Semester : V **Code : MA159**
Course: IX **Credit: 5**

Learning Objectives: This course aims to impart basic knowledge on concepts of the groups and rings as these algebraic structures have applications in Mathematical Physics, Mathematical Chemistry and Computer Science and Cryptography.

Course Outcomes: At the end of the Course, the Student will be able to: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding and the student will be able to

CO1	**Define**an Algebraic Structure and **acquire** the knowledge on the study of Group which serves as the fundamental building blocks for abstract algebra. Provide more ideas about Group: **Video Lesson:**https://www.youtube.com/watch?v=BnE_MJaU8BQ. **Learn** the concept of subgroups and Lagrange's theorem. Use this powerful tool and **solve [PO3]** important results in cyclic subgroups like Euler's theorem, Fermat's theorem etc., **e-Quiz: Identifying** if the given set with a binary operation is a group or not. **[PO3, PO7]**	**K1 K2 K3 K4**
CO2	**Finding** the number of subgroups in a finite groupusing counting principle. **Extending** the concept of Groups to some special classes of subgroups: the normal subgroups. **Illustrating** the various necessary and sufficient conditions. Understanding quotient groups.**Team work[PO5]: Deduction** of some results in normal subgroups and solving problems **.**	**K1 K2 K5 K6**
CO3	**Analyse**the mapping from one algebraic system to a like algebraic system which preserves structure. **Introduce** the concept of Kernal and related results using PPT **[PO7].** Also realization of the Group as a Group of permutations and solving problems - **Team work[PO5]**.	**K1 K2 K5**
CO4	**Define** Rings. **Discussion** of Examples – **Team work[PO5].** Introducing some special classes of rings with examples. Understanding the concept of Ring homomorphism and **Extend** the concept of Kernal in Ring Homomorphism. **Introducing** Ideals and construction of Quotient Rings **Comparing** fundamental theorem on Homomorphism in Group and Ring**[PO4]**.	**K1 K2 K3 K4**
CO5	**Discussion** on more Ideals and Quotient Ring. **Familiarize** the concept of Euclidean Rings. **Define** the terms Principle Ideal Ring, GCD, Unit, Associates, Prime element, Relatively prime elements using PPT and Web Resources **[PO7]**. **Proving** results in Euclidean Rings .**Applying** these results to prove the Unique Factorization theorem.	**K1 K2 K3 K4**

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international	Lifelong learners
CO1	3	1	3	3	3		3	1	1	1
CO2	2	1	2	1	2		2	1	1	1
CO3	2	1	2	2	2	1	2	1	1	1
CO4	3	1	2	3	2		2	1	1	1
CO5	3	1	2	1	1		3	1	1	1
AVG	3	1	2	2	2		2	1	1	1
TOTAL	13	5	11	10	10	1	12	5	5	5

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

Unit I: Group Theory

Definition of a group – Some examples of Groups – Some Preliminary lemmas – Sub groups.

Chapter 2: Sections 2.1 – 2.4

Unit II: Group Theory

A counting principle – Normal subgroups and Quotient Groups.

Chapter 2: Sections 2.5 – 2.6

Unit III: Group Theory

Homomorphisms – Automorphism – Cayley's theorem – Permutation Groups.

Chapter 2: Sections 2.7 – 2.10

Unit IV: Ring Theory

Definition and examples of rings – Some special classes of rings – Ring homomorphisms – Ideals and Quotient rings.

Chapter 3: Sections 3.1 – 3.4

Unit V: Ring Theory

More Ideals and Quotient rings – Euclidean Rings.

Chapter 3: Sections 3.5 and 3.7

Book for study:

1. I.N. Herstein, Topics in Algebra (2nd edition, 2007),Wiley Eastern Ltd, New Delhi, 2007

Books for reference:

1. **J**.B.Fraleigh, A First Course in Algebra (3rd Edition), Addison Wesley. (Indian Print), 1986.
2. M.L.Santiago, Modern Algebra, Tata McGraw Hill, New Delhi, 2002.
3. N.S. Gopalakrishnan, University Algebra, New Age International (P) Limited, New Delhi, 2001
4. Dipak Chatterjee, Abstract Algebra, 2nd Edition, New Delhi: Prentice Hall of India, 2005.

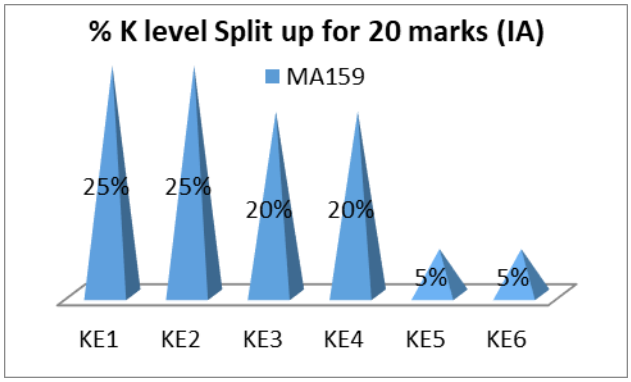
Web references:

1. https://nptel.ac.in/courses/111/106/111106113/
2. https://math.berkeley.edu/~apaulin/AbstractAlgebra.pdf
3. http://staffnew.uny.ac.id/upload/132319832/pendidikan/REFERENSI+ABSTRACT+ALGEBRA+SCHAUM.pdf
4. https://marinazahara22.files.wordpress.com/2013/10/i-n-herstein-topics-in-algebra-2nd-edition-1975-wiley-international-editions-john-wiley-and-sons-wie-1975.pdf

ASSESSMENT PATTERN

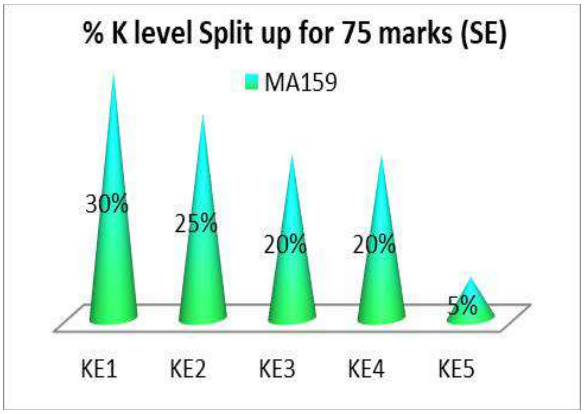
CIE – Continuous Internal Evaluation (25 Marks)

MA159				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	1	2		2
Understand (5)	2	1		2
Apply (4)	1	1		2
Analyse (4)	1	0		3
Evaluate (1)	0	0		1
Create (1)	0	1		0



ESE-End Semester Evaluation (75 Marks; Weightage 75%)

MA159	
Bloom's Taxonomy	**Weightage %**
Remember	30%
Understand	25%
Apply	20%
Analyze	20%
Evaluate	5%



REAL ANALYSIS I

Semester : V **Code : MA160**
Course: X **Credit: 5**

Learning Objectives: This course aims to provide students with the specialist knowledge necessary for basic concepts in Real Analysis. To understand the various limiting behaviours of sequences and series. To study the concepts of limit of a function on the real line and limits in a metric space.

Course Outcomes: Knowledge level - K1(Remember),K2(Understand),K3(Apply), K4 (Analyze), K5(Evaluate), K6(Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding and Interactive sessions. At the end of the Course, the Student will be able to

CO1	**Define** functions between sets and **understand** equivalent sets, countable, uncountable sets and upper, lower bounds on the real line. **Examine** the results by **apply** the **acquired** knowledge on concepts of real numbers.	**K1K2K3K4**
CO2	**Define** sequence and subsequence of real numbers. **Explain** and **determine** convergent, divergent, bounded and monotone sequence of real numbers. Able to **apply** the operations on convergent and divergent sequence of real numbers. **Group seminar**: **Construct** convergent and divergent sequences. Prepare a PPT and present. **[PO2,PO4,PO5,PO7,PO9].** https://nptel.ac.in/courses/111/101/111101134/	**K1K2 K3K5 K6**
CO3	**Define** limit of a sequence**. Apply** the concept of limit of a sequence to **Determine** the limit superior, limit inferior of a sequence. **Understand** and **classify** the Cauchy sequences,convergent, divergent, alternating , conditional and absolute convergent series.	**K1K2 K3K4K5**
CO4	**Apply** comparison test, ratio test and root test to **classify** absolutely convergent series. **Define** the class l^2 and **Explain** the theorems on l^2.	**K1K2K3K4**
CO5	**Understand** and **apply** the concept of limit of a function on the real line. **Define** metric and metric spaces. **Determine** whether a function is continuous at a point on the real line and on a metric space. **Assignment**: **Compose** continuous functions on a real line and on a metric space. Submission through Google classroom in pdf format. **[PO2,PO4,PO7,PO9].** https://nptel.ac.in/courses/111/106/111106053/	**K1K2K3K5K6**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated –1

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/	National and international perspective	Lifelong learners
CO1	3	1	2	1			1	1	1	1
CO2	3	2	2	2	2		2	2	1	2
CO3	3	1	2	1			1	1	1	1
CO4	3	1	2	1			1	1	1	1
CO5	3	2	2	2			2	1	1	1
AVG	3	1	2	1			1	1	1	1
TOTAL	15	7	10	7	2		7	6	5	6

Unit– I:

Sets and elements – operations on sets – functions – real valued functions – equivalence – countability – real numbers – least upper bounds.

Chapter: 1: 1.1– 1.7

Unit – II:

Definition of a sequence and subsequence – limit of a sequence – convergent sequences – divergent sequences – bounded sequences – monotone sequences - operations on convergent sequences – operations on divergent sequences.

Chapter: 2: 2.1– 2.8

Unit – III:

Limit superior and limit inferior – Cauchy sequences- convergence and divergence – series with non negative terms – alternating series – conditional convergence and absolute convergence.

Chapter: 2: 2.9, 2.10, Chapter 3: 3.1-3.4

Unit IV:

Tests for absolute convergence – series whose terms form a non-increasing sequence – the class l^2.

Chapter: 3: 3.6, 3.7 &3.10

Unit:V

Limit of a function on a real line – metric spaces – limits in metric spaces – functions continuous at a point on the real line – reformulation – functions continuous on a metric space.

Chapter: 4: 4.1 – 4.3, Chapter: 5: 5.1– 5.3

Book for study:

Richard R.Goldberg , Methods of Real Analysis, Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi, 1970

Books for reference:

1. Tom M. Apostol, Mathematical Analysis, II edition, Narosa Publishing House, New Delhi, 1997.
2. W.Rudin, Principles of Mathematical Analysis, 3rd Edition Mc Graw- Hill Book Company, New York, 1979.
3. Robert G. Bartle, Donald R. Sherbert, Introduction to Real Analysis, John Wiley, New York, 4th edition 2011.
4. Shanti Narayan, M.D.Raisinghania, Elements of Real Analysis, New Delhi, S. Chand, eight revised edition 2007.

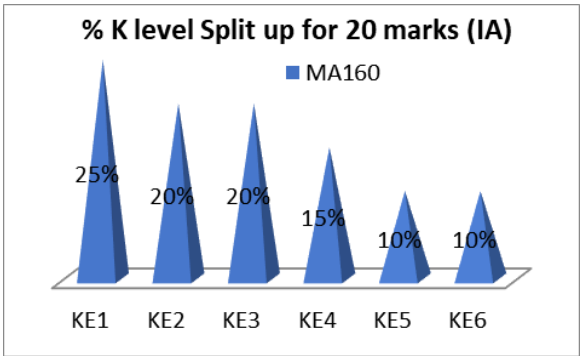
Web references:

1.http://www.nptel.ac.in
2.http://www.math.utah.edu/online/1220/notes/ch9.pdf
3.http://www.freebookcentre.net/Mathematics/Real-Analysis-Books.html
4.https://www.jirka.org/ra/realanal.pdf
5.http://www.math.stonybrook.edu/~aknapp/download/b2-realanal-inside.pdf

ASSESSMENT PATTERN

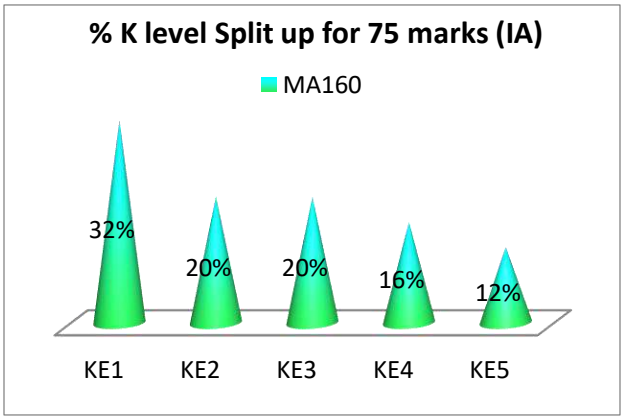
CIE – Continuous Internal Evaluation (25 Marks)

MA160				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (3)	0	1		2
Evaluate (2)	1	0		1
Create (2)	0	2		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA160	
Bloom's Taxonomy	**Weightage %**
Remember	**32%**
Understand	20%
Apply	20%
Analyze	16%
Evaluate	12%



MECHANICS I

Semester: V **Code: MA161**
Course: X1 **Credit: 5**

Learning Objectives: To develop the capacity of predicting the effects of acceleration, relative velocity, force,equilibrium, energy and center of mass. To improve the analytical thinking of problemsolving skill and better understanding of physics concepts which may lead to a solid foundation in engineering applications.

Course Outcomes with K- Level Mapping:K1-Remember, K2-Understand, K3-Apply,K4-Analyze, K5-Evaluate, K6-Create At the end of the Course, the students would be able to refer E-Resources and discuss some important topics in the class as group discussions:

CO1*	**Understand** the basic Units of kinematics and **discuss** various components of kinematics like velocity and acceleration**. Develop** the problem **solving** skill of velocity in a plane, Rectilinear motion with constant acceleration and angular velocity along concentric circles	K1, K2, K3
CO2*	**Describe** thefundamental concepts of force **relate** to nature of forces, types of forces, laws of friction and capable of resolving the forces. **Apply** the problems relevant to Newton's law, tension, resistance and friction.	K1,K2, K3
CO3*	**Demonstrate** the force correlate to equilibrium of a particle , **Analyze** thetriangle law and Lami's theorem. **Apply** the equilibrium condition several forces and inclined plane **Set of problems will be given as group assignment**. [**PO3, PO4 ,PO7, PO8,PO10]**	K1, K2,K3, K4, K5
CO4*	**Acquire** the knowledge **relate** to moment of forces on a rigid body,Varnignon's theorem and system of forces. **Create and evaluate** new problems related the line of equation of motion of system of coplanar forces **Group Seminar/ assignment** as a team**. [P03,PO4 PO7,PO8,PO10]** https://nptel.ac.in/courses/115/104/115104094	K1,K2,K3, K4, K5, K6
CO5*	**Analyze**the center of gravity ideas to gravity, mass centre and **evaluate** mass centre using integration. **Discuss** the basics of work, energy,power concepts and **connect** to stretching an elastic string, conservative field of forces, conservation of energy,	K1, K2, K3, K4

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated –1

CO/PO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness /	National and international perspective	Lifelong learners
CO1	3	1	2	1			1	1	1	1
CO2	3	1	2	1			1	1	1	1
CO3	3	1	2	2	1		2	2	1	2
CO4	3	1	2	2	1		2	2	1	2
CO5	3	1	2	1			1	1	1	1
Avg	3	1	2	1			1	1	1	1
Total	15	5	10	7	2		7	7	5	7

UnitI : Kinematics

Basic Units– Velocity and Acceleration of a particle– Resultant of two velocities– Relative velocity of a point moving in a plane – Rectilinear motion with constant acceleration– Velocity and Acceleration components in (i) Tangential and Normal directions (ii) Radial and Transverse directions – Angular velocity – Relative angular velocity – Vanishing of relative angular velocity when two particles move along concentric circles.

Chapter: 1

Unit II : **Force**

Newton's law of motion– Definition of force– Types of forces– Earth's gravity– Tension– Resistance– Friction– Laws of friction– Resultant of three forces related to a triangle acting at a point–Resultant of several forces acting at a point.

Chapter: 2

Unit III: **Equilibrium of a particle**

Equilibrium of a particle under three forces – Law of triangle of forces– Lami's theorem– Necessary and sufficient condition for equilibrium of a particle under several forces– Limiting equilibrium of a particle on an inclined plane

Chapter: 3

Unit IV: **Forces on a Rigid Body**

Moment of a force about a point and about a line– Scalar moment– General motion of a rigid body– Equivalent system of forces– Parallel forces– Point of application of resultant of many parallel forces – Varignon's theorem– Equation of the line of action of the resultant– Equilibrium of a rigid body under three coplanar forces

Chapter: 4 (omit 4.4.3, 4.5, 4.6 and 4.7)

UnitV: **Centre of mass**

Centre of gravity– Finding mass centre – Finding mass centre using integration. [Theory only]

Work, Energy and Power: Work– Units of work– Work done in stretching an elastic string– Conservative field of forces– Energy– Conservation of energy– Power [Book work only].

Chapter: 6 (omit 6.2.3, 6.2.4 and 6.3), and Chapter: 11

Book for study:

Mechanics by P.Duraipandian and others, S.Chand Publishers,2014

Note:

The Question Paper may be set so that at least 50% of the questions are from theory part

Books for reference:

1.Dynamics, A.V. Dharmapadam, S. Viswanathan Publishers,2012
2. Dynamics, K.Viswanath Naik and M.S. Kasi, EmeraldPublishers,1992
3. Statics, A.V. Dharmapadam, S. Viswanathan Publishers,1994
4. Statics, K.Viswanath Naik and M.S. Kasi, EmeraldPublishers1994

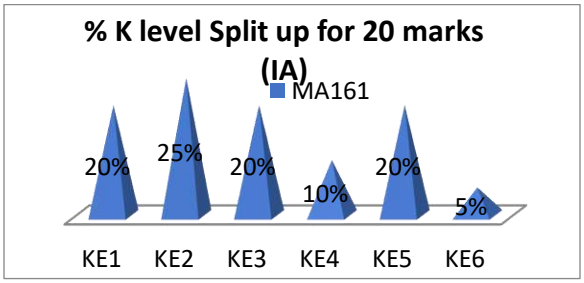
Web references:

www.nptel.ac.in
https://www.tutorialspoint.com

ASSESSMENT PATTERN

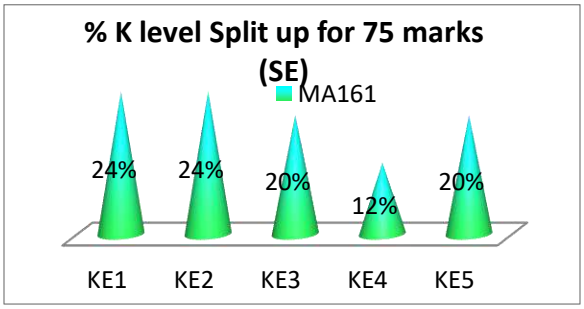
CIE- Continuous Internal Evaluation (25 Marks)

MA161				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (4)	1	1		2
Understand (5)	1	0		4
Apply (4)	1	2		1
Analyse (2)	0	1		1
Evaluate (4)	2	0		2
Create (1)	0	1		0



ESE- Semester End Examination (75Marks; Weightage 75 %)

MA161	
Bloom's Taxonomy	**Weightage %**
Remember	**24%**
Understand	24%
Apply	20%
Analyze	12%
Evaluate	20%



OPERATIONS RESEARCH

SemesterV **Code No: MA162**
Course:XII **Credit: 5**

Learning Objectives:Operations Research deals with the optimization problems in real life situations. We study the profit maximization, cost minimization in linear programming models, minimization of transportation costs, Assignment problems to minimize assignment of different persons to different jobs, Network analysis, Game theory.

Course Outcomes with K level mapping:**K1 Remembering, K2 Understanding ,K3 Applying ,K4 Analysing , K5 Evaluating ,K6 Creating**. Throughout the course, retention of all the concepts is emphasized after thorough understanding. Students will be able to

CO.No.	COURSE OUTCOME STATEMENT	KNOWLEDGE
CO 1	**Formulate** real-world problems as a linear programming model and **describe** the theoretical working and **find** solution by graphical and simplex methods. **[PO3]** https://nptel.ac.in/courses/111/107/111107128/	**K1,K2,K3,K4,K5**
CO 2	**Acquire** the knowledge of artificial variable techniques and two phase simplex method and **apply** them to **solve** non canonical LPP.**[PO3]** https://nptel.ac.in/courses/111/107/111107128/	**K1,K2,K3,K4,K5, K6**
CO 3	**Learn** techniqus to find initial solutions of transportation problem and **apply** MODI method to **solve** transportation problem. Also **use** Hungarian method to **solve** assignment problems and travelling salesman problem. **Activity:** Refer e resources to identify applications of either of TP,AP or TSP and prepare a PPT of the same and present.(group seminar) **Digital Tool : Microsoft powerpoint. [PO3, PO5, PO7, PO9]** https://nptel.ac.in/courses/110/106/110106062/	**K1,K2,K3,K4,K5, K6**
CO 4	**Apply** the knowledge of game theory concepts to **demonstrate** methods like graphical and dominance property to **analyze** and **solve** the Two-person, zero-sum games with or without saddle points. **[PO3]** https://nptel.ac.in/courses/111/107/111107128/	**K1,K2,K3,K4,K5**
CO 5	**Gain** knowledge to **apply** CPM and PERT techniques to **analyse,schedule**, plan and control activity oriented projects. **Activity:** Prepare a network diagram representing various routes from your residence to college and find the shortest and longest route . (**Submission of individualAssignment as pdf**) **Digital Tool : Google Classroom [PO3, PO7, PO9]** https://nptel.ac.in/courses/112/106/112106131/	**K1,K2,K3,K4**

	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness / reasoning	National and international perspective	Lifelong learners
CO1	2	1	2	1			1	1	1	1
CO2	2	1	2	1			1	1	1	1
CO3	2	2	2	1	1		2	2	1	2
CO4	2	1	2	1			1	1	1	1
CO5	2	2	2	1	1		2	2	1	2
Avg	2	1	2	1			1	1	1	1
Total	10	7	10	5	2		7	7	5	7

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated –1

Unit I

LinearProgramming:MathematicalFormulation of LPP [for Production Allocation-Blending-Production Mix-Production Planning-Transportation Problems]– Graphical method of solution – Some Exceptional Cases-The General LPP-Canonical and Standard form of LPP – Simplex Method technique.

Chapter 2 : Section 2.6 -2.12 & 2.16 (Page number 43 to 14 & 155 to 167)

Unit II

Artificial variable technique – Big-M method- Two Phase Method- Some Special Cases in the Simplex method – Some important Definitions.

Chapter 2 : 2.17 – 2.18 & 2.13 – 2.14 (Page number 168 to 210 & 143 to 145)

Unit III

Transportation problem: Definition of the Transportation Model-Formulation and Solution of Transportation Model- North West Corner rule– Least Cost Method– Vogel's approximation method– MODI method– Variants in Transportation Problems.

Assignment problem: Definition of the Assignment Model-Mathematical Representation-Hungarian Method–Variants of the Assignment Problems– Travelling salesman problem.

Chapter 3 :3.1 – 3.6 (Page number 228 to 282) & Chapter 4 : 4.1 – 4.7 & 4.10 (Page number 322 to 356 & 383 to 387)

Unit IV

Theory of Games : Characteristics of Games- Game Models-Definitions-Rules for Game Theory- Two–person Zero–sum game with saddle point and without saddle point— Dominance Property -Graphical Method for 2 x n or m x 2 Games– Solve Mixed Strategies for 3 x 3 Games using Method of Matrices .

Chapter 9 : 9.10 -9.20-1 (Page number 794 to 832)

Unit V

Network Analysis : Network and Basic components – Rules of network construction-Fulkerson's Rule– Time Calculation in network– Critical Path Method– PERT Calculation.

Chapter 14: 14.1 – 14.13 (Page number 1155 to 1181)

Book for study:

Operations Research – Prem Kumar Gupta & D.S. Hira ,Fifth edition, S.Chand & Company Ltd,New Delhi – 2011.

Books for reference:

1.Operations Research – Hamdy A. Taha , Hall of India Private Limited 10th Edition ,2017.
2.Operations Research – KantiSwarup ,P.K.Gupta and Manmohan,Sultan Chand and sons, 15th Edition,2019.
3.Operations Research – V.K.Kapoor,Sultan Chand & Sons,5th Edition,2017.
4.Operations Research - S.D. Sharma , Kedar Nath Ram Nath Publisher,2020.

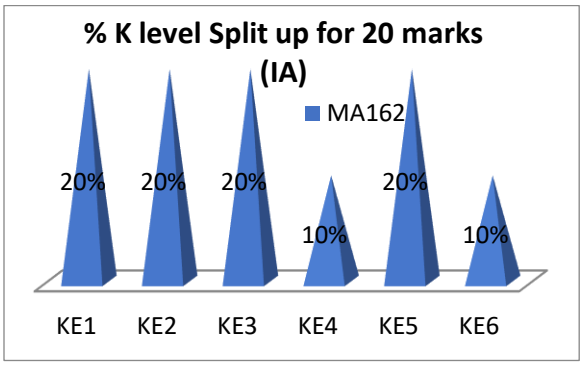
Web References:

1.www.nptel.ac.in,
2.https://nptel.ac.in/courses/112/106/112106134/
3.www.itu.edu.tr/topcuil/ya/OR.pdf
4.www.springer.com/gp/book
5.https://youtu.be/66aKgySf9vo

ASSESSMENT PATTERN

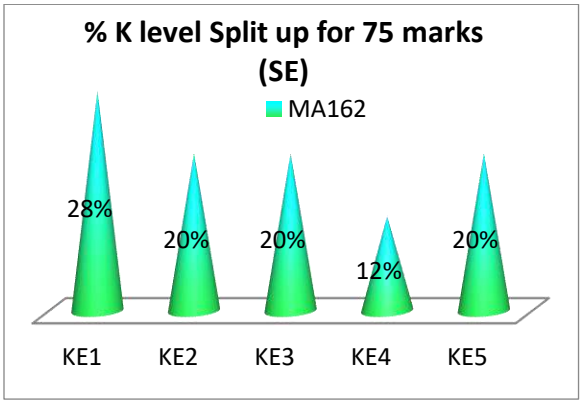
CIE - Continuous Internal Evaluation (25 Marks)

MA162				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (4)	2	1		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (2)	0	1		1
Evaluate (4)	1	0		3
Create (2)	0	2		0



ESE – End Semester Evaluation (75Marks; Weightage 75%)

MA162	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	20%
Apply	20%
Analyze	12%
Evaluate	20%



GRAPH THEORY

Semester : V **Code : MA163**
Course: X III Elective I **Credit: 5**

Learning Objectives:The objective of this paper is to introduce the main concepts of graph theory and study about connected graph, Eulerian graph, Hamiltonian graph, directed graph etc. It has wide application in other branches of science, networks of communication and used to find shortest path in road or a network.

Course Outcomes:
Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). At the end of the Course, the Student will be able to

CO1	**Recall** some basic concepts of graph theory. **Demonstrate** the degree of the graph, subgraphs and isomorphism of graphs with examples. **Make use of** matrix form to represent graphs. The algebra of matrices is used to **inspect** certain properties of graphs. **Deduct** several operations such as union, intersection, sum, product and composition of graphs. NPTEL :: Mathematics - NOC:Graph Theory	**K1K2K3K4K5**
CO2	**Relate** the concept of the sum of the degrees of the points of graph G is twice the number of lines. **Explain** degree sequences and graphic sequences with examples. The basic properties of connected and disconnected graphs are **developed**. Walks, trails and path are defined and **examined** thoroughly by certain results. **Interpret** various results in connected and disconnected graphs and its components. NPTEL :: Mathematics - NOC:Graph Theory	**K1K2K3K4K5**
CO3	**Relate** the concept of cutpoint to define what is a block. **Explain** the block of the graph with several equivalent conditions for a graph to be a block. **Develop** two parameters of graph , its connectivity and edge connectivity which measure the extent to which it is connected. **Examine** a connected acyclic graph called Tree. Characterization of a tree is **proved** and the concept of centre of a tree is interpreted. NPTEL :: Mathematics - NOC:Graph Theory	**K1K2K3K4K5**
CO4	**Define** the relation between the degree of a vertex and global properties like the existence of Eulerian or Hamiltonian cycles. **Summarized** that a closed trail containing all points and lines in a graph is an Eulerian graph. The Characterization of Eulerian graphs can be **applied** to find whether eulerian trail exists or not. Sufficient condition for a graph to be Hamiltonian is **analyzed** through Dirac's theorem. The Closure of a graph G is **evaluated** and well defined. **Develop** the knowledge of students in the subject by making them refer other learning resources.**[PO2,PO5,PO7]** **Activity : Group seminar on given topics within the syllabus with reference from web resources.** **Digital Tool : Microsoft powerpoint.** https://www.youtube.com/watch?v=Lw5rRctO9js	**K1K2K3K4K5K6**

CO5	**Define** some basic properties of directed graph followed by discussion of paths. **Illustrated** very clearly whether a digraph is strongly or unilaterally or weakly connected. **Construct** matrices using the concept of digraphs. **Classified** reachability matrix, distance matrix and detour matrix using digraphs.**Evaluate** the incidence matrix of a digraph D with p vertices and q arcs. Combine the students in a group to **discuss** the subject and share their views. **[PO2, PO7]** **Activity : Submission of individual assignment in the topics within the syllabus using nlist and web resources.** **Digital Tool : Google Classroom** https://freevideolectures.com/course/4625/nptel-graph-theory/4	**K1K2K3K4K5K6**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated –1

	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Disciplinary Knowledge and skills	**Skilled Communicator**	**Critical thinker and problem solver**	**Sense of inquiry**	**Team player/worker**	**Skilled project manager**	**Digitally Efficient**	**Ethical awareness / reasoning**	**National and international perspective**	**Lifelong learners**
CO1	2	1	2	1			1	1	1	1
CO2	2	1	2	1			1	1	1	1
CO3	2	1	2	1			1	1	1	1
CO4	2	2	2	1	1		2	2	1	2
CO5	2	2	2	1			2	2	1	2
Avg	**2**	**1**	**2**	**1**			**1**	**1**	**1**	**1**
Total	**10**	**7**	**10**	**5**	**1**		**7**	**7**	**5**	**7**

Unit I :

Graphs and Subgraphs : Introduction - Definitions and examples – Degrees - Subgraphs - Isomorphism - Intersection Graphs and Line Graphs – Matrices - Operations on Graphs

Chapter 2 : Section 2.0 – 2.4 and 2.7 – 2.9

Unit II :

Degree Sequences: Introduction –Degree Sequences - Graphic Sequences. Connectedness : Introduction -Walks, Trails and Paths - Connectedness and Components .

Chapter 3 : **Section 3.0 – 3.2**

Chapter 4 : Section 4.0 – 4.2

Unit III :

Blocks – Connectivity. Trees : Introduction - Characterisation of Trees – Centre of a Tree .

Chapter 4 : Section 4.3 – 4.4

Chapter 6 : Section 6.0 – 6.2

Unit IV :

Eulerian Graphs and Hamiltonian Graphs: Introduction – Eulerian Graphs – Hamiltonian Graphs.

Chapter 5 : Section 5.0 – 5.2

Unit V :

Directed Graphs : Introduction – Definition and Basic Properties - Paths and Connections - Digraphs and Matrices.

Chapter 10 : Section 10.0 – 10.3

Book for study:

S.Arumugam and S.Ramachandran, Invitation to Graph Theory , Scitech Publications (India) Pvt ltd.chennai – 17. 2009 edition.

Books for reference:

1. Choudum.S.A. , A First Course In Graph Theory , Macmillan India Limited, 1987
2. J.A.Bondy and U.S.R.Murthy, Graph Theory with Applications,Macmillan, London.5th Edition 1982
3. narasinghdeo, graph theory with application to engineering and computer science, prentice hall of india pvt ltd, new delhi -110001

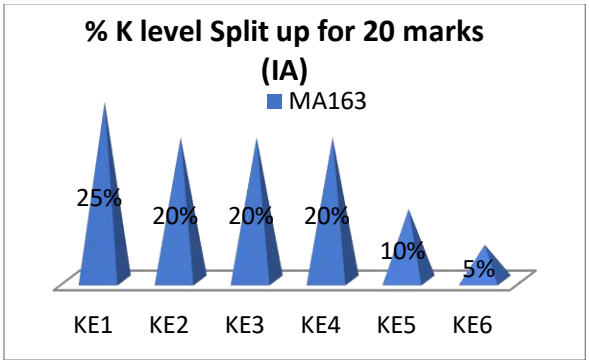
Web resources:

1. www.nptel.com
2. http://www.coursera.org
3. https://edurev.in/course/quiz/attempt/-1_Graphs-Theory-MCQ-1/f7e55993..
4. https://freevideolectures.com/course/4625/nptel-graph-theory/4
5. https://www.youtube.com/watch?v=Lw5rRctO9js

ASSESSMENT PATTERN

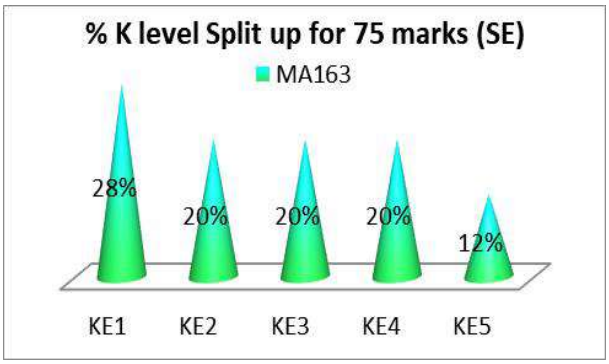
CIE – Continuous Internal Evaluation (25 Marks)

MA163				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	2		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (4)	0	1		3
Evaluate (2)	1	0		1
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA163	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	20%
Apply	20%
Analyze	20%
Evaluate	12%



ALGEBRAIC STRUCTURES II

Semester : VI **Code : MA164**
Course: XIV **Credit: 5**

Learning Objectives: This course aims to impart knowledge on concepts of the Algebraic structures of Vector Spaces and Linear Transformations. The student acquires skills through thorough understanding of the fundamentals of algebra.

Course Outcomes:

Knowledge level - K1(Remember),K2(Understand),K3(Apply), K4 (Analyze), K5 (Evaluate),K6(Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding. At the end of the Course, the Student will be able to

CO1	**Acquire** thorough knowledge on vector spaces and its linear independence and their conversions. perform arithmetic calculations and **apply** them to solve problems. **Categorise**span , linear dependency , independency in various situations using definitions**, realizing** them with applied problems and extend the ideas to **design** universal lemmas.**(e-Quiz: Numerical Problems) [PO7, PO3]** https://nptel.ac.in/courses/111/106/111106051	**K1 K2 K3 K5**
CO2	**Learn**Dual spaces and second dual spaces and creatively construct isomorphisms between them, **Evaluation**of new expressions through **critical** problem solving .Acquire knowledge in Duality of vector spaces and a special kind of space called inner product space are introduced.**[PO3]**	K1 K2 K5
CO3	**Distinguish** the fundamental components of linear transformations,**design and analyze transformations**, **learn** building various transformations and realize their applications. **(Interactive –uses of transformation in computer field-discussion session – Planned)**Illustrate the characteristic roots and Matrices concept. https://nptel.ac.in/courses/111/106/111106051	K1 K2 K4 K6
CO4	Derive the special category of rings viz., polynomial rings, extend it to polynomial rings over rational fields, classify based on concepts, understand link with the algebraic concepts.	K1 K2 K3 K4
CO5	Understand the concept Modules and classify the differences between modules and rings. Spaces are over fields and modules are defined over rings .These are the two major splits which are used for the development of the subject.students are asked to submit an assignment the noted differences.To differentiate ,the chapter is introduced. https://youtu.be/EIDXE28_8eQ	K1 K2 K3 K4 K5

Strongly correlated – 3 **Moderately correlated – 2** **Weakly correlated –1**

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	1	2	1			1	1	1	1
CO2	3	1	2	1					1	1
CO3	3	1	2		1	1	1		1	1
CO4	3	2	2	1					1	1
CO5	3	1	2		2	1	1			1
AVG	3	1	2	1	1		1		1	1
TOTAL	15	6	10	3	3	2	3	1	4	5

Unit – I:

Vector spaces – Elementary basic concepts – Linear independence and Bases.

Chapter 4: Sections 4.1 and 4.2

Unit – II:

Dual Spaces – Inner Product Spaces.

Chapter 4: Sections 4.3 and 4.4

Unit – III:

The Algebra of Linear Transformations – Characteristic Roots – Matrices.

Chapter 6: Section 6.1 – 6.3

Unit IV:

Polynomial Rings – Polynomial Ringsover the rational field

Chapter 3: Section 3.9 and 3.10

Unit- V:

Modules.

Chapter 4: Section 4.5

Books for study:

I.N. Herstein , Topics in Algebra (2^{nd}edition, 2007), Wiley Eastern Ltd, New Delhi, 2007

Books for reference:

1. David C. Lay, Linear Algebra and its Applications, Pearson publishers.

2. J.B.Fraleigh (1986), A First Course in Algebra (3rd Edition), Addison Wesley. Mass. (Indian Print),

3. M.L.Santiago. (2002), Modern Algebra, Tata McGraw Hill, New Delhi 1. J.B.Fraleigh, A First Course in Algebra (3rd Edition), Addison Wesley. Mass. (Indian Print), 1986.

4. N.S. Gopalakrishnan, University Algebra, New Age International (P) Limited, New Delhi, 2001

Web references:

1.www.nptel.com

2. www. mathsforum.org,

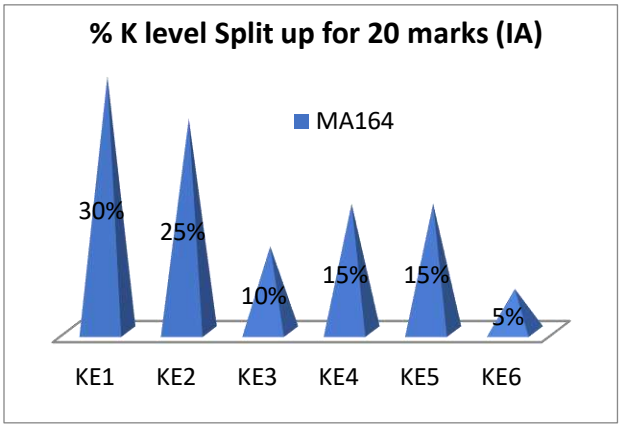
3. http://en.m.wikibooks.org,

4.http://mathworld.wolfram

ASSESSMENT PATTERN

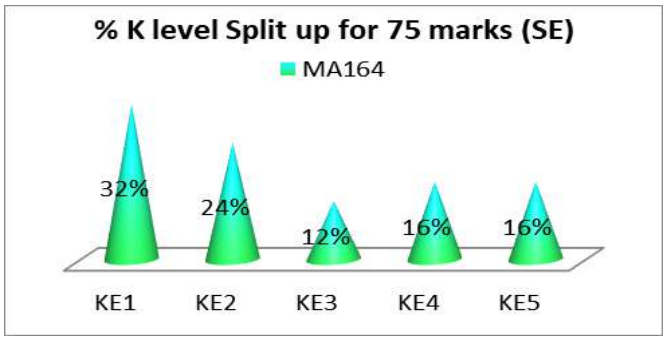
CIE – Continuous Internal Evaluation (25 Marks)

MA164				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (6)	2	2		2
Understand (5)	1	0		4
Apply (2)	1	1		0
Analyse (3)	0	1		2
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA164	
Bloom's Taxonomy	**Weightage %**
Remember	**32%**
Understand	24%
Apply	12%
Analyze	16%
Evaluate	16%



REAL ANALYSIS II

Semester: VI **Code: MA165**

Course: XV **Credit: 5**

Learning Objectives: This course is intended to expose the basic concepts of Real Analysis. In particular, the open sets, closed sets, the connectedness, completeness, compactness , the properties of Riemann integral and the derivative of functions.

Course Outcomes: Knowledge level - K1(Remember),K2(Understand),K3(Apply), K4 (Analyze), K5 (Evaluate),K6(Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding and Interactive sessions. At the end of the Course, the Student will be able to

CO1	**Define** open and closed sets. **Understand**, **Analyse** their properties and **determine** given subsets of a metric space are open and/or closed. **Apply** fundamental theorem on continuous function.	**K1,K2,K3, K4, K5**
CO2	**Classify** connected sets. **Identify** and **analyze** bounded, totally bounded sets on Metric Space. **Define** complete and compact metric spaces. **Interpret** Picard fixed point theorem.	**K1,K2,K3, K4, K5**
CO3	**Define** and **explain** continuous functions on compact metric spaces. **Apply** and **Determine** for a function on a metric space is continuous or uniformly continuous.	**K1,K2, K3,K5**
CO4	**Define** Sets of measure zero. **Understand** and **apply** the concepts for existence of Riemann integral. **Analyze** the properties of Riemann integral. **Group seminar:** Properties of Riemann integral. Prepare a PPT and present. **[PO2,PO4, PO5,PO7,PO9].** **https://nptel.ac.in/courses/111/101/111101134/**	**K1, K2 K3, K4**
CO5	**Recall** and **extend** the concepts of derivatives**. Analyze** and **appl**y the Mean Value Theorem and the Fundamental Theorem of Calculus to problems in the context of real analysis.**Formulate**Taylor's formula in various forms of the remainder. **Assignment:** Write Taylor's series in various forms of the remainder for a given function. Submission through Google classroom in pdf format. **[PO2, PO4, PO7, PO9].** **https://nptel.ac.in/courses/111/106/111106053/**	**K1, K2,K3,K4, K6**

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/	National and international perspective	Lifelong learners
CO1	3	1	2	1			1	1	1	1
CO2	3	1	2	1			1	1	1	1
CO3	3	1	2	1			1	1	1	1
CO4	3	2	2	2	2		2	2	1	2
CO5	3	2	2	2			2	1	1	1
AVG	3	1	2	1			1	1	1	1
TOTAL	15	7	10	7	2		7	6	5	6

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated –1

Unit I:

Open sets – Closed sets – Discontinuous functions on the real line –More about open sets.

Chapter: 5: 5.4– 5.6, Chapter: 6: 6.1

Unit II:

Connected sets-Bounded sets and totally bounded sets – Complete metric spaces – Compact metric spaces

Chapter: 6: 6.2– 6.5

Unit III:

Continuous functions on a compact metric spaces – Continuity of inverse functions – Uniform continuity.

Chapter: 6: 6.6– 6.8

Unit IV:

Sets of measure zero – Definition of the Riemann integral – Existence of the Riemann Integral (statement only) – Properties of Riemann integral- Derivatives.

Chapter: 7: 7.1– 7.5

Unit- V:

Rolle's theorem – The Law of the mean – Fundamental theorems of calculus -Taylor's theorem .

Chapter: 7: 7.6– 7.8, Chapter: 8: 8.5

Book for study:

Richard R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi, 1970

Books for reference:

1. Tom M. Apostol, Mathematical Analysis, II edition, Narosa Publishing House, New Delhi, 1997.

2. W.Rudin,Principles of Mathematical Analysis, 3rd Edition Mc Graw- Hill Book Company, New York, 1979.

3. Robert G. Bartle, Donald R. Sherbert, Introduction to Real Analysis, John Wiley, New York, 4th edition 2011.

4. Shanti Narayan, M.D.Raisinghania, Elements of Real Analysis, New Delhi, S. Chand, eight revised edition 2007.

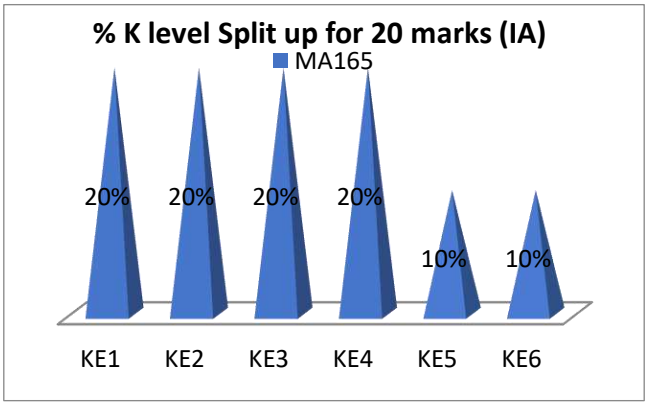
Web references:

1.http://www.nptel.ac.in
2.http://www.freebookcentre.net/Mathematics/Real-Analysis-Books.html
3.https://www.jirka.org/ra/realanal.pdf
4.http://www.math.stonybrook.edu/~aknapp/download/b2-realanal-inside.pdf

ASSESSMENT PATTERN

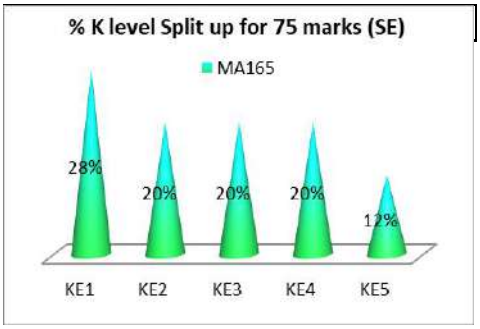
CIE – Continuous Internal Evaluation (25 Marks)

MA165				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (4)	2	1		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (4)	0	1		3
Evaluate (2)	1	0		1
Create (2)	0	2		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA165	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	20%
Apply	20%
Analyze	20%
Evaluate	12%



COMPLEX ANALYSIS

Semester : VI **Code : MA166**
Course: XVI **Credit: 5**
Learning Objectives: To introduce conceptual learning of complex analysis at basic level

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions . At the end of the course, students will be able to

CO1	**Understand** the concepts of limits, continuity, derivatives and analyticity of complex valued functions. **Derive** necessary and sufficient condition for differentiability of a complex valued function. Also get **introduced** to harmonic functions and **find** harmonic conjugate of a function. Activity: JAM on Analytic function.**[PO2]** https://nptel.ac.in/courses/111/107/111107056/	**K1, K2, K3,K4**
CO2	Get **introduced** to contour integrals and **insist** the importance of analyticity by **proving** some important theorems like Cauchy's integral formula, Morera's theorem ,etc. Activity: Prepare a PPT and have a group discussion on **winding number and homology[PO2,PO4,PO5,PO7,PO8,PO9]** https://nptel.ac.in/courses/111/106/111106141/	**K1, K2, K3, K4, K5**
CO3	**Study** the geometrical properties of conformal mappings and **derive** series representations of complex valued functions about regular and singular points as Taylor and Laurent series. Submit[GC] assignments on series representations of some special functions in pdf format **.[PO3,PO4,PO7]**	**K1, K2, K3, K4, K6**
CO4	Get **introduced** to isolated and non isolated singularities and types of singularities. **Calculate** residues of complex valued functions at their poles. **Evaluate** contour integrals using Cauchy residue theorem and argument principle. Group discussion on application of Rouche's theorem. **[PO3,PO4 ,PO5,PO8]**	**K1,K2, K3, K5**
CO5	**Evaluate** real integrals using contour integration	**K1,K2, K3, K5**

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international	Lifelong learners
CO1	3	2	2	1			1	1		1
CO2	3	2	3	2	3		3	2	3	3
CO3	3	2	2	2			2	1		1
CO4	3	2	2	2	2		1	2		1
CO5	3	1	3	1			1	1		1
AVG	3	2	2	2	1		2	1	1	1
TOTAL	15	9	12	8	5		8	7	3	7

Unit – I:

Analytic functions: Functions of a complex variable– Mapping, Limits, Theorems on limits, Continuity, Derivative, Differentiation formulae – Cauchy– Riemann equations (Cartesian and polar form) – Necessary and sufficient conditions– Analytic functions and Harmonic functions.

Chapter 2

Unit – II:

Integrals– Definite integrals of a complex valued function– contours– line integrals– examples– Cauchy – Goursat theorem (Statement Only) – simply and multiply connected domains – Antiderivatives and independence of path– Cauchy integral formula– Derivatives of analytic functions – Morera's theorem, Maximum modulus theorem– Liouville's theorem– The fundamental theorem of algebra.

Chapter 4 (Omit sections33, 34 & 35)

Unit – III:

Mapping by Elementary functions – Linear function, The function 1/z, Linear fractional transformation, The function z^2, The function e^z . Power series: Taylor's and Laurent's theorem– Problems

Chapter 7: (Section 63 – 65, 67and 70),
Chapter 5: (sections 44, 45 and 46)

Unit IV:

Classification of singularities – Problems. Residues and Poles– Residues– Cauchy's residue theorem– Numbers of poles and zeros – Argument principle– Rouche's theorem – Problems.

Chapter 6: (Section 54 – 58), Chapter 12: (Sections 108, 109)

Unit- V:

Evaluation of improper real integrals– Improper integrals involving sines and cosines– Definite integrals involving sines and cosines.

Chapter 6: (Section 59 – 61)

Book for study:

R.V.Churchill and J.W.Brown, Complex variables and Applications, Fifth Edition, McGraw Hill, International Book Company, 1990.

Books for reference:

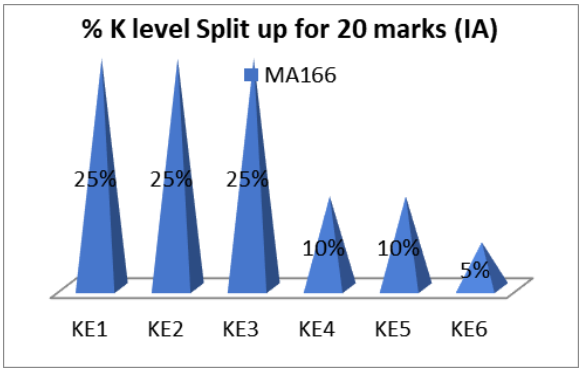
1.Complex analysis, Laxmi Duraipandian, Duraipandian, Emerald publications,
2.Complex Analysis, V. Karunakaran, Alpha Science International, 2005
3.Theory and problems of Complex Variable, M.R.Spiegel, Schaum's series, 1974.
4.An introduction to Complex Function Theory, Bruce P. Palka, , Springer Publications, 2012.

Web references:

1.www.nptel.ac.in
2.https://www.coursera.org/lecture/complex-analysis/inverse-functions-of-analytic-functions-33cDQ
3.https://www.wolframalpha.com/examples/mathematics/complex-analysis/

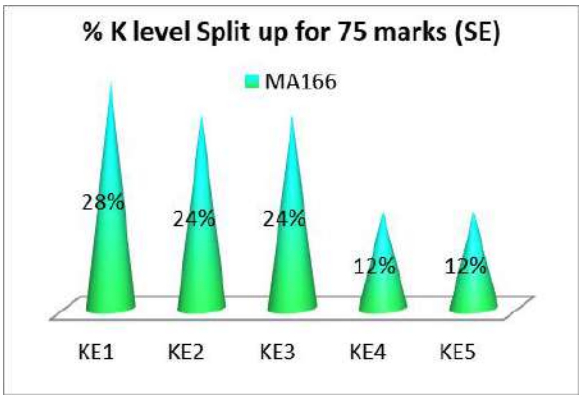
CIE– Continuous Internal Evaluation (25 Marks)

MA166				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	1	1		3
Understand (5)	1	0		4
Apply (5)	2	2		1
Analyse (2)	0	1		1
Evaluate (2)	1	0		1
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA166	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	24%
Apply	24%
Analyze	12%
Evaluate	12%



MECHANICS – II

Semester: VI **Code: MA167**
Course: XVII **Credit: 5**

Learning Objectives: To introduce basic concepts of S.H.M, Projectile, Impact and central orbits. To improve the problem solving skills.

Course Outcomes with K- Level Mapping:K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create. At the end of the Course, the student would be able to:

CO1	**Describe** the concept of Simple Harmonic Motion and **compare** horizontal line along with vertical line. **Discuss** motion under gravity in a resisting medium and measure the velocity concepts.	K1,K2,K3
CO2	**Study** about projectiles and **relate** to parameters like forces, speed, nature of a trajectory, motion and maximum horizontal range. **Demonstrate** the projectile plane like horizontal and inclined plane and **test** maximum range on an inclined plane. **Set of problems will be given as group assignment**.[**PO3,PO4,PO7, PO8, PO10]**	K1,K2,K3,K5
CO3	**Explain** the impact of a particle on a surface and **relate** to impulse, linear momentum, elasticity and collision. **Construct** the collision of two smooth spheres and **correlate** to kinetic energy and fixed smooth plane.	K1,K2,K3,K4
CO4	**Express** the central orbits, conic concepts and associate laws. **Develop** a differential equation and **apply** different methods to find the central orbits and also **compose** the kepler's laws of Planetary motion.	K1,K2,K3,K4
CO5	**Derive** the moment of inertia of simple bodies and **state** Perpendicular and Parallel axis theorems. **Develop** the concepts of Hanging strings with different constraints like homogeneous string, parametric form,sag, span and **connect** to the telephone wire, Suspension bridge concepts. **Group Seminar/assignment** as a team. [**PO3,PO4, PO 7,PO8, PO10]** https://nptel.ac.in/courses/115/104/115104094	K1,K2,K3,K4,K5,K6

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

CO/PO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international	Lifelong learners
CO1	3	1	2	1			1	1	1	1
CO2	3	1	2	2	1		2	2	1	2
CO3	3	1	2	1			1	1	1	1
CO4	3	1	2	1			1	1	1	1
CO5	3	1	2	2	1		2	2	1	2
Avg	3	1	2	1			1	1	1	1
Total	15	5	10	7	2		7	7	5	7

Unit I:Rectilinear Motion under varying force

Simple Harmonic Motion (S.H.M) – Composition of two simple harmonic motions of same period – S.H.M along a horizontal line – S.H.M along a vertical line – Motion under gravity in a resisting medium– resistance varying as the velocity and as the square of the velocity.

Chapter: 12

Unit II:Projectiles

Forces on a Projectile – Nature of a trajectory– Results pertaining to the motion of a projectile – Maximum Horizontal Range – Two trajectories with the given speed and range – Projectile projected horizontally – Projectile projected on an inclined plane – Maximum Range on an inclined plane

Chapter: 13 (omit 13.3)

Unit III: Impact

Definition of Impulsive forces and Impulse– Principle of conservation of linear momentum – Elasticity – Collision of two smooth spheres– Change in kinetic energy and impulse imparted due to collision – Impact of a smooth sphere on a fixed smooth plane.

Chapter: 14

Unit IV: Central orbits

Central orbit– Differential equation of the central orbit– Laws of a central force– Methods to find the central orbits - Conic as a central orbit – Kepler's laws of Planetary motion

Chapter: 16

Unit V: Moment of inertia

Moment of inertia of simple bodies [Derivations only] – Perpendicular and Parallel axis theorems (Statement only),

Hanging Strings: Equilibrium of a uniform homogeneous string, parametric form , sag, span, sag and span of a telephone wire - Suspension bridge

Chapter: 17 and Chapter: 9

Book for study:

Mechanics by P.Duraipandian and others, S.Chand Publishers,2014

Note:

The Question Paper may be set so that at least 50% of the questions are from theory part

Books for reference:

1.Dynamics, A.V. Dharmapadam, S. Viswanathan Publishers,2012
2. Dynamics, K.Viswanath Naik and M.S. Kasi, EmeraldPublishers,1992
3. Statics, A.V. Dharmapadam, S. Viswanathan Publishers,1994
4. Statics, K.Viswanath Naik and M.S. Kasi, EmeraldPublishers1994

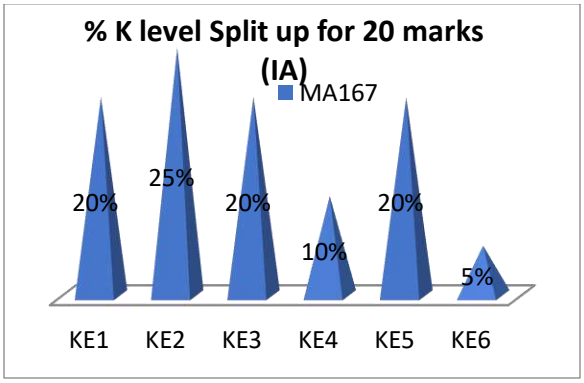
Web references:

1.www.nptel.ac.in
2.https://www.tutorialspoint.com

ASSESSMENT PATTERNCIE

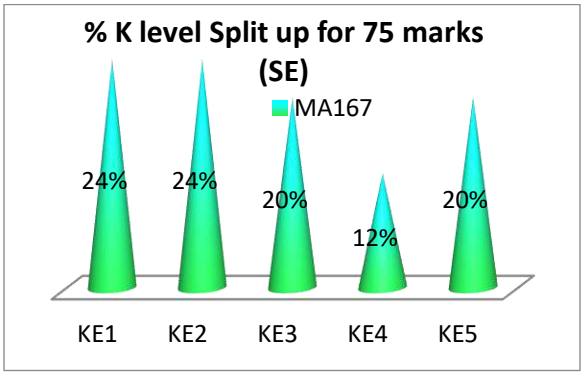
Continuous Internal Evaluation (25 Marks)

MA167				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (4)	1	1		2
Understand (5)	1	0		4
Apply (4)	1	2		1
Analyse (2)	0	1		1
Evaluate (4)	2	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75Marks; Weightage 75%)

MA167	
Bloom's Taxonomy	**Weightage %**
Remember	**24%**
Understand	24%
Apply	20%
Analyze	12%
Evaluate	20%



DISCRETE MATHEMATICS

Semester VI **Code No: MA168**

Course: XVIII Elective II **Credit: 5**

Learning Objectives:

To give insight knowledge in Discrete Mathematical Problems which has applications in logic and Inference theory.

Course Outcomes: Knowledge level - K1(Remember),K2(Understand),K3(Apply), K4 (Analyze), K5 (Evaluate),K6(Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding.At the end of the Course, the Student will be able to

CO NUMBER	COURSE OUTCOME STATEMENT	KNOWLEDGE
CO 1	**Recall** some basic concepts of Mathematical Logic.**Define** the Negation, Conjunction, Disjunction.**Develop** the knowledge of logical thinking and problem **solving** skill using of truth table. https://nptel.ac.in/courses/106/106/106106183/**[PO3]**	**K1,K2,K3, K4,K5**
CO 2	Gain knowledge of equivalence of formula , Duality Law and tautological implication .Also **apply** the Formulas with Distinct Truth Tables . **Explain** the Functionally Complete Sets of Connectives and Other Connectives.**[PO3]** https://nptel.ac.in/courses/106/106/106106183/#	**K1.K2,K3, K4,K5**
CO 3	**Define** two state devices and Statement Logic .Also **Analyze** about the normal forms CNF,DNF,PCNF and PDNF and **solve** the problems. **Activity: Submission of individual assignment in exercise problems in the prescribed tex book with reference from nlist and web resources.** **Digital Tool : Google Classroom [PO3, PO7, PO9]** https://nptel.ac.in/courses/106/106/106106183/#	**K1,K2,K3, K4,K5,K6**
CO 4	**Understand** and **analyze** the theory of inference and validity using truth table and rules of inference. **Explain** the Consistency of Premises and Indirect Method of Proof. Also **solve** the problems.**[PO3]** https://nptel.ac.in/courses/106/106/106106183/	**K1,K2,K3, K4,K5,K6**
CO 5	**Define** lattices, lattices as partially ordered sets and some properties of lattices. **Appiy** the lattices as algebraic systems and **explain** the direct product and Homomorphism and **classify** some special lattices. **[PO5, PO7, PO9]** https://nptel.ac.in/courses/111/107/111107058/ **Activity : Group seminar on lattices and PPT presentation with reference from web resources.** **Digital Tool : Microsoft powerpoint.**	**K1,K2,K3, K4,K5**

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international	Lifelong learners
CO1	2	1	2	1			1	1	1	1
CO2	2	1	2	1			1	1	1	1
CO3	2	2	2	1	1		2	2	1	2
CO4	2	1	2	1			1	1	1	1
CO5	2	2	2	1	1		2	2	1	2
AVG	2	1	2	1			1	1	1	1
TOTAL	10	7	10	5	2		7	7	5	7

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated – 1

Unit I

Mathematical logic - Introduction, Connectives - Negation, Conjunction, Disjunction - Statement formulas and Truth Tables - Conditional and biconditional - Well formed formulas - Tautologies. (Simple Problems)

Section: 1.1, 1.2 [1.2.1 – 1.2.8 (except 1.2.5)]

Unit II

Equivalence of Formulas - Duality Law - Tautological Implications - Formulas with Distinct Truth Tables - Functionally Complete Sets of Connectives - Other Connectives. (Simple Problems)

Section: [1.2.9 – 1.2.14]

Unit III

Two - state devices and Statement Logic - Disjunctive Normal forms - Conjunctive Normal forms - Principal Disjunctive Normal forms - Principal Conjunctive Normal forms. (Simple Problems)

Section: [1.2.15 -1.3.4]

Unit IV

The Theory of Inference for the Statement Calculus: Validity using Truth Tables - Rules of Inference - Consistency of Premises and Indirect Method of Proof (Simple Problems)

Section: [1.4.1 – 1.4.3]

Unit V

Lattices: Lattices as Partially Ordered Sets - Definition and Examples - Some Properties of Lattices- Lattices as Algebraic Systems- Sublattices, Direct Product and Homomorphism - Some Special Lattices.

Section: [4.1.1. – 4.1.5]

Book for study:

Tremblay J.P. and Manohar R., Discrete Mathematical Structures with Applications toComputer Science, Tata McGraw-Hill, Newdelhi,1997.

Books for reference:

1. Discrete Mathematics by Prof V.Sundaresan and others. A.R.Publications, June 2001.
2. Discrete Mathematics - Dr.S.P.Rajagopalan and Dr. R.Sattanathan, Margham Publications, Chennai – 17.
3.Discrete Mathematics – Dr. M. K. Venkataraman, Dr. N. Sridharan and N. Chandrasekaran, The National Publishing Company.
4. Discrete Mathematics- Schaum's Series – Second Edition.

Website References :

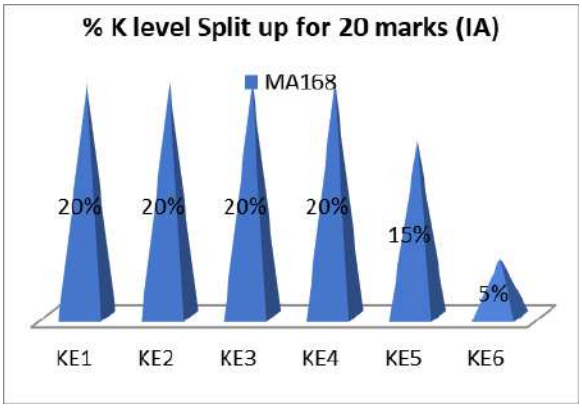
1.www.nptel.comwww. mathsforum.org

2.https://www.classcentral.com/course/swayam-discrete-mathematics-12929

3.**https://nptel.ac.in/courses/106/108/106108227/**

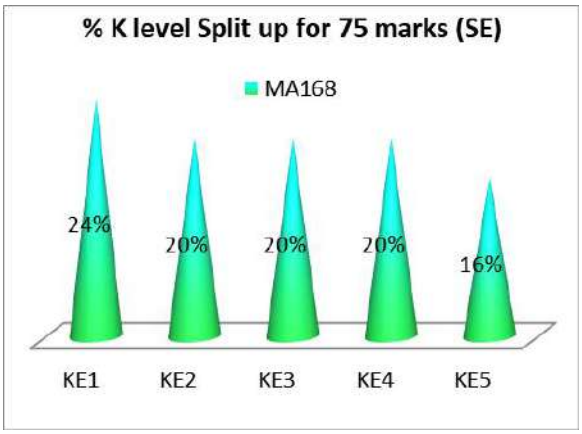
CIE – Continuous Internal Evaluation (25 Marks)

MA168				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (4)	2	0		2
Understand (4)	1	2		1
Apply (4)	1	1		2
Analyse (4)	0	1		3
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MA168	
Bloom's Taxonomy	**Weightage %**
Remember	**24%**
Understand	20%
Apply	20%
Analyze	20%
Evaluate	16%



CALCULUS OF FINITE DIFFERENCES AND NUMERICAL ANALYSIS I

Semester : I **Code:MAA27**
Course: Allied I Course I **Credit: 5**

Course Objective: To learn the numerical techniques of solving transcendental equations, system of linear equations, finite differences and interpolation.

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding.

CO1	Learning basic concepts of numerical techniques. Solving algebraic and transcendental equations Activities: Group activity can be given assigning to solve the same problem in various methods**[PO3, PO5]**	**K1, K2, K4**
CO2	Learning the numerical methods of solving simultaneous linear algebraic equations	**K1,K2, K3, K5**
CO3	Acquiring knowledge about finite differences and finite difference operators	**K1,K2,K3,K4,K5**
CO4	Introduction to the concept of interpolation and constructing the interpolating polynomials Activities: Assignment can be given for solving problems to develop skills**[PO3, PO7]**	**K1,K2,K4,K5**
CO5	Applying Interpolating formulas to data with unequal intervals	**K1,K2,K4,K5**

Strongly correlated – 3 **Moderately correlated – 2** **Weakly correlated –1**

CO/PO/ PSO	**PO**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Disciplinary Knowledge and skills	**Skilled Communicator**	**Critical thinker and problem solver**	**Sense of inquiry**	**Team player/worker**	**Skilled project manager**	**Digitally Efficient**	**Ethical awareness/**	**National and international**	**Lifelong learners**
CO1	**3**	1	2	**1**			**2**	1		1
CO2	**3**	2	2	**1**	2		**1**	1		1
CO3	**3**	1	2	**1**			**1**	1		
CO4	**3**	2	1	**1**			**1**	1	1	1
CO5	**3**	1	1	**1**	2		**2**	1	1	1
Avg	**3**	1	2	**1**	1		**1**	1		1
Total	**15**	7	**8**	**5**	**4**		**7**	**5**	**2**	**3**

Unit 1: Solutions of Algebraic and transcendental equations– Iteration method, Regula – falsi method– Newton – Raphson Method.
Chapter 1: Section 1.2 – 1.4

Unit 2 : Solutions of simultaneous equations – Gauss elimination methods– Gauss– Seidal method– Crout's Method.
Chapter 2: Section 2.1, 2.2, 2.3, 2.6

Unit 3 : Finite difference Δ, V, E operator and relation between them, Differences of a polynomial, factorial polynomial.
Chapter 3: Section 3.1 – 3.4

Unit 4: Interpolation with equal intervals– Newton's forward and backward interpolation formula, Central difference formula, Gauss forward and backward formulae, Stirling's formula and Bessel's formula.
Chapter 4&5: Section 4.1 – 4.6, 5.3 – 5.6

Unit 5: Interpolations with unequal intervals– divided differences– Newton divided difference formula for interpolation– Lagrange's formula for interpolation– Inverse interpolation– Lagrange's formula.
Chapter 6: Section 6.1 – 6.7

Book for study :

Calculus of finite differences and Numerical Analysis , P. Kandasamy & K. Thilagavathy, S.Chand and Co and Private Ltd, 2003

Books for Reference:

1. Introductory methods of Numerical Analysis , S.S.Sastry ,PHI, 2012.
2. Numerical Anlysis, Sivaramakrishna Das, Pearson , 2014.
3. Elementary Numerical Analysis , Atkinson and Han, Wiley India Ltd, 2006.

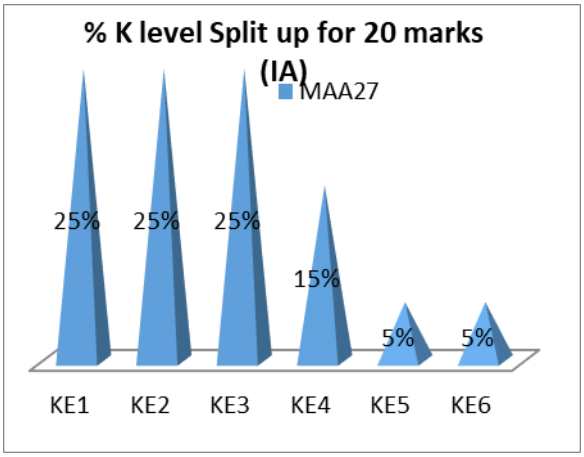
Web References:

1. http://mathforum.org
2.https://nptel.ac.in/
3.www.springer.com/gp/book
4.www.ioz.pwr.wroc.pl

ASSESSMENT PATTERN

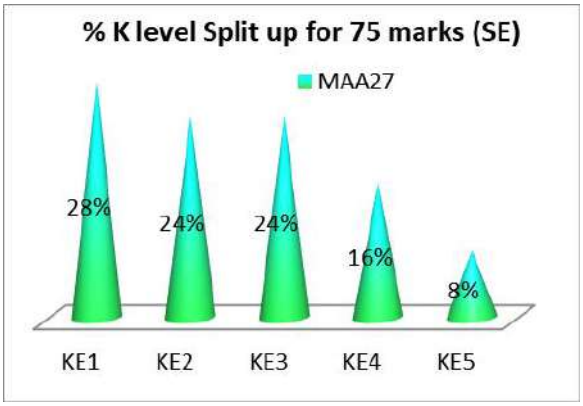
CIE – Continuous Internal Evaluation (25 Marks)

MAA27				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (5)	1	0		4
Apply (4)	2	1		1
Analyse (1)	0	1		0
Evaluate (4)	0	1		3
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks)

MAA27	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	24%
Apply	24%
Analyze	16%
Evaluate	8%



CALCULUS OF FINITE DIFFERENCES AND NUMERICAL ANALYSIS II

Semester : II **Code : MAA28**
Allied I Course II **Credit: 5**

Learning Objectives: This course covers the basic methods for finding the numerical differentiation and numerical integration. It also deals with solution of difference equations and numerical solution of ordinary differential equations.

Course Outcomes : Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). K1* Throughout the course, retention of all the concepts is emphasized after thorough understanding.

CO1*	Learning the numerical methods of differentiation and finding derivatives by using interpolation concepts **Activities:**Assignment in derivation of differentiation formulae **[PO3, PO5]**	**K1, K2, K3**
CO2*	Extending the numerical methods of finding derivatives to unequal intervals	**K1, K2, K3**
CO3*	Applying interpolating formulas to the data to find integrals numerically Group activities: Given a problem each group can be asked to solve in various methods	**K1,K3, K4**
CO4*	Solving difference equations using finite difference concepts **Activities:**Assignment in solving problems**[PO3, PO7]**	**K1, K3**
CO5*	Solving Ordinary differential equations using various numerical methods **Activities:** Assignment in solving problems using various methods	**K1, K3**

Strongly correlated – 3 **Moderately correlated – 2** **Weakly correlated –1**

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	1	2				2	1		1
CO2	3	2	2	1	2		3	1		
CO3	3	1	2				1	1		
CO4	3	1	1	1			1	1	1	1
CO5	3	1	1		2		2	1	1	1
AVG	3	1	2		1		2	1		1
TOTAL	15	6	8	2	4		9	5	2	3

Unit 1:

Numerical differentiation: Derivatives up to second order using Newton's forward and backward difference formula. Derivatives using Stirling's formula.

Chapter 7: Sections 7.1-7.4

Unit2 :

Derivatives using divided difference formula, Maxima and Minima using the above formulae.

Chapter 7 : Section 7.6

Unit 3 :

Numerical integration: General Quadrature formula , Trapezoidal rule, Simpson's 1/3 rd rule, Simpson's $3/8^{th}$ rule, Euler Maclaurin formula.

Chapter 7: Sections 7.7-7.9, 7.13, 7.14

Unit 4:

Interpolation with equal intervals– Newton's forward and backward interpolation formula, Central difference formula, Gauss forward and backward formulae, Stirling's formula and Bessel's formula.

Chapter 4&5: Section 4.1 – 4.6, 5.3-5.6

Unit 5:

Interpolations with unequal intervals– divided differences– Newton divided difference formula for interpolation– Lagrange's formula for interpolation– Inverse interpolation– Lagrange's formula.

Chapter 6: Section 6.1 – 6.7

Book for study:

Calculus of finite differences and Numerical Analysis , P. Kandasamy & K. Thilagavathy, S.Chand and Co and Private Ltd, 2003

Books for reference:

1.Introductory methods of Numerical Analysis , S.S.Sastry ,PHI, 2012.
2.Numerical Anlysis, Sivaramakrishna Das, Pearson , 2014.
3.Numerical Analysis , Atkinson and Han, Wiley India Ltd, 2006.

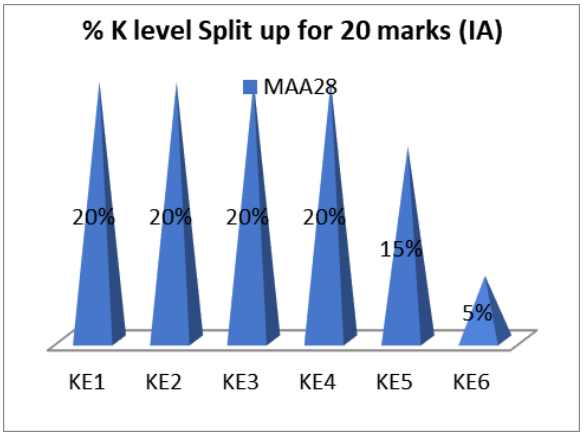
Web references:

1.http://mathforum.org
2.https://nptel.ac.in/
3.www.springer.com/gp/book
4.www.ioz.pwr.wroc.pl

ASSESSMENT PATTERN

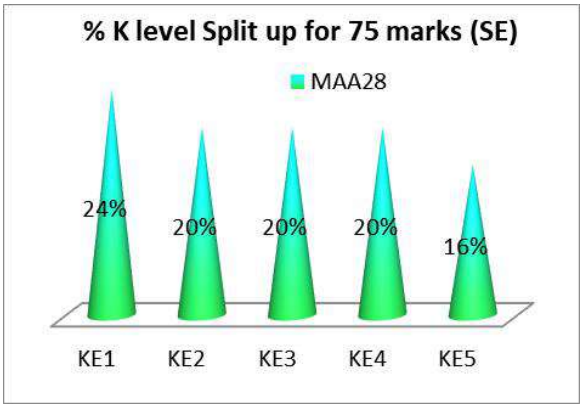
CIE – Continuous Internal Evaluation (25 Marks)

MAA28				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (4)	2	2		0
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (4)	0	1		3
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE- Semester End Examination (75 Marks; Weightage 75 %)

MAA28	
Bloom's Taxonomy	**Weightage %**
Remember	**24%**
Understand	20%
Apply	20%
Analyze	20%
Evaluate	16%



MATHEMATICAL STATISTICS-I

Semester : III **Code:MAA29**

Course: Allied II Course I **Credit: 5**

Learning Objectives : The course will help the students to have a well fundamental knowledge in basic probability concepts. Students will have a profound knowledge of standard distributions which can describe real life phenomena. Students will acquire skills in handling situations involving random variables.

Course Outcomes with K-Level Mapping : **able to: K1-Remember, K2-Understgand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create**. At the end of the course, the student would be

CO1	**Acquire** a thorough knowledge in probability theory. Make **use** of that knowledge in **solving** many real life problems. Know Bayer's theorem and **apply** itin some critical situations. *JAM: To talk about permutation, combination and probability, difference between permutation and combination* **[PO2][PO3][PO4]**.	**K1 K2 K3 K4 K5**
CO2	**Understand**the one-dimensional and two dimensional random variables. **Identify** the difference between the discrete and continuous case. **Know** the various definitions relating to probability functions and apply all these things in problems. Group activity:To ask the students to prepare PPT for all the definitions in this Unit**[PO2][PO3][PO5][PO7]**	**K1 K2 K3 K4 K5**
CO3	**Explore** the new concept of Mathematical expectation of a random variable. **Derive** the definition of moment generating functions and **formulate** the properties of it. **Understand** the Chebyshev's inequality and **apply** it in problems. An assignment on problems related - to be submitted in google class room.**[PO2][PO3][PO4][PO7]**	**K1 K2 K3 K4 K5**
CO4	**Analyse** many standard distributions. **Differentiate** those distributions and **Understand** the properties of it. **Apply** everything in **solving** the problems.**[PO3]** E Resource: https://youtu.be/kknZuDVo2vQ (NPTEL)	**K1 K2 K3 K4 K5**
CO5	**Appreciate** the concept of correlation and regression. **Use** the data to **draw** the scatter diagram. **Apply** the properties of correlation and regression to **solve** the problems. *Group Activity: Ask the students to collect some data and draw the scatter diagrams and predict the correlation and regression.***[PO2] [PO3][PO4] [PO5] [PO6]**.	**K1 K2 K3 K5 K6**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	1	-	-	1	1	-	1
CO2	3	1	3	-	1	-	2	1	-	1
CO3	3	1	3	1	-	-	2	1	-	1
CO4	3	-	2	-	-	-	1	1	1	1
CO5	3	1	3	1	1	2	1	2	-	1
Avg	3	1	3	1			1	1		1
Total	15	4	14	3	2	2	7	6	1	5

Strongly correlated – 3 Moderately correlated – 2 Weakly correlated –1

Unit I : PROBABILITY THEORY

Probability: – Definition– Axioms of probability – Properties - Probability space– Addition theorem for two and three events– Conditional Probability– Multiplication theorem for two events– Baye's theorem.Simple problems.

Chapter:3 Sections 3.3 to 3.5, 3.8.5, 3.9, 3.9.1, 3.10, 3.11 Chapter4: Section 4.2

Unit II:RANDOM VARIABLES

Random variable– One dimensional discrete and continuous random variables– probability function– probability density function– cumulative distribution function– definitions, properties and problems.

Random variable– Two dimensional discrete and continuous random variables– Joint and Marginal probability mass functions–Two dimensional distribution function, Jointand Marginal probability density functions, Independent random variables– Conditionaldistribution function and conditional probability density function– definitions, properties and problems.

Chapter: 5 Sections 5.1 to 5.4, 5.4.1, 5.5, 5.5.1 to 5.5.6,

Unit III: MATHEMATICAL EXPECTATION

Mathematical expectation– discrete and continuous random variable– expected value of random variable– properties of expected value– variance of a random variable– properties of variance– moments– moment generating function, Chebychev's Inequality – Problems using discrete and continuous probability distributions.

Chapter: 6 Sections 6.1,6.2, 6.4, 6.5, Chapter 7.1, 7.1.2, 7.1.3, 7.5.

Unit IV: DISTRIBUTIONS

Standard discrete and Continuous distributions– Bernoulli, Binomial, Poisson, Normal and Rectangular distributions– their properties– simple problems.

Chapter:8 Sections 8.3, 8.4, 8.4.1, 8.4.2, 8.4.6, 8.4.7, 8.5, 8.5.2, 8.5.5, 8.5.8 .

Chapter 9 Sections 9.2, 9.2.1, 9.2.2, 9.2.5, 9.2.7, 9.2.8, 9.2.13, 9.2.14, 9.3, 9.3.1, 9.3.2

Unit V: CORRELATION AND REGRESSION

Correlation– scatter diagram,Pearson's correlation coefficient– rank correlation– Spearman's rank correlation coefficient – Regression– Properties (simple problems).

Chapter:10 Sections 10.1 to 10.7,
Chapter 11, Sections 11.1, 11.2

Book for study:

Fundamentals of Mathematical Statistics– S.C. Gupta and V.K. Kapoor, S.Chand & Sons Educational Publishers, Delhi,2014.

Books for reference:

1.Elements of Mathematical Statistics– S.C. Gupta and V.K. Kapoor,Sultan Chand & Sons Educational Publishers, Delhi.2002

2. Mathematical Statistics by J.N.Sharma and J.K.Goyal, Krishna Prakashan Mandhir, Meerut, 1979.

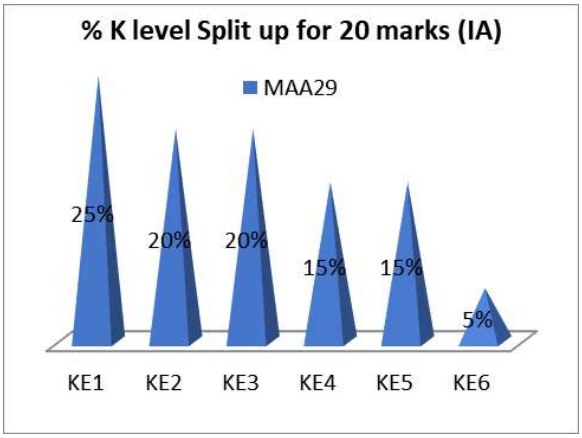
Web references:

1. www.nptel.com
2. mathsforum.org

ASSESSMENT PATTERN

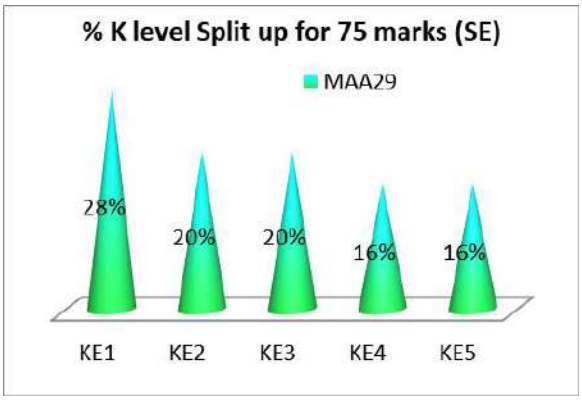
CIE – Continuous Internal Evaluation (25 Marks)

MAA29				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	2		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (3)	0	1		2
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75Marks; Weightage 75%)

MAA29	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	20%
Apply	20%
Analyze	16%
Evaluate	16%



MATHEMATICAL STATISTICS II

SEMESTER: IV **CODE: MAA30**

Course: Allied II - Course II **Credit: 5**

Learning Objectives: The course will provide the students to have a thorough knowledge in testing of hypothesis. Students will be able to analyze various phenomena in real life situations.

Knowledge level- K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze),K5(Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions. At the end of the course, students will be able to

CO NUMBER	COURSE OUTCOME STATEMENT	KNOWLEDGE LEVEL
CO 1	**Recall** the basic concepts of Sampling, Sampling Distribution, Testing of hypothesis, Errors, Level of Significance. Also **distinguish** between types of sampling, types of errors and types of hypothesis.	**K1, K2,K3, K4**
CO 2	Understand conceptually Large sample and **Interpret** the importance of their properties, **Analyse** the significance of proportion, mean, standard deviation with single sample and double samples. **Submit assignment [PDF format] in GC[PO7]**	**K1, K2,K3, K4,K5**
CO 3	**Analyse** various small sample tests- "t" tests for mean and correlation and **Evaluate** to arrive at an inference about the case under study. Also, demonstrating the concept of Chi-square test and its application to the case. **Team work and Interactive problem solving in groups [PO5,PO7] Written pdf file to be uploaded in Google classroom**	**K1,K2,K3, K4, K5, K6**
CO 4	**Categorize** the study of F- test for testing the variances in 2 and more than 2 samples. Also applying the concept of ANOVA for randomized designs to **evaluate** the significance of variances.**Submit assignment [PDF format] in GC[PO7]** http://www.tutorialspoint.com / statistics/hypothesis_testing.htm	**K1,K2,K3,K4, K5,K6**
CO 5	**Interpret** the characteristics of estimation and **Understand** and **analyze** about Neymann theorem and Cramer-Rao inequality.	**K1,K2,K3,K4,K5**

Strongly correlated – 3, Moderately correlated – 2, Weakly correlated –1

CO/PO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	1	2	1	1	_	1	1	1	1
CO2	3	1	2	1	1		2	1	1	1
CO3	3	3	3	2	3		2	2	1	2
CO4	3	2	3	2	2		2	2	1	2
CO5	3	2	2	1	1		1	1	1	1
Avg	3	2	2	1	2		2	1	1	1
Total	15	9	12	7	8		8	7	5	7

Unit I

Parameter and Statistics , Types of Sampling, Sampling distribution of statistics based on normal distribution–standard error, Test of Significance, Null Hypothesis, Alternative Hypothesis, Types of Error, Critical Region and Level of Significance. Power of tests, Procedure for Testing of Hypothesis.

Chapter 14 (Sections 14.1 to 14.5) of [1]

Unit II

Test of significance for Large sample: Test for Single Proportion, Test for difference of proportion, Test of significance for single mean, Test of significance for difference of means, Test of significance for difference of standard deviations.

Chapter: 14 (Sections 14.6 to 14.8) of [1]

UNIT III

Student's t – distribution (Definition only)- Small sample tests : Test of significance using student's t – distribution - Test of significance of sample mean and population mean , 't' – test for difference of means of two samples of sizes n_1 and n_2, (i), $n_1 \neq n_2$ (ii), $n_1 = n_2$ and the samples are independent , Paired 't' test of significance, t – test for an observed sample correlation coefficient - Chi-square distribution (Definition only)-Chi – square– test of goodness of fit– independence of attributes.

Chapter 15 (Sections 15.1,15.2, 15.6, 15.6.1 to 15.6.3) of [1]

Chapter: 16 (Sections 16.2, 16.3, 16.3.1 to 16.3.5) of [1]

Unit IV

F-distribution (Definition only) - F – test of significance to test the equality of population variances– ANOVA- one way and two way classification – Completely randomized design- Randomized Block design- Latin Square design.

Chapter: 16 Sections 16.5, 16.6, 16.6.1 of [1]

Chapter: 18 Sections18.1 to 18.7 , Chapter 19 Sections 19.1 to 19.5 of [2]

Unit V

Estimation- Characteristics of Estimators- Factorization theorem(Neymann)- Cramer-Rao Inequality.

Chapter: 17 Sections 17.1 to 17.3 of [1]

NOTE

Compulsory Assignment for 10 marks has to be submitted based on the following topics.

Case Study

Preparation of Questionnaire, collection of data, Interpretation of data using Charts and suitable tests.

Books for study:

1. S.C. Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th revised edition, Sultan Chand & Sons Educational Publishers, Delhi, 2014.

2. J.N.Sharma and J.K.Goyal, Mathematical Statistics, 8th Edition, Krishna Prakashan Mandir Publishers, Meerut, 1979.

Books for reference:

1. S.C. Gupta and V.K.Kapoor, Elements of Mathematical Statistics, 8th revised edition, Sultan Chand & Sons Educational Publishers, Delhi, 2002.

2. P.R. Vittal, Mathematical Statistics, New Edition, Margham Publications, Chennai, 2002 .

3. S.P.Gupta, Statistical Methods , 43rdEdition, Sultan Chand & Sons Educational Publishers, Delhi, 2014.

4. V.Seetharaman, Text book on Statistics, first edition, Nadanasundaram Press, Madurai, 1965.

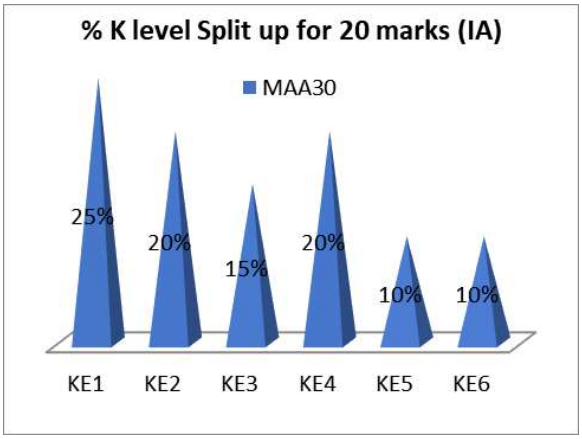
Web references :

1. www.nptel.ac.in
2. www.mathforum.org
3. http://www.tutorialspoint.com / statistics/hypothesis_testing.htm
4. www.khanacademy.org

ASSESSMENT PATTERN

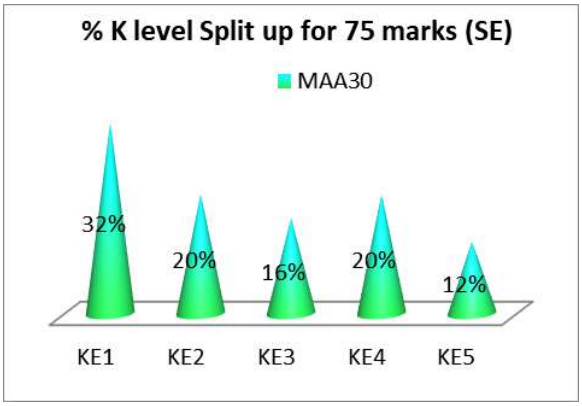
CIE – Continuous Internal Evaluation (25Marks)

MAA30				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (4)	1	0		3
Apply (3)	1	1		1
Analyse (4)	0	1		3
Evaluate (2)	1	0		1
Create (2)	0	2		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MAA30	
Bloom's Taxonomy	**Weightage %**
Remember	32%
Understand	20%
Apply	16%
Analyze	20%
Evaluate	12%



ALLIED MATHEMATICS -I

Semester: I **CODE: MAA31**

Course: Allied - I **Credit: 5**

Learning Objectives: This paper aims to impart knowledge on various mathematical problems that can be applied to solve problems in their related fields.

Knowledge level- K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze),K5(Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions. At the end of the course, students will be able to

CO NUMBER	COURSE OUTCOME STATEMENT	KNOWLEDGE LEVEL
CO 1	**Recall** the basic concepts of binomial and exponential concepts .Developing the knowledge on Binomial , Exponential, and Logarithmic Series and **interpret** the importance of their properties.	**K1, K2, K3,K5**
CO 2	**Evaluate** Eigen values, Eigen vectors and inverse of matrix using Cayley Hamilton theorem.**understand and analyse** various properties of eigen values and eigen vectors.**Submit assignment [PDF format] in GCR [PO7].** **http://www.sosmath.com /matrix / eigen0/ eigen0.htm**	**K1. K2, K3,K4,K5**
CO 3	**Evaluate** trigonometric expansion of $\cos^n\theta$, $\sin^n\theta$, $\cos n\theta$, $\sin n\theta$, $\sin\theta$, $\cos\theta$, and $\tan\theta$ in terms of θ.	**K1, K2, K3, K5**
CO 4	Understand the Hyperbolic functions and relating with circular functions. Separating real and imaginary parts.**Distinguish** and **determine** the difference between circular and hyperbolic functions. **Team work and Interactive problem solving in groups [PO5,PO7,] Written pdf file to be uploaded in Google classroom.**	**K1, K2, K3,K4,K5,K6**
CO 5	Extending the concept of differentiation to higher order. **Evaluating** Curvature and Radius of curvature . **Categorize and assess** the radius of curvature in Cartesian and polar coordinates. **Submit assignment [PDF format] in GCR [PO7]**	**K1, K2, K3,K4, K5**

Strongly correlated – 3,Moderately correlated – 2 ,Weakly correlated –1

CO/PO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	1	2	1	1		1	1	1	1
CO2	3	2	2	2	2		2	2	1	2
CO3	3	1	1	1	1		1	2	1	1
CO4	3	3	3	2	3		3	3	1	2
CO5	3	2	2	2	2		1	2	1	1
Avg	3	2	2	1	2		2	2	1	1
Total	**15**	**9**	**10**	**8**	**9**		**8**	10	**5**	**7**

Unit I

Binomial series, Exponential series and Logarithmic series – Summations only

Chapter 2 (Section 2.1.3, 2.2.1 & 2.3.3) of [1]

Unit II

Eigen values and Eigen vectors - Cayley Hamilton Theorem – Inverse of a matrix using Cayley Hamilton Theorem.

Chapter 4 (Section 4.5, 4.5.2 & 4.5.3) of [1]

Unit III

Expansions – Expansions of $\cos^n\theta$ and $\sin^n\theta$ – Expansions of $\cos n\theta$ and $\sin n\theta$ – Expansions of $\sin\theta$, $\cos\theta$, $\tan\theta$ in θ.

Chapter 6 (Section 6.1, 6.1.1, 6.1.2 & 6.1.3) of [1]

Unit IV

Hyperbolic functions- Relations between circular and hyperbolic functions - Formulae in hyperbolic functions – Real and Imaginary parts.

Chapter 6 : (Section 6.2, 6.2.1, 6.2.2 & 6.2.3) of [1]

Unit V

Successive Differentiation- n^{th} derivatives – Leibnitz's theorem - Curvature and radius of curvature .

Chapter 1 (Section 1.1, 1.1.1, 1.1.2 & 1.4.3) of [2]

Books for study:

1. Prof P.Duraipandian & Dr.S.Udayabaskaran , Allied Mathematics – Vol 1 (First Edition), S.Chand and Company Ltd., New Delhi, 2014

2. Prof P.Duraipandian & Dr.S.Udayabaskaran , Allied Mathematics – Vol 2 (First Edition), S.Chand and Company Ltd., New Delhi, 2014

Books for reference:

1. T. K. Manickavachagom Pillay, T. Natarajan and K. S. Ganapathy, Algebra, Volume I &II, S. Viswanathan Printers & Publishers Pvt. Ltd., Chennai, 2011.
2. S. Narayanan and T. K Manickavachagom Pillay, Calculus Volume I, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, Reprint 2011
3. S.Narayanan, T. K. Manickavachagom Pillay, Trigonometry, S. Viswanathan(Printers and Publishers) Pvt. Ltd., Chennai, Reprint 2009 .
4. S. Arumugam & A.Thangapandi Issac, Modern Algebra, New Gamma Publications, Darjling, India, 2000

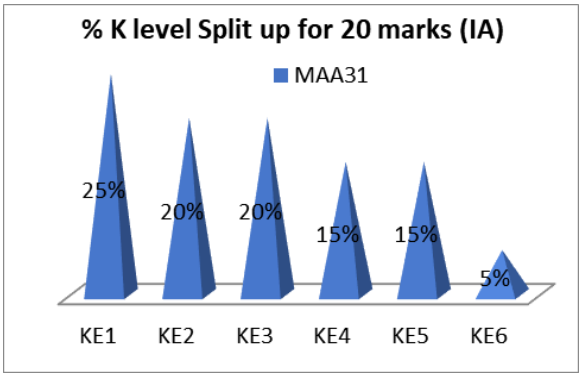
Web references:

1. www.nptel.ac.in
2. www.mathforum.org
3. http://www.sosmath.com /matrix / eigen0/ eigen0.htm
4. www.khan academy.org

ASSESSMENT PATTERN

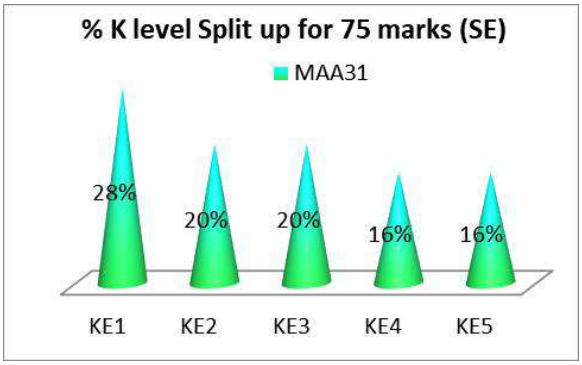
CIE – Continuous Internal Evaluation (25 Marks)

MAA31				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	2		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (3)	0	1		2
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MAA31	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	20%
Apply	20%
Analyse	16%
Evaluate	16%



ALLIED MATHEMATICS -II

Semester: II **Code: MAA32**

Course: Allied- II **Credit: 5**

Learning Objectives: This paper aims to impart knowledge on various mathematical problems that can be applied to solve problems in their related fields.

Knowledge level- K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze),K5(Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding through interactive sessions. At the end of the course, students will be able to

CO NUMBER	COURSE OUTCOME STATEMENT	KNOWLEDGE LEVEL
CO 1	Understand the **Evaluation** of integrals of type $\int e^{ax} \cos bx\, dx$ and $\int e^{ax} \sin bx\, dx$, integrals using Bernoull's formula.	**K1,K2,K3,K5**
CO 2	**Distinguish** between various reduction formulae and **Evaluate** integrals of type $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int_0^{\Pi/2} \cos^n x\, dx$, $\int_0^{\Pi/2} \sin^n x dx$, $\int_0^{\Pi/2} \sin^m x \cos^n x\, dx$, where m and n are positive integers. **Submit assignment [PDF format] in GC[PO7]**	**K1,K2,K3, K4, K5**
CO 3	Do Conceptual demonstration of Vectors, related functions and vector operators. **understand and analyse** various properties of vectors	**K1,K2,K3, K4,**
CO 4	**Categorize** and **assess** the linear differential equations and solving related problems. **Submit assignment in linear differential equations problems [PDF format] in GC[PO7]** http://www.tutorialspoint.com / diiferential_equations/index.asp	**K1,K2,K3, K4, K5**
CO 5	Develop the knowledge about partial differential equations and obtaining general, singular and complete solution. Also **distinguish** between them and **evaluate** partial differential equation by Lagrange's method. **Team work and Interactive problem solving(Partial differential equations) in groups [PO5,PO7,] Written pdf file to be uploaded in Google classroom**	**K1,K2,K3, K4, K5, K6**

Strongly correlated – 3,Moderately correlated – 2 ,Weakly correlated –1 ,No Correlation – 0

CO/PO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	1	2	1	1		1	1	1	1
CO2	3	2	2	2	2		2	2	1	2
CO3	3	1	1	1	1		1	2	1	1
CO4	3	2	2	2	2		3	2	1	2
CO5	3	3	3	2	3		3	3	1	2
Avg	3	2	2	2	2		2	2	1	2
Total	**15**	**9**	**10**	**8**	**9**		**10**	**10**	**5**	**8**

Unit I

Evaluation of $\int e^{ax}$ cos bx dx and $\int e^{ax}$ sin bx dx where a and b are constants- Integration by parts- Bernoulli's Formula- Definite integral and its properties.

Chapter 2 (Sections 2.6, 2.6.1, 2.7, 2.8)

Unit II

Reduction formulae, $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int_0^{\Pi/2} \cos^n x\, dx$, $\int_0^{\Pi/2} \sin^n x dx$, $\int_0^{\Pi/2} \sin^m x \cos^n x\, dx$, where m and n are positive integers.

Chapter 2 (Sections 2.9, formula 1,2 3 only)

Unit III

Vector calculus: Scalar and Vector point functions. Differentiation of Vectors, Differential operators, Directional Derivative, Gradient, Divergence and Curl.

Chapter 8 (Sections 8.2, 8.2.2, 8.3, 8.3.1, 8.4, 8.4.1)

Unit IV

Linear differential equations of the second order with constant coefficients of the form $(aD^2+bD+c)y=e^{ax}$ v (v is any function of the form cos bx, sin bx, x^n) and $(aD^2+bD+c)y=x^m$ (m being a positive integer),Linear differential equations with variable coefficients (reducible to θ form)

Chapter 5 (Sections 5.2.1, 5.2.3)

Unit V

Partial differential equations: Formation of equation by elimination of arbitrary constants and an arbitrary function. Definition of general, particular and complete solutions, singular solution (Geometrical Meaning not expected) solution of first order equation on the standard forms.

1.F(p,q)=0 2.F(x,p,q)=0 3.F(y,p,q) =0 4. F(z,p,q)=0 5.F_1 (x,p)=F_2(y,q)

Lagrange's method of solving the differential equations Pp+Qq=R (Geometrical interpretation not expected)

Chapter 6 (Sections 6.1, 6.2, 6.3, 6.4)

Book for study:

1. Prof P.Duraipandian & Dr.S.Udayabaskaran , Allied Mathematics – Vol 2 (First Edition), S.Chand and Company Ltd., New Delhi, 2014

Books for reference:

1. T. K. Manickavachagom Pillay, T. Natarajan and K. S. Ganapathy, Algebra Volume I &II, S. Viswanathan Printers & Publishers Pvt. Ltd., Chennai, 2011

2. S. Narayanan and T. K Manickavachagom Pillay, Calculus Volume I, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, Reprint 2011

3. S.Narayanan, T. K. Manickavachagom Pillay, Trigonometry, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai, Reprint 2009 .

4. S. Arumugam & A.Thangapandi Issac, Modern Algebra, New Gamma Publications, Darjling, India, 2000

Web references:

1.www.nptel.ac.in

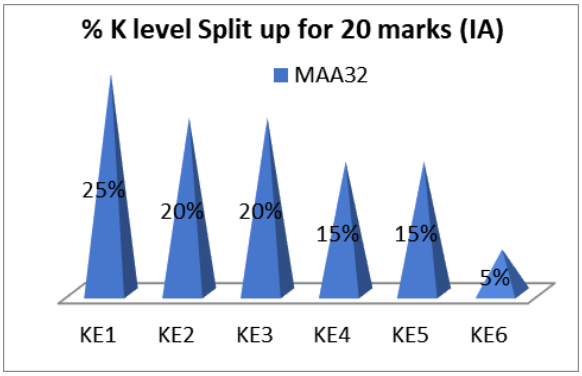
2.www.mathforum.org

3. http://www.tutorialspoint.com / diiferential_equations/index.asp

ASSESSMENT PATTERN

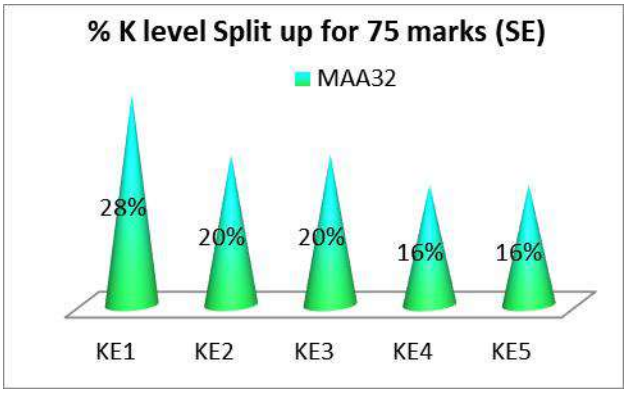
CIE – Continuous Internal Evaluation (25 Marks)

MAA32				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	2		1
Understand (4)	1	0		3
Apply (4)	1	1		2
Analyse (3)	0	1		2
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation **(75 Marks; Weightage 75%)**

MAA32	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	20%
Apply	20%
Analyze	16%
Evaluate	16%



STATISTICAL METHODS I

Semester: III **Code: MAA 33**
Course: Allied Mathematics(for Geography) - I **Credit: 5**

Learning Objectives: The course will help the students to have a well founded knowledge in handling of data using various representations and to analyze various phenomena in real life situations.

Course Outcomes with K- Level Mapping:K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create. Throughout the course, students are trained to understand the various representations to represent and analyse various types of data from real life situations and the students would be able to

CO NUMBER	COURSE OUTCOME STATEMENT	KNOWLEDGE LEVEL
CO 1	**Define** statistical data and **explain** the various diagrammatic representations of data. **Compare** the different representations and **construct** bar and pie diagrams for various types of data **(Group activity)**	**K1, K2,K3, K4, K6**
CO 2	**Define** the different measures of Central tendency, **compare** and **evaluating** them for different data -www.nptel.com,	**K1, K2,K3,K4, K5**
CO 3	**Understanding** and **defining** the various measures of Dispersion, **comparing and estimating** their values for various data**(E-quiz)**	**K1, K2, K5, K6**
CO 4	**Defining** and **explaining** the concepts of Moments, Skewness and Kurtosis and **analysing** them for a given data by **estimating** their values. **www. mathsforum.org**	**K1, K2, K4, K5, K6**
CO 5	**Defining** the Correlation coefficient and **relating** them to real life events by **estimating** their values and **making decisions.** **Group Activity : To calculate rank correlation for marks in different subjects**	**K1, K2, K3, K4, K5, K6**

Strongly Correlated -3 Moderately Correlated -2 Weakly Correlated - 1

CO/PO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	3	2	1	1	2	1	2	1	-	1
CO2	3	1	2	1	-	-	2	1	1	1
CO3	3	2	2	1	2	1	2	1	-	1
CO4	3	2	1	1	-	-	2	1	1	1
CO5	3	2	2	1	2	1	2	1	1	1
Avg	3	2	2	1	1	1	2	1	1	1
Total	15	9	8	5	6	3	10	5	3	5

Unit I

Diagrammatic representation of various types of statistical data– Bar diagram – Pie diagram and Frequency curves.

Chapter: 6 (Pages 128 -145, 165 -176)

Unit II

Measures of central tendency– Mean, Median, Mode– Concepts, Formulae without proof and simple problems.

Chapter: 7 (Pages 178- 219)

Unit III

Measures of Dispersion– Range, Quartile deviation, Standard deviation and Coefficient of variation– Concepts.Formulae without proof and simple problems.

Chapter: 8 (Pages 272-302)

Unit IV

Moments: about origin, Central moments (upto fourth moments, formula only with simple problems) – Skewness– Kurtosis – Concept and simple problems only.

Chapter: 9 (Pages 342, 350 – 353, 355 -387)

Unit V

Correlation – Scatter diagram– Pearson's Correlation coefficient– Spearman's rank Correlation coefficient– Simple problems.

Chapter: 10 (Pages 390 -423)

Book for study:

Statistical Methods by S.P.Gupta, Sultan Chand and Sons Educational Publishers, Delhi,2002.

Book for Reference:

Mathematical Statistics by Dr. P.R. Vittal, Margham Publications, New Edition ,2016.

Web References:

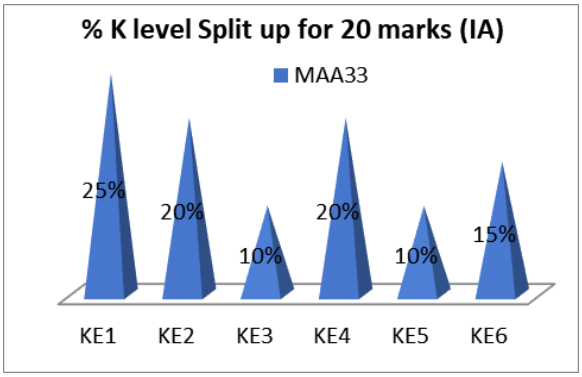
1.www.nptel.com

2.www. mathsforum.org

ASSESSMENT PATTERN

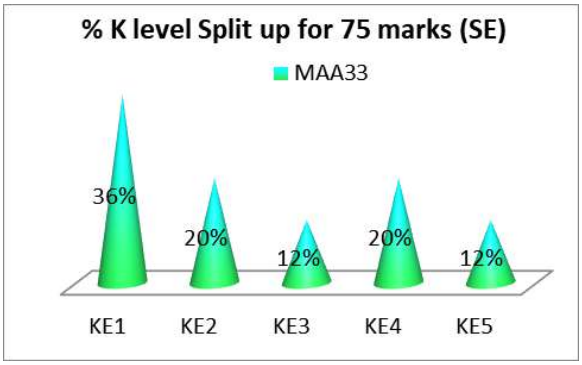
CIE – Continuous Internal Evaluation (25 Marks)

MAA33				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	0		3
Understand (4)	1	0		3
Apply (2)	1	1		0
Analyse (4)	0	1		3
Evaluate (2)	1	0		1
Create (3)	0	3		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MAA33	
Bloom's Taxonomy	**Weightage %**
Remember	**36%**
Understand	20%
Apply	12%
Analyze	20%
Evaluate	12%



STATISTICAL METHODSII

Semester: IV **Code: MAA 34**

Course: Allied Mathematics (for Geography) - II **Credit : 5**

Learning Objective: The course will provide the students a well founded knowledge in testing of hypothesis. Students will be able to analyse various phenomena in real life situations.

Course Outcomes with K- Level Mapping:K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create. Throughout the course, students are trained to understand the various representations to represent and analyse various types of data from real life situations and the students would be able to

CO NUMBER	COURSE OUTCOME STATEMENT	KNOWLEDGE LEVEL
CO 1	**Define** and **explain** the concepts of normal distribution and **solve** problems applying normal distribution. **Explain** the concept of Sampling distribution and **estimating** their errors in **solving** problems	**K1, K2,K3, K5, K6**
CO 2	**Define** basic concepts in testing hypothesis, **explain** the process of **creating and testing** a null hypothesis, **Applying** to real life problems by **creating** a null hypothesis and **test** the level of significance using two-tailed tests and **decide** on accepting or rejecting the null hypothesis for large samples **(Small group Assignment) [PO2, PO3]** https://youtu.be/Q1yu6TQZ79w	**K1, K2,K3,K4, K5, K6**
CO 3	**Define** and **explain** the t-distribution for testing the level of significance for small samples. **Estimate and Compare** i) the means of sample and population ii) samples of different sizes using t-test and paired t-test for small samples **(Group Activity:** Prepare a questionnaire, collect data and perform t- test for testing Hypothesis) –**[PO5]**	**K1, K2, K4, K5, K6**
CO 4	**Define** F -test and **apply** the F- test of significance to **test the equality** of two different estimates of the population variance**https://youtu.be/gp5xQHdbwwI[PO4]**	**K1, K2, K4, K6**
CO 5	**Defining** the Chi – square test for **analysing** the independence of attributes and **applying** the Chi – square test of goodness of fit for **testing** data.	**K1, K3, K4, K6**

Strongly Correlated -3 Moderately Correlated -2 Weakly Correlated – 1

CO/PO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international	Lifelong learners
CO1	3	1	1	2	-	-	1	1	-	1
CO2	3	2	3	1	2	1	2	1	1	1
CO3	3	2	2	2	2	1	2	2	-	2
CO4	3	2	1	1	-	-	1	1	1	1
CO5	3	2	2	2	2	1	2	1	1	1
Avg	3	2	2	2	1	1	2	1	1	1
Total	**15**	**9**	**9**	**8**	**6**	**3**	**8**	**6**	**3**	**6**

UnitI:

Normal distribution: Concepts and simple problems – Concept of sampling distribution – Standard error.

Chapter 8 : Sections (8.2 , 8.2.2 , Chap 12: 12.3.1, 12.3.2)

Unit II:

Test of significance of large samples: Parameter and Statistics - Two tailed tests, Types of Error, Level of Significance, Null Hypothesis , Alternative Hypothesis.

Test of significance for large samples with respect to mean, Test for equality of two means- concepts and problems.

Chapter: 12: Sections (12.3, 12.4, 12.5, 12.6,12.7, 12.8, 12.13, 12.14)

Unit III:

Test of significance for small samples: using student's t – distribution –

Test of significance of sample mean and population mean

't' – Test for difference of means of two samples

(a), If $n_1 = n_2$

(b), If $n_1 \neq n_2$ where n_1 and n_2 are sizes of samples and samples are independent.

Paired 't' test of significance

Chapter: 14: Sections (14.2.5, 14.2.6, 14.2.7)

Unit IV: Test of significance for small samples: F – test of significance to test the equality of two different estimates of the population variance– simple problems

Chapter: 14: Sections (14.3.1, 14.3.2)

UnitV:

Chi – square test: Test for independence of attributes and Chi – square test of goodness of fit– simple problems.

Chapter: 13: Sections : (13.5, 13.5.2, 13.5.3)

Book for Study:

1. S.C. Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th revised edition, Sultan Chand & Sons Educational Publishers, Delhi, 2014.

Books for reference:

1. Statistical Methods by S.P.Gupta, Sultan Chand and Sons Educational Publishers, Delhi,2002.

2. Mathematical Statistics by Dr. P.R. Vittal, Margham Publications, New Edition ,2016.

3. Fundamentals of Statistics, S.C. Gupta, Himalaya Publishing House, Seventh Edition.

4.Fundamentals of Applied Statistics, S.C.Gupta and V.K. Kapoor, Sultan Chand Publications, New Edition.

Web references :

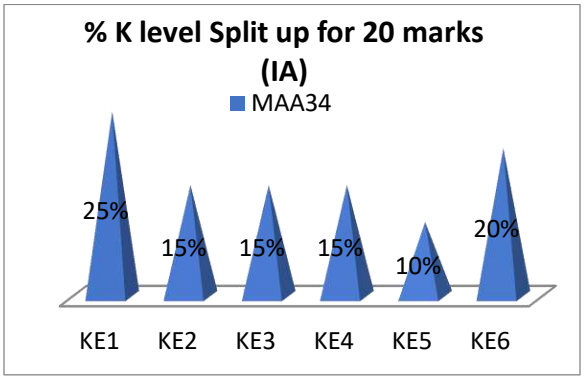
1.www.nptel.ac.in

2. www. mathsforum.org

ASSESSMENT PATTERN

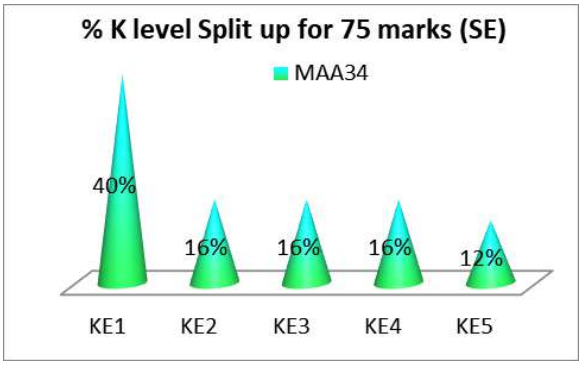
CIE – Continuous Internal Evaluation (25 Marks)

MAA34				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (3)	1	0		2
Apply (3)	0	1		2
Analyse (3)	1	0		2
Evaluate (3)	1	0		2
Create (3)		3		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MAA34	
Bloom's Taxonomy	**Weightage %**
Remember	**40%**
Understand	16%
Apply	16%
Analyze	16%
Evaluate	12%



FUNDAMENTALS OF STATISTICS

Semester : III **Code :MANM5**
Course: Non Major Elective - I **Credit: 2**

Learning Objectives: The course will provide the students to have a fundamental knowledge in basic mathematical statistics concepts which acquire skills in handling real life situations.

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5(Evaluate), K6(Create). Throughout the course, retention of all concepts is emphasized after thorough understanding through interactive sessions. At the end of the Course, the Student will be able to:

CO1	**Acquire** the knowledge of converting data into a single value (Average) which helps in **decision** making problems. **Apply** this concept to find the mean in our daily life problems. **[PO3]**	**K1, K2,K3, K4, K5**
CO2	**Evaluate** the data according to magnitude to get the positional average (Median).**Apply** it in finding the mid value for a bigger data.**[PO3,PO5]**	**K1, K2, K3, K4,K5**
CO3	**Apply** the knowledge of calculating mode for discrete data and continuous data. **[PO3,PO4,]**	**K1, K2, K3,K5**
CO4	**Dealing** with the study of extreme values which is applied in industrial problems. Assignment problems in range and quartile deviation and submitted as pdf in Google classroom **[PO2,PO3,PO7]**	**K1, K2, K3, K4,K5**
C05	**Evaluate** measure of dispersion (standard deviation) . Practice problems as assignment and submit as pdf in Google class room .**[PO2,PO3,PO4,PO7]** **nptel.ac.in**	**K1, K2, K3, K4,K5**

Strongly Correlated -3 Moderately Correlated -2 Weakly Correlated -1

CO/PO/ PSO	PO									
	1	2	3	4	5	6	7	8	9	10
	Disciplinary Knowledge and skills	Skilled Communicator	Critical thinker and problem solver	Sense of inquiry	Team player/worker	Skilled project manager	Digitally Efficient	Ethical awareness/ reasoning	National and international perspective	Lifelong learners
CO1	2	2	2	1	1			1		
CO2	2	2	2	1	1			1		
CO3	2	2	2	1	1			1		
CO4	2	2	2	1	1		2	1		1
CO5	2	2	2	1	1		2	1	2	1
AVG	2	2	2	1	1		1	1		
TOTAL	10	10	10	5	5		4	5	2	2

Unit-I :Arithmetic mean:

Formulae for calculating arithmetic mean in a frequency distribution – Merits and Demerits– Simple Problems.

Part IIChapter: 5 , Pages 5.1 – 5.5 and 5.8 - 5.10

Unit- II :Median

Concept : Simple problems.

Part IIChapter: 5 Pages 5.5 -5.7 and 5.10 - 5.13

Unit- III: M**ode**

Definition – Formulae: Merits and Demerits– Simple Problems.

Part IIChapter: 5 Pages 5.7 and 5.15 – 5.15

Unit- IV: Range, Quartile deviation

Merits and Demerits– Simple Problems.

Part IIChapter: 6 Pages 6.1 – 6.2, 6.7

Unit-V: Standard deviation

Formulae– Merits and Demerits-Simple Problems.

Part IIChapter: 6 Pages 6.4, 6.9

Book for study:

1.P.R.Vittal,Mathematical Statistics, Margham Publications, 2016

Books for reference :

1. Dr. S.P.Gupta, Statistical methods, Sultan Chand and Sons Educational Publishers, Delhi **,** 2014
2. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Educational Publishers, Delhi **,** 2014.
3. R.S.N.Pillai and V.Bagavathi, Statistics, S.Chand and company Ltd., 2000 .
4. J.N.Kapoor and H.C. Saxena , Mathematical Statistics, S.Chand and company Ltd., 2005 .

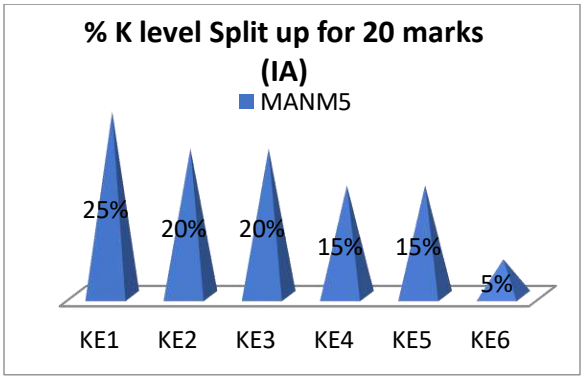
Web references :

1.www.nptel.com
2.www.mathsforum.org
3.www.quora.com
4.www.vedantu.com
5.www.datasciencecentral.com

ASSESSMENT PATTERN

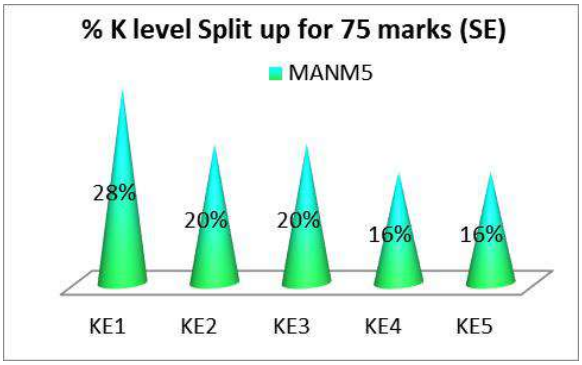
CIE – Continuous Internal Evaluation (25 Marks)

MANM5				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (5)	2	1		2
Understand (3)	1	0		2
Apply (3)	1	1		2
Analyse (3)	0	1		2
Evaluate (2)	1	0		2
Create (4)	0	2		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MANM5	
Bloom's Taxonomy	**Weightage %**
Remember	**28%**
Understand	20%
Apply	20%
Analyze	16%
Evaluate	16%



APPLICATIONS OF MATHEMATICS AND STATISTICS

Semester : IV **Code : MANM6**

Course:Non Major Elective - II **Credit: 2**

Learning Objectives: The subject will provide the students to have a fundamental knowledge in basic concepts in the area of Application of Mathematics and Statistics.

Course Outcomes: Knowledge level - K1 (Remember), K2 (Understand), K3 (Apply), K4 (Analyze), K5 (Evaluate), K6 (Create). Throughout the course, retention of all the concepts is emphasized after thorough understanding. At the end of the Course, the Student will be able to

CO1	**Define** a Determinant. **Discuss** the properties of Determinants. **Finding** the value of the Determinant. Addition and Multiplication. **Introducing** Crammer's Rule for solving a system of linear Equations. **Practice** problems **[PO3, PO4, PO7]**	**K1,K2,K3,K5**
CO2	**Define** Matrices. **Discuss** the types of matrices with examples. Addition and multiplication. **Video Lessons:**https://www.youtube.com/watch?v=xyAuNHPsq-g. Finding the inverse of a matrix and solving problems**. Apply this concept to Solve** a system of linear Equations. **[PO3, PO5, PO7]**	**K1,K2,K5,K6**
CO3	**Introduce** the concept of Rank of the Matrix. **Finding** the rank using elementary matrix transformations and solving problems**. Apply** the concept to**test**Consistency of system of non-homogenous linear equations. **[PO3, PO5, PO7]**	**K1,K2,K4**
CO4	**Define** correlation. **Explaining** its uses and types. Problem solving. **Analyzing** the data given, using the calculated value. **[PO3, PO4, PO7]. Assignment given as team work for solving problems.**	**K1,K2,K4**
CO5	**Understanding** the concept of Rank Correlation and **solving** problems. **Analyzing** the data given, using the calculated value. **Interactive** session through PPT, GMeet**[PO3, PO4, PO7]. Assignment given as team work for solving problems.**	**K1,K2,K4**

Strongly correlated – 3 **Moderately correlated – 2** **Weakly correlated – 1**

CO/PO/ PSO	**PO**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Disciplinary Knowledge and skills	**Skilled Communicator**	**Critical thinker and problem solver**	**Sense of inquiry**	**Team player/worker**	**Skilled project manager**	**Digitally Efficient**	**Ethical awareness/ reasoning**	**National and international perspective**	**Lifelong learners**
CO1	2	1	3	1	1		2	1		1
CO2	2	1	3	1	1		2	1		1
CO3	2	1	3	2	2		2	1		1
CO4		2	3	3	3	1	2	1		1
CO5		2	3	3	3	1	2	2		1
AVG	1	1	3	2	2		2	1		1
TOTAL	6	7	15	10	10	2	10	6		5

Unit – I: Determinants

Definition, properties, simple problems
Chapter: 1

Unit– II: Matrices

Definition, Types of matrices, Arithmetic operations on matrices
Chapter: 2

Unit – III: Matrices

Rank of a matrix, problems (for rank of order 3)
Chapter : 2

Unit IV: Correlation

Definition, Karl Pearson's Coefficient of Correlation (problems only).
Chapter: 10 (Pages 390, 398)

Unit- V: Rank Correlation

Definition, Spearman's Coefficient of rank Correlation, repeated ranks (problems only).
Chapter: 10 (Pages 416 – 423)

Books for study :

1. T.K.M. Pillai, T. Natarajan, K.S. Ganapathy, Algebra, Volume II. S.Vishwanathan (Printers and Publishers), PVT LTD, 1997.
2. S.P.Gupta, Statistical Methods, Sultan Chand and Sons, New Delhi, 2002

Books for reference:

1. S.Arumugam, Thangapandi Issac , Classical Algebra, New Gamma Publishing House, Palayamkottai, 2011
2. Algebra and Trigonometry, S.Sudha Emerald Publishers, Chennai, 1998.
3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons Educational Publishers, Delhi, 2002
4. Mathematical Statistics by J.K.Goyal and J.N.Sharma, Krishna Prakashan Mandhir, Meerut, 1978

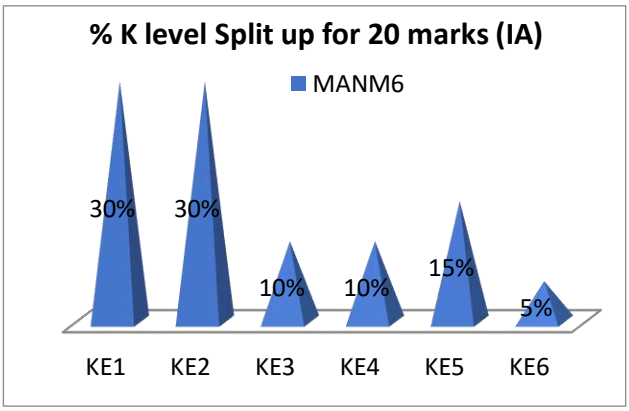
Web references:

1. https://www.toppr.com/guides/maths/matrices/matrix/
2. https://nptel.ac.in/courses/111/107/111107112/
3. https://www.toppr.com/guides/business-mathematics-and-statistics/correlation-and-regression/rank-correlation/

ASSESSMENT PATTERN

CIE – Continuous Internal Evaluation (25 Marks)

MANM6				
Bloom's Taxonomy	**Test**	**Assignment**	**Attendance**	**Model Exam**
Total (25)	**5**	**5**	**5**	**10**
Remember (6)	2	2		2
Understand (6)	1	0		5
Apply (2)	1	1		0
Analyse (2)	0	1		1
Evaluate (3)	1	0		2
Create (1)	0	1		0



ESE – End Semester Evaluation (75 Marks; Weightage 75%)

MANM6	
Bloom's Taxonomy	**Weightage %**
Remember	**32%**
Understand	28%
Apply	12%
Analyze	12%
Evaluate	16%