

ST.PHILOMENA'S COLLEGE (AUTONOMOUS), MYSURU

POST GRADUATE COURSE – SEMESTER SCHEME

Learning Outcome Based Curriculum from the

Academic year 2018-20 onwards

PG DEPARTMENT OF MATHEMATICS



ST. PHILOMENA'S COLLEGE (AUTONOMOUS) MYSORE POST GRADUATE PROGRAMMES Learning Outcome Based Curriculum – 2018 Guidelines/Regulations

(For Candidates admitted during the Academic year 2018 -2020 onwards)

POST GRADUATE PROGRAMMES

The Master's Degree Programme will be conducted under the existing regulations governing two year- four semesters Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) with Learning Outcome - Based Curriculum under Autonomous Structure.

Guidelines/Regulations

1. Eligibility for Admission

Candidates shall have studied Mathematics as Major/Core subject in any Bachelor degree course of any recognized University with not less than 45 % (40% for SC/ST and Category - I Candidates) of the aggregate marks of all the years of course of study. The qualification and the percentage marks for admission shall be as per the guidelines issued by University of Mysore from time to time

Note: - In case of candidates who have taken more than three years to complete their Bachelors Degree, the percentage of mark is arrived as per the guidelines issued by University of Mysore from time to time

2. Duration of the Programs

The duration of Programme shall extend over 4 semesters (two academic years) of 20 weeks each including instructions and examinations.

3. Maximum Period for Completion of the Programs

The candidates shall complete the Programme within 4 years from the date of admission. The term completing the Programme means passing all the prescribed examinations of the programme to become eligible for the degree. No candidate shall be permitted to appear for the examinations after the prescribed period for completing the Programme. Whenever a candidate opts for blank semesters/ dropped papers, he/she have to study the prevailing papers offered by the department when he /she continues his /her studies.

4. Medium of Instruction

The medium of instruction shall be English.

5. Hours of Instruction per Week

There shall be 24-30 hours of instructions per week in subjects without practicals / field-work and 28-34 hours of instructions per week in subjects with practicals /field-work. These hours may be distributed for lectures, seminars, tutorials, practicals, project-work and other modes of instruction which individual courses may demand.

6. Attendance

Each paper (theory/practical) shall be treated as an independent unit for the purpose of attendance. A student shall attend a minimum of 75% of the total instruction hours in a paper (theory/practical) including tutorials and seminars in each semester. There shall no provision for condonation of shortage of attendance and a student who fails to secure 75% attendance in a paper shall be required to repeat that semester with the payment of semester fees.

7. Guidelines to Implement CBCS & CAGP Master Degree Programme

Course: Every paper offered will have three components associated with the teaching-learning process, namely

(a) L - Lecture (b) T - Tutorial (c) P - Practical

Where

L - Stands for Lecture session.

T - Stands for Tutorial session consisting participatory discussion/self-study/desk work/ brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

P -Stands for Practical session and it consists of Hands on experience / Laboratory Experiments/Field Studies/Case studies that equip students to acquire the much required skill component.

In terms of credits, every one hour session of L per week amounts to one credit per semester and a minimum of two hour session of T or P per week amounts to one credit per semester, over a period of one semester of 16 weeks for teaching – learning process. The total duration of a semester is 20 weeks inclusive of semester end examination.

A paper shall have either one or two or all the three components. That means a may have only lecture component, or only practical component or combination of any two or all the three components.

The total credit earned by a student at the end of the semester upon successfully completing the course is equal to L + T + P of each paper.

Different papers of study are labeled and defined as follows:

Hard Core Paper

A paper which should compulsorily be studied by a candidate as a core requirement is termed as a **Hard Core Paper**.

Soft Core Paper

If there is a choice or an option for the candidate to choose a paper from a pool of papers from the main discipline subject of study or from a sister/related discipline / subject which supports the main discipline/ subject is termed as a **Soft Core Paper**.

Elective Paper

Generally a paper which can be chosen from a pool of papers and which may be very specific or specialized or advanced or supportive to the discipline / subject of study or which provides an extended scope or which enables an exposure to some other discipline / subject / domain

or nurtures the candidate's proficiency / skill is called an Elective Paper. Elective papers may be offered by the main discipline / subject of study or by sister / related discipline / subject of study. *A Soft Core paper may also be considered as an elective.*

Open Elective

An elective paper chosen generally from an unrelated discipline / subject, with an intention to seek exposure is called an **open elective. A core paper offered in a discipline / subject may be treated as an elective by other discipline / subject and vice versa**.

Project work / Dissertation work

It is a special paper involving application of knowledge in solving / analyzing / exploring a real life situation / difficult problem.

Minor Project Work

A project work up to 4 credits is called Minor Project work.

Major Project Work

A project work of 6 to 8 credits is called Major Project Work.

Dissertation Work

A project work can be of 10 - 12 credits. A Project /Dissertation work may be a hard core or a soft core as decided by the BOS concerned.

8. Scheme of Instruction

8.1 A candidate has to earn a minimum of *76 credits*, for successful completion of a Master's Degree with a distribution of credits for different papers as given in the following table.

Paper Type	Credits
Hard Core	A minimum of 42, but not exceeding 52
Soft Core	A minimum of 16
Open Elective	A minimum of 08

- 8.2 A candidate can enroll for a maximum of 24 credits per semester.
- **8.3** Only such candidates who register for a minimum of 18 credits per semester and complete successfully 76 credits in 4 successive semesters shall be considered for declaration of ranks, medals and are eligible to apply for student fellowship, scholarship, free ships and hostel facilities.

9. Continuous Assessment, Earning of Credits and Award of Grades

The evaluation of the candidate shall be based on continuous assessment. The structure for evaluation is as follows:

9.1 Assessment and evaluation processes happen in a continuous mode. However, for reporting purposes, a semester is divided into 3 distinct components identified as C_1 , C_2 , and C_3

9.2 The performance of a candidate in a paper will be assessed for a maximum of 100 marks as explained below.

a) The first component (C₁) of assessment is for 15 marks. This will be based on test, assignment, seminar and attendance (Class Participation).During the first half of the semester, the first 50% of the syllabus will be completed. This shall be consolidated during the 8th week of the semester. Beyond 8th week, making changes in C₁ is not

permitted. The marks for the class participation - 91-100 % -05 marks, 81-90% - 04 marks and 75-80\% -03 marks.

- b) The second component (C₂) of assessment is for 15 marks. This will be based on test, assignment, seminar and attendance (Class Participation). The continuous assessment and scores of second half of the semester will be consolidated during the 16^{th} week of the semester. During the second half of the semester, the remaining units in the paper will be completed. The marks for the class participation- 91-100 % -05 marks, 81-90% 04 marks and 75-80% -03 marks
- c) The outline for continuous assessment activities for Component I (C₁) and Component – II (C₂) will be proposed by the teacher(s) concerned before the commencement of the semester and will be discussed and decided in the respective Departmental Council. The students should be informed about the modalities well in advance. The evaluated papers / assignments during component - I (C₁) and component - II (C₂) of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.
- d) During the $18^{th} 20^{th}$ week of the semester, a semester end examination of 2 hours duration shall be conducted for each paper. This forms the third/final component of assessment (C₃) and the maximum marks for the final component will be 70.

10. Setting Question Papers and Evaluation of Answer Scripts.

- a) Question papers in three sets shall be set one by the internal and two by the external examiners. While selecting the examiners the University Guidelines to be followed.
 Whenever there are no sufficient internal examiners, the Chairman of Board of Examination [BOE] shall get the question papers set by external examiners.
- b) The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation.
- c) There shall be single valuation for all theory papers by **external examiners**. A detailed scheme of valuation to be prepared by the department and to be provided to the external examiner along with the answer scripts
- d) The examination for Practical Work / Field Work / Project Work will be conducted jointly by internal and external examiners. However, the BOE on its discretion can also permit two internal examiners from the College.
- e) If a paper is full of (L = 0): T: (P=0) type, then the examination for C₃ component will be as decided by the BOS concerned.

Component	Syllabus in a paper	Weightage	Period of continuous assessment					
C ₁	First 50% of the Syllabus	15%	First half of the semester To be consolidated by 8 th week					
C ₂	Remaining 50% of the Syllabus	15%	Second half of the semester To be consolidated by 16 th week					
C ₃	Semester-end examination (all units of the paper)	70%	To be completed during $18^{\text{th}} - 20^{\text{th}}$ Week					
	Final grades to be announced latest by 24 th week							

i) The details of continuous assessment are summarized in the following Table

k) A candidate's performance from all 3 components will be in terms of scores, and the sum of all three scores will be for a maximum of 100 marks (15 + 15 + 70).

m) Finally, awarding the grades should be completed latest by 24th week of the Semester.

11. Minor / Major Project Evaluation

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his / her progress in the form of seminars in addition to the regular discussion with the guide. Components of evaluation are as follows:

Component – I (C₁): Periodic Progress and Progress Reports (15)

Component – II (C₂): Results of Work and Draft Report (15)

Component – III (C₃): Final Viva Voce and evaluation (70). The report evaluation is for 40 and the Viva –voce examination is for 30.

12. In case a candidate secures less than 30% in C_1 and C_2 put together in a paper, the candidate is said to have **DROPPED** that paper, and such a candidate is not allowed to appear for C_3 in that paper.

In case a candidate's class attendance in a paper is less that 75% or as stipulated by the College, the candidate is said to have **DROPPED** that paper, and such a candidate is not allowed to appear for C_3 in that paper.

Teachers offering the papers will place the above details in the P G Department Council meeting during the last week of the semester, before the commencement of C_3 and subsequently a notification pertaining to the above will be brought out by the Principal before the commencement of C_3 examination. A copy of this notification shall also be sent to the office of the Controller of Examinations.

12.1 In case a candidate secures less than 30% in C₃ he/she may choose **DROP/MAKEUP** option.

In case a candidate secures more than or equal to 30% in C_3 but his/her grade (G) = 4, as per section 12.5 below, then he/she may be declared to have been conditionally successful in that paper, provided that such a benefit of conditional clearance based on G = 4 shall not be availed for a maximum of **8 credits** for the entire programme of Master's Degree of two years.

A candidate exercising his/her option to MAKEUP examination shall be declared passes if he/she secures more than or equal to 30% in C_3 provided he/she fulfils the conditions mentioned in the Para 12.1 & 12.5.To a candidate who does not pass in MAKE UP examination , no separate MAKEUP examination shall be conducted. Such a candidate has to appear for the examination as and when the C_3 component examination is conducted for Odd & Even semester of that academic year along with the regular candidates.

- 12.2 A candidate has to re-register for the DROPPED paper when the paper is offered again by the department if it is a hard core paper. The candidate may choose the same or an alternate core/elective in case the dropped paper is soft core/ elective paper. A candidate who is said to have DROPPED project work has to re-register for the same subsequently within the stipulated period. The details of any dropped paper will not appear in the grade card.
- **12.3** The tentative / provisional grade card will be issued by the Registrar (Evaluation) at the end of every semester indicating the papers completed successfully. This statement will not contain the list of DROPPED papers.
- **12.4** Upon successful completion Master's degree a final grade card consisting of grades of all papers successfully completed by the candidate will be issued by the Registrar (Evaluation).
- **12.5** The Grade (G) and the Grade Point (GP) earned by the candidate in the subject will be as given below.

Р	G	$GP = V \times G$
90 - 100	10	V x 10
80 - 89	9	V x 9
70 – 79	8	V x 8
60 - 69	7	V x 7
50 - 59	6	V x 6
40-49	5	V x 5
30 - 39	4	V x 4
0-30	0	V x 0

Here, P is the percentage of marks $P = [(C_1+C_2) + C_3]$ secured by a candidate in a paper which is rounded to nearest integer. V is the credit value of paper. G is the Grade and GP is the Grade Point.

12.6 A candidate can withdraw any paper within ten days from the date of notification of final results of that semester. Whenever a candidate withdraws a paper, he/she has to register for the same paper in case it is hard core paper, the same paper or an alternate paper if it is soft core/open elective.

A DROPPED paper is automatically considered as a paper withdrawn.

12.7 The Semester Grade Point Average (SGPA) of a candidate after successful completion the required number of credits (76) is given by

$$SGPA = \frac{\sum GP}{Total \ number of \ credits}$$

12.8 The Final Semester Grade Point Average (SGPA) of a candidate after successful completion the required number of credits (76) is given by

$$CGPA = \frac{\sum GP \text{ of all the four Semesters}}{\sum Credits \text{ of all the Semesters}}$$

13. Classification of results

The Final Cumulative Grade Point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows:

CCDA	FGP						
CGPA	Numerical Index	Qualitative Index					
4< = CGPA < 5	5	SECOND CLASS					
5< = CGPA < 6	6	SECOND CLASS					
6< = CGPA < 7	7	FIRST CLASS					
7< = CGPA < 8	8	TIKST CLASS					
8< = CGPA < 9	9	DISTINCTION					
9< = CGPA < 10	10	DISTINCTION					

Overall percentage = $10 \times CGPA$ or is said to be 50% in case CGPA < 5

Preamble:

The aim of the post graduate education is to provide high quality education as well as a supportive learning environment for the students to reach their full academic potential. The higher education has to inculcate in students the spirit of hard work and research aptitude to know the essence of Mathematics. This is the third revision of the curriculum Board of Studies in Mathematics has designed the curriculum for M.Sc. Mathematics so as to monitor, review and enhance educational provision which ensures the Post Graduate Education remains intellectually demanding and relevant to current needs of Mathematics graduates. The thrust is given in fostering a friendly and stimulating learning environment which will motivate the students to reach high standards, enable them to acquire real insight into Mathematics and become self-confident, committed and adaptable graduates. With this in mind, we aim to provide a firm foundation in every aspect of Mathematics and to develop analytical, experimental, computational logical and reasoning skills of students.

The syllabi gives the foundation of Mathematics and evolution of Mathematics Education. The goal of the syllabus is to make the study of Mathematics, interesting and encouraging to the students to study in-depth which helps them for research. The syllabus is based on a basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of research and its applications.

The syllabi is prepared after discussion at length with number of faculty members of the subject from different universities and research fields. The units of the syllabus are well defined, taking into consideration the level and the requirement to the students.

The following modifications are incorporated in the revised syllabus from the academic year 2018-20.

Sl. No	Semester	Existing Paper replaced	New Paper	Credi ts	Justification	Percentage of Changes
1.	First	Linear Algebra	Linear Algebra-I	4	To explore more problems in vector spaces	25
2.	First	-	Numerical Analysis	4	To study the essence of various approximations of solutions	100
3.	Second	_	Linear Algebra-II	4	As the subject is a powerful mathematical tool, finding applications in subjects diverse fields of Mathematics, we extended the idea of Linear Algebra	25
4.	Third	_	Mathematical Computation	4	To encourage and to nurture the interdisciplinary ideas of the students	100

TOTAL CHANGES $\approx 10\%$

VISION AND MISSION OF THE COLLEGE

VISION:

The college is guided by the visionary zeal of providing value- based education to everyone irrespective of religion, caste, creed or sex by which the character is formed, intellect is explained and one can stand on his/her feet.

MISSION:

To transform young men and women who come to learn not from books, but also from life and to share the experience of working and playing together, which inculcates life skills to become good citizens with integrity and discipline.

VISION AND MISSION OF THE DEPARTMENT

VISION:

To strive for excellence in mathematical sciences that ignites students for interdisciplinary domains.

MISSION:

1. To provide quality education and research in Mathematics through updated curriculum, effective teaching learning process.

2. To inculcate innovative skills, team-work, ethical practices among students in turn to meet societal expectations

PO No.	Programme Educational Objectives (PEOs)
PEO-1	PROFESSIONAL GROWTH
	Keep on discovering new avenues in the chosen field and exploring areas that remain
	conducive for research and development.
PEO-2	CORE PROFICIENCY
	To expertise the students to organize, understand, evaluate, and solve problems by
	providing hands on experience through modern tools necessary for practice.
PEO-3	TECHNICAL PROFICIENCY
	To have the interdisciplinary knowledge and relating them the technical aspect as the
	impact of the subject concerned is very wide.
PEO-4	MANAGEMENT SKILLS
	Encourage personality development skills like time management, crisis management,
	Stress interviews and working as a team.
PEO-5	LEARNING ENVIRONMENT
	To provide students with knowledge and capability in formulating and analysis of
	mathematical models of real life applications.

Mapping of Mission of the department with Programme Educational Objectives

Mission		Programme Educational Objectives (PEOs)									
	PEOs-1	PEOs-2	PEOs-3	PEOs-4	PEOs-5						
M1	\checkmark	\checkmark									
M2											

Programme Outcomes (POs)

	At the end of the programme, the students will be able to:
PO-1	Apply knowledge of Mathematics, in all the fields of learning including higher research and its extensions
PO-2	Explain the knowledge of contemporary issues in the field of Mathematics and applied
	Sciences.
PO-3	Work effectively as an individual, and also as a member or leader in multi-disciplinary
	teams
PO-4	Adjust themselves completely to the demands of the growing field of Mathematics by
	lifelong learning
PO-5	Crack lectureship and fellowship exams approved by UGC like CSIR - NET, SET and
	GATE.

PSO No.	Upon completion of the Programme the student will -
PSO-1	Develop problem-solving skills and apply them independently to problems in pure and applied mathematics.
PSO-2	Analyse complex mathematical ideas and arguments.
PSO-3	Improve their own learning and performance.
PSO-4	Develop abstract mathematical thinking.
PSO-5	Apply the knowledge of mathematical concepts in interdisciplinary fields.
PSO-6	Employ confidently the knowledge of mathematical software and tools for treating the complex mathematical problems and scientific investigations.
PSO-7	Pursue research in challenging areas of pure/applied mathematics.

Programme Specific Outcomes (PSOs)

Mapping of Programme Educational Objectives with Program Outcomes and Programme Specific outcomes

	Programme Outcomes					Program Specific Outcomes							
Programme Educational Objectives	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PSO-1	PSO-2	PSO-3	PSO-4	PSO- 5	PSO- 6	PSO- 7	
PEOs-1							V						
PEOs-2	\checkmark					V	V				V		
PEOs-3			\checkmark								\checkmark		
PEOs-4				V									
PEOs-5													

		l Semester				Total
SI. No	Code	Title	Туре	L:T P	Credit	Credit
1		Algebra-I	HC	4:0:0	4)
2		Real Analysis-I	HC	4:0:0	4	
3		Real Analysis-II	HC	4:0:0	4	
4		Complex Analysis-I	HC	4:0:0	4	
		Any One of the following				20
5		Linear Algebra-I	SC	4:0:0	4	
6		Combinatorics and Graph Theory	SC	4:0:0	4	
7		Numerical Analysis	SC	4:0:0	4)
		II Semester				
1		Algebra-II	HC	4:0:0	4)
2		Real Analysis-III	НС	4:0:0	4	
3		Complex Analysis-II	НС	4:0:0	4	
		Any One of the following				
4		Linear Algebra-II	SC	4:0:0	4	
5		Representation Theory of Finite Groups	SC	4:0:0	4	20
6		Theory of Partitions	SC	4:0:0	4	
		Open Elective(offered from other departments)	OE	4:0:0	4]]
		III Semester				
1		Elements of Functional Analysis	HC	4:0:0	4	
2		Topology-I	HC	4:0:0	4	
		Any two of the following				
3		Graph Theory	SC	4:0:0	4	
4		Commutative Algebra	SC	4:0:0	4	}
5		Algebraic Number Theory	SC	4:0:0	4	20
6		Galois Theory	SC	4:0:0	4	
7		Mathematical Computation (ID)	SC	3:0:2	4	
		Open Elective(offered from other departments)	OE	4:0:0	4	J
		IV Semester				
1		Measure and Integration	HC	4:0:0	4)
2		Topology-II	HC	4:0:0	4	
		Any Three of the following			4	
3		Project Work	С	4:0:0	4	
4		Ordinary and Partial Differential Equation	SC	4:0:0	4	
5		Theory of Numbers	SC	4:0:0	4	20
6		Advanced Graph Theory	SC	4:0:0	4	
7		Deferential Geometry	SC	4:0:0	4	ון
		O.E(offered from our dept in II and III sem)				
		Fundamentals of Mathematics	OE	4:0:0	4	
I		HC-44 + SC-28 + OE-8 = 80		1		80

M Sc - Mathematics - Course Structure [credits distribution]

ST. PHILOMENA'S COLLEGE (AUTONOMOUS) Programme : M.Sc in Mathematics (For Candidates admitted during the Academic year 2018-2020 onwards)

FIRST YEAR - SEMESTER - I

Course T	itle	Algebra	-I									
Course T	уре	Hard C	ore- Theory	Total Hours	64	Но	ours/W	/eek	04	Cro	edits	04
Course C	Course Code		Evaluation	Internal	C	C1+C2 = 15+			15 30 M		arks	100
				External	Durat	ion	C3	03H	lrs	70 Mark		100
General (Dbjec	tive										
		-	ts and to deve Finite groups.	elop working k	nowled	ge o	n Gro	oups, l	Norn	nal Subș	groups,	
CO No.				Cours	e Obje	ectiv	es					
CO-1	Τοι	understan	d Residues, U	J(n) and Prope	erties of	f prii	ne nu	mbers	5.			
CO-2	To i	dentify th	ne concept of	Normal group	s and Q	Juoti	ents g	groups	5			
CO-3	Тоа	analyse P	ermutation gr	oups and Cour	nting pr	rincij	ple.					
C0-4	Τοι	understan	d Sylow's the	eorem and its a	pplicat	ions						
CLOs		Co	urse Learnii	ng Outcomes	(CLOs	;)			PS	Os	CI	DS
No.	At	fter comp	leting this co	urse, the stude	nt will	be al	ole to	A	ddr	essed		
CLO-1		lerstand t binary o		of the algebra	aic stru	ıctur	e witl	h	PSO	D-1	Unde	rstand
CLO-2	Des	scribe No	rmal groups a	and Quotients g	groups.				PSO	D-2	Ana	alyse
CLO-3	Ana	alyse Perr	nutation grou	ps and Counting	ng prin	ciple			PSC	D-2	Ana	alyse
CLO-4	Exp	olain Sylo	w theorem ar	nd its application	ons				PSC	D-1	Ap	ply
Unit		C	ourse Conter	nt				-			Dur	ation
1		nber The	-									
		-	s, residue clas	sses,								
		mat theo	•								16 ho	ours
		er and W ear congi	ilson theorer	Π,							1010	
		-	arithmetical f	functions								
		mitive roo										
	Qu	adratic re	esidues and th	ne law of quad	ratic re	cipro	ocity					
Extra Rea	ding	/Key Wo	ords: Primiti	ve roots							•	

2	Groups	
	Binary operation, definition of algebraic structure and groups	16 hours
	Subgroups and cosets,	
	Lagrange's Theorem,	
	Cyclic subgroups,	
	Normal subgroups and factor groups.	
Extra Re	ading /Key Words: Subgroups of finite non-abelian groups.	
3	Isomorphism	
	Homomorphism- kernel and image,	16 hours
	The fundamental theorem of homomorphism,	
	Two laws of isomorphism	
Extra Rea	ding /Key Words: Homomorphism and Isomorphism	1
4	Permutation Groups	16 hours
	Group of permutations,	
	Alternative group, Signature of Permutation	
	Cayley's theorem	
	Sylow's theorems	
Extra Re	ading /Key Words : Permutation Groups, Sylow's theorems and Direct pr	oducts

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	Publication
1	Algebra	Thomas W. Hungerford	Springer International Edition, New York	5 th	2010
2	Contemporary Abstract Algebra,	J. A. Gallian	Narosa Publishing House	4 th	2009
3	Algebra	Michael Artin	Prentice-Hall ofIndia	9 th	2008
4	Abstract Algebra	D.S. Dummit and R. M.Foote	John Wiley and Sons	10 th	1999
5	Topics in Algebra	I.N. Herstein	Vikas Publishing House	4 th	2013
6	A First course in Abstract Algebra	J.B. Fraleigh	Addison-Wesley	3 rd	2009
7	University Algebra	N. S. Gopalakrishnan	New Age International	2 nd	2009

FIRST YEAR - SEMESTER - I

	itle	Real Al	nalysis-I							
Course Ty	ype	Hard C	ore- Theory	Total Hours	64	Hours/Wee	ek 04	Cred	its	04
Course Co	ode		Evaluation	Internal	0	C1+C2 = 15+	-15	30 Ma	arks	100
				External	C3	Duration	03hrs	70 Ma	arks	
General O	bjec	tive								
	-	-	of Real numbe	ers, Sequences	and Se	ries and the	concept	of conve	rgence	e of
sequences	and	series.								
CO No.				Cours	e Obje	ectives				
CO-1	Τοι	understan	d the Archim	edean property	and ba	asic properti	es of Rea	al numbe	er.	
CO-2	To l limi		quence and Se	eries comprisin	ig conv	vergence sequ	uences, ı	ipper an	d lowe	r
CO-3	To f	find the n	ature of a seri	ies through ser	ies test	s.				
L			Марріі	ng of CLOs wi	th PSO	Os &CDLs				
CLOs No.		C	ourse Learni	ing Outcomes	(CLO	s)	PS	Os	CL	Ds
	A	After com	pleting this co	ourse, the stude	ent will	be able to	Addro	essed		
CLO-1	U	nderstand	l the basic pro	operties of real	numbe	ers	PSC)-1	Under	stan
CLO-2	A	pply the p	properties of t	the sequences			PSC	D-2	Ap	ply
CLO-3	Te	est the co	nvergence of	a given series			PSC) -4	Anal	yse,
									Ap	ply
Unit			Course	e Content					Dura	ntion
	Р	Propertie	s of Real Nu	mbers						
1		-	ded real numb							
			onal Euclidea	•					16 ho	urs
				e Power Mean	inequa	lity,				
			Schwarz ineq		•	-				
	1		1 1 1 1 1	ci's inequality						

2	Sequences of Real Numbers	
	Numerical sequences	16 hours
	Convergent sequences	
	Cauchy sequences	
Extra Rea	ding /Key Words: Sequences	
3	Series of Real Numbers-I	
	Series of real numbers,	16 hours
	Series of non-negative terms,	
	The number `e'and test of convergence	
Extra Read	ling /Key Words: Series	I
4	Series of Real Numbers-II	16 hours
	Multiplications of series,	
	Re-arrangements.	
	Double Series, infinite products.	
Extra Rea	ding /Key Words: Double Series and Infinite products.	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Principles of	W. Rudin	Int. Student edition,	3 rd	1997
	Mathematical Analysis		McGrawHill		
2	Mathematical Analysis	T. M. Apostal	Addison Wesley,	2^{nd}	1998
			Narosa, New Delhi,		
3	Methods of Real	R. R. Goldberg	Oxford and IBH, New	5 th	2008
	Analysis		Delhi		
4	Analysis I and Analysis II	Torence Tao	Hindustan Book	6 th	2006
			Agency, India,		
5	Introduction to real	Robert G Bartle	John Wiley and Sons.	4 th	2014
	analysis		Inc		
6	Elementary Analysis: The	Kenneth A. Ross	Springer Inter,	4 th	2008
	Theory of Calculus		Edition,2004.		

FIRST YEAR - SEMESTER - I

Course Title	Real Ar	alysis-II								
Course Type	Hard C	ore- Theory	Total Hours	64	Но	urs/W	'eek	04	Credits	04
Course Code		Evaluation	Internal	Cl	1+C2	2 = 15	+15		30 Marks	100
			External	Durati	ion	C3	03H	irs	70 Marks	
General Object	tive									

General Objective

To enable the students to appreciate various aspects of Countability, Metric spaces and understand continuous functions, Riemann-Stieltje's integral

CO No.	Course Objectives						
CO-1	To understand countability and to describe topological properties of Metric space.						
CO-2	To distinguish continuity and uniform continuity with example compactness in continuity and connectedness.	ples and to infe	r the				
CO-3	To derive the differentiability from limiting of functions and mean value theorems of differentiable functions.		-				
CO-4	To understand the concept of Riemann- Stielije's Integrabili discuss Rectifiable curves.	ty and its prope	erties and				
	Mapping of CLOs with PSOs &CDLs						
CLOs No.	Course Learning Outcomes (CLOs)	PSOs	CLDs				
	After completing this course, the student will be able to	Addressed					
CLO-1	Understand countable and uncountable sets and describe the topological properties on metric space.	PSO-1	Understand				
CLO-2	Differentiate continuity and uniform continuity with examples and infer the compactness in continuity and connectedness.	PSO-2	Analyse				
CLO-3	Derive the differentiability from limiting of functions and clarify the properties and mean value theorems of differentiable functions.	PSO-4	Evaluate				
CLO-4	Explain the concept of Riemann- Stielije's Integrability and its properties and discuss Rectifiable curves.	PSO-3	Create				
Unit	Course Content		Duration				
1	Basic Topology						
	Finite sets,		16 hours				
	Countable and uncountable sets, The topology of the real line.		10 nours				
Extra Dog	ding /Key Words: Countablity and the topology of the rea	allina	1				

2	Limits and Continuity	
	Limit of a function	16 hours
	Continuous functions,	
	Properties of continuous functions, discontinuities,	
	Monotonic functions	
Extra Read	ling /Key Words: Limits and Continuity	
3	Differentiation	
	Differentiability,	16 hours
	Mean value theorems,	
	L'Hospital rule,	
	Taylor's theorem,	
	Maxima and minima,	
	Functions of bounded variation	
Extra Read	ling /Key Words: Differentiability, Convex and Concave functions	
4	Riemann-Stieltje's Integral	16 hours
	Definition and existence of integral.	
	Properties of the integral	
	Integration and differentiation.	
	First and second mean value theorems.	
Extra Read	⊥ ling /Key Words: Riemann-Stieltje's Integral and Motivation for Meası	ire
Integrals.		

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Principles of Mathematical Analysis	W. Rudin	Int. Student edition, McGrawHill,	3 rd	1997
2	Mathematical Analysis,	T. M. Apostal	Addison Wesley, Narosa, New Delhi,	2 nd	1998
3	Methods Of Real Analysis	R. R. Goldberg	Oxford and IBH, New Delhi	5 th	2008
4	Analysis I and Analysis II,	Torence Tao	Hindustan Book Agency, India,	6 th	2006
5	Elementary Analysis: The Theory of Calculus	Kenneth A. Ross	Springer Inter, Edition,2004.	4 th	2008

FIRST YEAR - SEMESTER - I

Course Ty	pe Ha	rd Core- Theor	y Total Hours	64	Но	ours/W	/eek	04	Cre	edits	04
Course Co	de	Evolveti	Internal	C	1+C2	2 = 15	5+15		30 M	arks	100
		Evaluatio	External	Durat	tion	C3	03H	irs	70 M	arks	100
COURSE	OBJEC	TIVES (COs)									
To enable the complex int			e and critically ev	valuate	the a	malyti	ic, har	moni	ic func	tions a	nd
CO No.			Cours	se Objo	ectiv	es					
CO-1	To unde	rstand the essen	nce of complex fi	eld							
CO-2	To analy	vse Analytic fur	nctions and expor	nential	funct	ions.					
CO-3	To apply	Cauchy's the	orem for disk and	the Int	egral	l form	ula.				
			operties of Analy		0						
Course Les successful o content cov	arning completi vered in	Map Outcomes (CI on of a course each unit of a	ping of CLOs was COs): The CLOs e. The CLO state course.For every of each unit to	ith PS(s indication ements y cours	Os & ate v are j se the	vhat a prepai ere ma	a stuc red by	con	siderin	g the	cours
Course Les successful o content cov	arning completi vered in	Map Outcomes (CI on of a course each unit of a I at the end of	ping of CLOs was consistent of CLOs was consistent of the CLOs state course. For every	ith PSO s indication ements y cours define	Ds & ate v are j se the CLO	vhat a prepai ere ma	a stuc red by ay be	con 5 or PSC	siderin • more Ds	ng the e CLO	cours
Course Les successful o content cov keywords	arning (completi vered in are used	Map Outcomes (CI on of a course each unit of a l at the end of Course Lea	ping of CLOs was COs): The CLOs e. The CLO state course.For every of each unit to	ith PSC s indicates ements y cours define s (CLO	Ds & ate v are j se the CL(Ds)	vhat a prepar ere ma Ds.	a stuc red by ay be	con 5 or	siderin • more Ds	ng the e CLO	course s. Th e
Course Les successful o content cov keywords	arning (completi ered in are used After	Map Outcomes (CI on of a course each unit of a l at the end o Course Lea completing this	ping of CLOs was LOs): The CLOs e. The CLO state course.For every of each unit to rning Outcomes	ith PSC s indicates ements y cours define s (CLO	Ds & ate v are j se the CL(Ds)	vhat a prepar ere ma Ds.	a stuc red by ay be	con 5 or PSC	siderin more Os essed	e CLO	cours s. The LDs
Course Lea successful o content cov keywords CLOs No.	arning completi vered in are used After Explai	Map Outcomes (CI on of a course each unit of a l at the end of Course Lea completing this n the essence of	ping of CLOs with the CLOs of CLOs with the CLO state course. For every of each unit to rning Outcomes course, the stude	ith PSC s indication ements y cours define s (CLC ent will	Ds & ate v are j se the CL(Ds) l be a	vhat a prepare ma Ds. ble to	a stuc red by ay be	y con 5 or PSC	siderin • more Ds essed	e CLO Cl Unde	course s. The LDs
Course Les successful o content cov keywords CLOs No.	arning (completi zered in are used After Explai Analy:	Map Outcomes (CI on of a course each unit of a l at the end of Course Lea completing this n the essence of se Analytic fun Cauchy's theo	ping of CLOs with the CLOs of the CLO state course. For every of each unit to rning Outcomes a course, the stude f Complex Field	ith PSO s indication oments y course define s (CLO ent will ential fr	Ds & ate v are j se the CL(Ds) l be a	vhat a prepare ma Ds. ble to	a stuc red by ay be	y con 5 or PSC	siderin more Ds essed D-1 D-2	clo Cl Unde Ana	course s. Th e L Ds erstance
Course Les successful o content cov keywords CLOs No. CLO-1 CLO-2	arning completi ered in are used After Explai Analys formu	Map Outcomes (CI on of a course each unit of a l at the end of Course Lea completing this n the essence of se Analytic fun Cauchy's theo la.	ping of CLOs with the CLOs of CLOs with the CLO state course. For every of each unit to rning Outcomes course, the stude f Complex Field ctions and exponent	ith PSC s indica ements y cours define s (CLC ent will ential fi the Inte	Ds & ate v are j se the CL(Ds) l be a uncti	vhat a prepare materies materies materies of the prepare materies of the prepa	a stuc red by ay be	or con 5 or PSC PSC PSC	siderin more Ds essed D-1 D-2 D-4	e CLO Cl Unde Ana Eva	course s. The L Ds erstance alyze
Course Less successful of content cov keywords CLOs No. CLO-1 CLO-2 CLO-3	arning completi vered in are used After Explai Analys Apply formu Under	Map Outcomes (CI on of a course each unit of a l at the end of Course Lea completing this n the essence of se Analytic fun Cauchy's theo la. stand Local pro Proposed	ping of CLOs with the CLOs of the CLO state course. For every of each unit to rning Outcomes is course, the stude f Complex Field ctions and exponent for disk and the formation of the course of the stude ctions and exponent for disk and the formation of the stude ctions and exponent for disk and the formation of the stude ctions and exponent for the stude ctions are stude ctions and exponent for the stude ctions are stude ctions and exponent for the stude ctions are stude ctions and exponent for the stude ctions are stude ction	ith PSC s indication ements y cours define s (CLO ent will ential f the Inte	Ds & ate v are j se the CL(Ds) l be a uncti	vhat a prepare materies materies materies of the prepare materies of the prepa	a stuc red by ay be	PSC PSC PSC	siderin more Ds essed D-1 D-2 D-4	e CLO Cl Unde Ana Eva Al	cours s. Th L Ds erstand alyze iluate

2	Sequence and Series	
	Analytic functions	16 hours
	Cauchy-Riemann equations	
	Harmonic functions,	
	Polynomials and Rational functions.	
	Elementary theory of power series - sequences, series, uniform	
	convergence of power series, Abel's limit theorem, The elementary	
	functions.	
Extra Read	ling /Key Words: Analytic functions and sequence of functions	
3	Topology and Complex Integration	
	Topology of the complex plane.	16 hours
	Linear fractional transformations, Cross-ratio, Symmetry,	
	Elementary conformal mappings.	
	Complex integration – Line integrals, Rectifiable arcs.	
	ing /Key Words: Cross-ratio, conformal and isogonal mappings and Co	omplex
integration		
4	Cauchy's Theorems	16 hours
	Cauchy's theorem for a rectangle.	
	Cauchy's theorem in a Circular disk, Cauchy's integral formula.	
	Local properties of analytic functions.	
Extra Read	ing /Key Words: Cauchy's theorem, Local properties of analytic functi	ons

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Complex Analysis	L. V. Ahlfors	McGraw-Hill, Kogakusha	3 rd	1979
2	Functions of one complex variable,	J. B. Conway	Narosa, New Delhi.	2 nd	1998
3	Invitation to Complex Analysis	R. P. Boas	The Random House	1 st	1987
4	An Introduction to Complex Function Theory	B. C. Palka	Springer	1 st	1991
5	Foundations of Complex Analysis,	S. Ponnusamy	Narosa	4 th	1995

FIRST YEAR - SEMESTER - I

Course Title	Linear	Algebra -I								
Course Type	Soft Co	ore- Theory	Total Hours	64	Ho	urs/W	/eek	04	Credits	04
Course Code		Evaluation	Internal	C1+C2 = 15+15			30 Marks	100		
			External	Durati	on	C3	03H	rs	70 Marks	

COURSE OBJECTIVES (COs)

To introduce the concepts and to develop working knowledge on Vector Spaces, Inner Product Spaces, Linear Transformation on these spaces and their canonical forms and types of linear transformations.

CO No.	Course Objectives
CO-1	To identify the Algebra of Linear Transformations and Characteristics roots.
CO-2	To analyse Linear Transformation.
CO-3	To understand Hermitian, Unitary and Normal Transformation

Mapping of CLOs with PSOs &CDLs

Course Learning Outcomes (CLOs): The CLOs indicate what a student has learnt after the successful completion of a course. The CLO statements are prepared by considering the course content covered in each unit of a course.For every course there may be 5 or more CLOs. **The keywords are used at the end of each unit to define CLOs.**

CLOs No.	Course Learning Outcomes (CLOs) After completing this course, the student will be able to	PSOs Addressed	CLDs	
CLO-1	Understand the concepts of Liner independence, bases and Dual spaces.	PSO-1	Understand	
CLO-2	Discuss Algebra of Linear Transformations and Characteristics roots.	PSO-4	Analyse	
CLO-3	Analyze rational canonical forms and Determinants.	PSO-2	Analyse	
CLO-4	Apply Hermitian, Unitary and Normal Transformations.	PSO-3	Apply	
Unit	Proposed Course Content		Duration	
1	Vector Spaces Definitions and examples of Vector Spaces, Subspaces Linear Combinations and Systems of Linear Equations Linear Dependence and Linear Independence, Bases and Dimension Maximal Linearly Independent and Minimal Generating s	sets	16 hours	

2	Linear Transformations	
	Definitions, examples of Linear Transformations	16 hours
	Null Spaces, and Ranges	
	The Matrix Representation of a Linear Transformation	
	Composition of Linear Transformations and Matrix Multiplication	
	Invertibility and Isomorphisms,	
	The Change of Coordinate Matrix and The Dual Space	
Extra Re	ading /Key Words: Linear Transformations	
3	Matrix Operations	
	Elementary Matrix Operations and Elementary Matrices,	16 hours
	The Rank of a Matrix and Matrix Inverses,	
	Systems of Linear Equations,	
	Properties of Determinants and Cofactor Expansions	
Extra Re	eading /Key Words: Matrix Operations	
4	Eigenvalues and Eigenvectors of Matrices	16 hours
	Elementary Operations and Cramer's Rule	
	Eigenvalues and Eigenvectors, Diagonalizability	
	Invariant Subspaces and the Cayley-Hamilton Theorem	

Sl. No	Title of the book	Author(s)	Publisher	Edition	Year of publication
1	Linear Algebra	S. Friedberg, A. Insel, and L. Spence	PHI	4th	2009
2	Linear Algebra	K. Hoffman and R. Kunze	Prentice-Hall of India	2^{nd}	1978
3	Finite Dimensional Vector Space	P. R. Halmos	Princeton, N.J.D.Van Nostr and Company	3 rd	1958
4	Linear Algebra	Lang. S.	Addison Wesley Pub. Co. Reading, Mass	1 st	1972

FIRST YEAR - SE	EMESTER – I
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	tle	Combin	atorics and G	braph Theory								
Course Ty	me	Soft Co	ore- Theory	Total Hours	64	Но	urs/W	/eek	04	Cre	dits	04
	-								<u> </u>			<u> </u>
Course Co	ode		Evaluation	Internal	C	1+C2	2 = 15	+15		30 Ma	arks 100	
			2 valuation	External	Durat	ion	C3	03H	rs	70 Ma	arks	100
COURSE	OBJ	ECTIVI	ES (COs)									1
To introdu	ce th	e concer	ots and to de	velop working	knowl	edge	on p	artiall	v or	dered s	ets. L	attices.
				binations and b							, _	
CO No.					se Obje							
CO-1	To i	dentify th	ne concept of	Blocks – Cut j	points c	of gra	aphs					
CO-2	To a	nalyse K	önigsberg bri	idge problem.								
CO-3	Tou	Inderstan	d Pigeon-hole	e principle and	its app	olicat	ions					
			Mappir	ng of CLOs wi	ith PSC)s &	CDL	5				
successful content co	comj verec	pletion o l in each	f a course. The unit of a co	s): The CLOs The CLO state ourse.For every each unit to	ements	are p e the	prepai ere ma	ed by	con	siderin	g the	course
CLOs No.		C	- ·									
	A		ourse Learni	ing Outcomes	(CLO	s)			PS (Os	C	LDs
		fter com		ing Outcomes ourse, the stude		-	ble to		PS(ddre		C	LDs
CLO-1		-	pleting this co	0	ent will	be a				essed		LDs
CLO-1	Uı	-	pleting this co	ourse, the stude	ent will	be a			ddre	essed		
CLO-1 CLO-2	Ur blo Ar	nderstand ocks of g	pleting this co the definition raphs	burse, the stude	ent will at point	be a ts, br	ridges		ddre	essed	Unde	
	Ut blo Ap so Ex	nderstand ocks of g oply the l lving sor	pleting this co l the definition raphs knowledge of ne real world Permutations	burse, the stude	ent will at point knowled	be a ts, br dge i	ridges n	,	ddre PSC	essed 0-1 0-5	Unde	erstand
CLO-2	Un blo An so Ex ap	nderstand ocks of g oply the k lving sor plain F plication	pleting this co the definition raphs knowledge of the real world Permutations	ourse, the stude ons namely, cu graph theory l problems	ent will it point knowled nations	be a ts, br dge i an	ridges n	,	ddre PSC PSC	essed 0-1 0-5 0-2	Unde Aj An	erstand pply
CLO-2 CLO-3	Un blo An so Ex ap	nderstand ocks of g oply the h lving sor cplain F plication	pleting this co the definition raphs convledge of ne real world Permutations geon-hole prin	ourse, the stude ons namely, cu graph theory l problems and Combi	ent will it point knowled nations	be a ts, br dge i an	ridges n	,	Addre PSC PSC PSC	essed 0-1 0-5 0-2	Undo Aj An Aj	erstand pply alyse

Extra Rea	nding /Key Words: Boolean Algebra	
2	Permutations and Combinations	
	Permutations and Combinations	16 hours
	Pigeon-hole principle	
	Principle of inclusion and exclusion	
Extra Rea	nding /Key Words: Aplications of permutations and Combinations	· ·
3	Basics of Graphs	
	The Königsberg bridge problem	16 hours
	Definition, Vertices of graphs,	
	Walks and connectedness, Degrees	
Extra Rea	nding /Key Words: Traversability and line graphs	
4	Blocks and acyclic graphs	16 hours
	Blocks - Cut points, bridges	
	Block graphs and Cut point graphs	
	Tree-Elementary properties of trees	
Extra Rea	nding /Key Words: Connectivity and line connectivity	I

					Year of
S1.	Title of the book	Author(s)	Publisher	Edition	publicati
No					on
1	Elements of Discrete	C. L. Liu	McGraw-Hill	1^{st}	1986
	Mathematics				
2	Discrete Mathematics and its Applications	Kenneth H. Rosen	McGraw-Hill	4 th	2002
3	Graph Theory	F. Harary	Addition Wesley	1^{st}	1969
			Reading Mass		
4	Basic Graph Theory	K. R. Parthasarathy	Tata McGraw-Hill, New	2 nd	1994
			Delhi		
5	Introduction to Graph Theory	D. B. West	Pearson Education Inc.,	2 nd	2001

FIRST YEAR - SEMESTER - I

Course	Title	Numeri	cal Analysis											
Course 7	Гуре	Soft Co	ore- Theory	Total Hours	64	Hours/Week 04			4 Hours/Week		urs/Week 04		Credits	04
Course (Code		Evaluation	Internal	C	1+C2	-C2 = 15 + 15			30 Marks	100			
				External	Durat	ion	C3	03H	irs	70 Marks				
equation CO No.				olve a polynor	se Obje					,				
CO No.				Cours	e Obie	ectiv	es							
CO-1	To st	udy Tran	scendental an	nd Polynomial	Equation	ons.								
CO-2	To st	udy Gau	ss elimination	method and C	auss-J	orda	n metł	nod.						
CO–3	To stu	idy Jacob	i iteration me	ethod and Gau	ss-Seid	el ite	eratior	n met	hod					
			Маррі	ng of CLOs w	ith PS	Os 8	CDL	ι S						
Course Learning Outcomes (CLOs): The CLOs indicate what a student has learnt after the successful completion of a course. The CLO statements are prepared by considering the course content covered in each unit of a course. For every course there may be 5 or more CLOs. The														

keywords are used at the end of each unit to define CLOs.

CLOs No.	Course Learning Outcomes (CLOs) After completing this course, the student will be able to	PSOs Addressed	CLDs		
CLO-1	Understand some special mathematical expectations and Chebyshev's inequality.	PSO-1	Understand		
CLO-2	Study Marginal and conditional distributions, the correlation co-efficient and Stochastic Independence.	PSO-2	Analyse		
CLO-3	Apply the Trinomial and Multinomial Distributions, The Poisson Distribution and The Gamma and Chi-square distributions to solve problems.	PSO-5	Apply		
CLO-4	Study the t & F distributions and their applications.	PSO-5	Apply		
Unit Proposed Course Content					

1	Transcendental and Polynomial Equations Introduction, The bisection method, Iteration methods based on first degree equation Iteration methods based on second degree equation, Rate of convergence, Rate of convergence of Secant and Newton- Raphson method, Iteration methods, first order method, second order method, higher order methods. Polynomial equations, Descartes' Rule of Signs, The Birge-Vieta	16 hours
Extra Readir	ng /Key Words: Iteration methods of Higher degree	
2	Solutions of System of Linear Equations by Direct Methods Gauss elimination method Gauss-Jordan method Triangularization method Cholesky method	16 hours
Extra Readi	ng /Key Words: Gauss elimination method and Gauss-Jordan method	
3	Solutions of System of Linear Equations by Iteration methods Jacobi iteration method, Gauss-Seidel iteration method, Convergence analysis, Eigenvalues and eigenvectors	16 hours
Extra Reading	g /Key Words: Iteration methods	
4	Interpolation and Approximation Introduction, Lagrange and Newton interpolations Linear and Higher order interpolation Finite difference operators Interpolating polynomials using finite differences Hermite interpolation, Approximations	16 hours
Extra Readi	ng /Key Words : Interpolation and Approximation	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	An introduction to	Atkinson K.E.	John Wiley and	1 st	1988
	numerical analysis		Sons, USA		
2	Numerical recipesinC	Press W.H., Flannery	CambridgeUniversi	2^{nd}	2007
		B.P., Teukolsky S.A.	tyPress,UK,1989		
		and Vetterling W.T			
3	Numerical Methods for	Computation M.K.	New Age	4 th	2003
	Scientific and	Jain, S.R.K. Iyengar	International		
	Engineering	and R.K.Jain	Publishers		

FIRST YEAR - SEMESTER - II

Course Tit	le	Algebra-										
Course Ty	pe	Hard C	ore- Theory	Total Hours	64	Hour	rs/We	eek	04	Cree	dits	04
Course Co	de		Evaluation	Internal	C	1+C2 =	= 15-	+15		30 Ma	rks	100
			L'valuation	External	Durat	tion (C3	03H	rs	70 Ma	rks	100
COURSE	OBJ	IECTIVI	ES (COs)									
To introduc Extension	e th	e concept	ts and to deve	elop working k	nowled	lge on]	Ring	gs, Fie	ld the	eory an	d Fiel	d
CO No.				Cours	e Obj	ectives						
CO-1	Tou	ınderstan	d the properti	ies of rings and	l fields							
CO-2	To k	know the	application o	f homomorphi	sm and	l field e	exten	sion				
CO-3	To l	ocate the	different fiel	d extensions								
successful o	com	pletion o	f a course.	s): The CLOs The CLO state	ments	are pro	epare	ed by	cons	sidering	g the	course
successful of content cov	comj verec	pletion o 1 in each used at	f a course. T unit of a co the end of o		ments / cours define	are pro the there CLOs	eparo e ma	ed by y be	cons 5 or PSC	sidering more	g the CLO	course
successful of content cov keywords	comj verec are	pletion o 1 in each used at	f a course. 7 unit of a co the end of o ourse Learni	The CLO state ourse.For every each unit to	ments cours define	are pro- se there CLOs	eparo e ma	ed by y be	cons 5 or	sidering more	g the CLO	course s. The
successful of content cov keywords	comj verec are A	pletion o d in each used at Co fter comp	f a course. 7 unit of a co the end of o ourse Learni	The CLO state ourse.For every each unit to ng Outcomes ourse, the stude	ments cours define	are pro- se there CLOs	eparo e ma	ed by y be	cons 5 or PSC	sidering more	g the CLO	course s. The L Ds
successful of content cov keywords CLOs No.	are	pletion o d in each used at Co fter comp nderstand	f a course. 7 unit of a co the end of o ourse Learni pleting this co the concept o	The CLO state ourse.For every each unit to ng Outcomes ourse, the stude	ments / cours define / (CLO ent will	are pro- se there CLOs	eparo e ma	ed by y be	cons 5 or PSC ddres	sidering more os ssed -1	g the CLO Cl Cl Unde	course s. The
successful of content cov keywords CLOs No.	are	pletion o d in each used at Co fter comp nderstand	f a course. 7 unit of a co the end of o ourse Learni pleting this co the concept o properties of	The CLO state ourse.For every each unit to ng Outcomes ourse, the stude of rings	ments 7 cours define 6 (CLO ent will 8	are pro se there CLOs () () () () () () () () () () () () ()	eparo e ma	A	cons 5 or PSC ddres	sidering more 0s ssed -1 -5	g the CLO Cl Unde	course s. The L Ds erstand
successful of content cov keywords CLOs No. CLO-1 CLO-2	are	pletion o d in each used at Co fter comp nderstand oply the p iscuss Ex	f a course. The unit of a course the end of a course the end of a course the end of a course the course the concept of the concept of the concept of the concept for the conce	The CLO state ourse.For every each unit to ng Outcomes ourse, the stude of rings different ideals	ments / cours define / (CLO ent will s polyno	are pro se there CLOs () () () () () () () () () () () () ()	eparo e ma	A	cons 5 or PSC ddres PSO	sidering more 0s ssed -1 -5	g the CLO Cl Unde An An	course s. The L Ds erstand
successful of content cov keywords CLOs No. CLO-1 CLO-2 CLO-3	A A Uu A Di B Ri Inu Ho	pletion o d in each used at Co fter comp nderstand oply the p iscuss Ex Rings ngs, tegral do omomorp	f a course. The unit of a course the end of a course the concept of a course the course th	The CLO state ourse.For every each unit to ng Outcomes ourse, the stude of rings different ideals and Roots of p ourse Content	ments 7 cours define 7 (CLO ent will 8 polyno	are pro se there CLOs () () () () () () () () () () () () ()	eparo e ma	A	cons 5 or PSC ddres PSO	sidering more 0s ssed -1 -5	g the CLO Cl Unde An An	course s. The L Ds erstand oply alyze ration

2	Ideal	
	Euclidean and principal ideal rings,	16 hours
	Polynomials,	
	Zeros of a polynomial,	
	Factorization,	
	Irreducibility criterion.	
Extra Re	ading /Key Words: Ideals and Polynomial rings	
3	Fields	
	Adjunction of roots,	16 hours
	Kronecker's lemma,	
	Algebraic and transcendental extensions	
	Finite fields.	
Extra Re	ading /Key Words: Kronecker's lemma, Algebraic and transcendental ex	tensions
4	Extensions of fields	16 hours
	Separable and inseparable extensions	
	Perfect and imperfect fields	
	Theorem on the primitive element.	
	ading /Key Words: Separable and inseparable extensions, Perfect and imp	perfect
fields		

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Algebra	Thomas W. Hungerford	Springer International Edition, New York.	2 nd	2002
2	Algebra	Michael Artin	Prentice-Hall of India, New Delhi	2 nd	2015
3	Contemporary Abstract Algebra	Joseph A. Gallian	Narosa	4 th	1999
4	Abstract Algebra	D. S. Dummit and R. M. Foote	John Wiley and Sons,	2 nd	1999
5	Topics in Algebra	I. N. Herstein	John Wiley & Sons	2 nd	1975
6.	A First course in Abstract Algebra,	J. B. Fraleigh	Addison-Wesley	7 th	2003
7	University Algebra	N. S. Gopalakrishnan	New Age International	2 nd	1986

FIRST YEAR - SEMESTER - II

	tle Re	eal Ar	nalysis-III									
Course Ty	pe Ha	e Hard Core- Theory Total Hours 64 Hours/We		/eek	04	Cre	edits	04				
Course Co	ode		Evaluation	Internal	C	1+C2	2 = 15	5+15	-15 30 Ma		arks	100
				External	Durat	ion	C3	03H	lrs	70 M	arks	
differentiat Taylor`s the CO No. CO-1 CO-2 CO-3 CO-3	e sequen ion and l eorem. To Unde To Stud To Stud	erstan ly the ly the	nd series fun- to understand d Uniform co Stone-Weier Taylor's theo Mappin	ctions and their d the concept of Cours onvergence and strass theorem orem and its ap ng of CLOs wits s): The CLOs	of funct se Obje d contin and its plicatio ith PSC	ions ective nuity appl ons. Ds &	of sev es licatio	veral a	along	with p	roofs	
content cov	vered in	each	f a course. ' unit of a co	The CLO state ourse.For every each unit to	ements y cours	are j e the	ere ma	red by	y cor	nsiderir	ng the	course
content cov	vered in are use	each d at 1	f a course. ' unit of a co t he end of	The CLO state ourse.For every	ements y cours define	are j e the CLC	ere ma	red by	y cor	nsiderin r more	ng the e CLC	course
content cov keywords	vered in are use	each d at 1 Co	f a course. ' unit of a co the end of ourse Learn	The CLO state ourse.For every each unit to	ements y cours define (CLO	are j e the CLO s)	ere ma	red by ay be	y cor 5 or PS	nsiderin r more	ng the e CLC	course Ds. The
content cov keywords	After	each d at f Co comp	f a course. ' unit of a co the end of ourse Learn oleting this co	The CLO state ourse.For every each unit to ing Outcomes	ements y cours define (CLO ent will	are j e the CLC s)	ble to	red by ay be	y cor 5 or PS	nsiderin r more Os essed	e CLC	course Ds. The
content cov keywords CLOs No.	After Unde	each d at t Co comp erstance v the p	f a course. ' unit of a co the end of ourse Learn oleting this co d Uniform co	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude	ements y cours define (CLO ent will contin	are j e the CL(s) be a uity.	ble to	red by ay be	y cor 5 or PSC	nsiderin r more Os essed	e CLC	course Ds. The LDs
content cov keywords CLOs No.	After Unde Apply functio	each d at t Co comp erstance v the p ons.	f a course. ' unit of a co the end of ourse Learn oleting this co d Uniform co oroperties exp	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude	ements y cours define (CLO ent will contin	are j e the CL(s) be a uity.	ble to	red by ay be	y cor 5 or PSC	nsiderin r more Os essed D-3	e CLC	course Os. The LDs erstand
content cov keywords CLOs No. CLO-1 CLO-2	After Unde Apply functio	each d at t Co comp erstance v the p ons. vze the	f a course. ' unit of a co the end of ourse Learn oleting this co d Uniform co roperties exp e functions of	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude onvergence and ponential and le	ements y cours define (CLO ent will contin ogarithm	are j e the CL(s) be a uity.	ble to	red by ay be	y cor 5 or PSC Addro PSC	nsiderin r more Os essed D-3	e CLC C Und Ar	course os. The LDs erstand pply
content cov keywords CLOs No. CLO-1 CLO-2 CLO-3	After Unde Apply function Analy Seque Discu Unife Unife	each d at 1 Co comp erstand v the p ons. vze the ences ussion orm co orm co	f a course. ' unit of a co the end of o ourse Learn oleting this co d Uniform co roperties exp e functions of Proposed Co and series of and series of s of main pro onvergence, onvergence a onvergence a	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude onvergence and ponential and lo f two variables ourse Content of functions f functions	ements y cours define (CLO ent will contin ogarith	are j e the CL(s) be a uity.	ble to	red by ay be	y cor 5 or PSC Addro PSC	nsiderin r more Os essed D-3	e CLC C Und A Du	course os. The LDs erstand pply aalyse

2	Special functions	
	Power series	16 hours
	The exponential and logarithmic functions	
	The trigonometric functions	
	Improper integrals and their convergence	
Extra Read	ing /Key Words: Special functions	
3	Functions of two Variables	
	Functions of two variables.	16 hours
	Partial derivatives	
	Continuity and differentiability	
	The chain rule,	
	Jacobians	
Extra Read	ing /Key Words: Functions of several variables	
4	Implicit Function and Taylor's Theorem	16 hours
	The Implicit function theorem	
	Taylor's theorem,	
	Maxima and Minima	
	Lagrange's multipliers	
Extra Read	ling /Key Words: Implicit Function and Lagrange's multipliers	1

					Year of
S1.	Title of the book	Author(s)	Publisher	Edition	publication
No					
1	Principles of	W. Rudin	Int. Student edition,	3 rd	1997
	Mathematical Analysis		McGrawHill,		
2	Mathematical Analysis	T. M. Apostal	AddisonWesley,	2 nd	1998
		-	Narosa, NewDelhi,		
3	Methods of Real	R. R. Goldberg	Oxford and IBH, New	5 th	2008
	Analysis		Delhi		
4	Analysis I and Analysis	Torence Tao	Hindustan Book	6 th	2006
	II		Agency, India,		
5	Elementary Analysis:	Kenneth A. Ross	Springer Inter,	4 th	2008
5	The Theory of Calculus	Konneth 71. K035	Edition,2004.		2000

FIRST YEAR - SEMESTER - II

Course Title	Comple	x Analysis-II								
Course Type	Hard C	ore- Theory	Total Hours	64	Но	urs/W	'eek	04	Credits	04
Course Code		Evaluation	Internal	C	1+C2	2 = 15	+15		30 Marks	100
			External	Durat	ion	C3	03H	rs	70 Marks	

COURSE OBJECTIVES (COs)

To enable the students to appreciate and critically evaluate the residues, harmonic functions and infinite products

CO No.	Course Objectives
CO-1	To understand Residues and argument principles.
CO-2	To know the nature of harmonic functions.
CO-3	To express entire function in Taylor series.
CO-4	To understand infinite products of complex numbers through Jensen's formula and Hadamard's theorem.

Mapping of CLOs with PSOs &CDLs

Course Learning Outcomes (CLOs): The CLOs indicate what a student has learnt after the successful completion of a course. The CLO statements are prepared by considering the course content covered in each unit of a course.For every course there may be 5 or more CLOs. **The keywords are used at the end of each unit to define CLOs.**

CLOs No.	Course Learning Outcomes (CLOs) After completing this course, the student will be able to	PSOs Addressed	CLDs
CLO-1	Understand Residues and argument principles	PSO-1	Understand
CLO-2	Explain the nature of Harmonic functions	PSO-2	Analyse
CLO-3	Apply Taylor's series to study the annulus of convergence.	PSO-5	Apply
CLO-4	Evaluate infinite products of complex numbers through Jensen's formula and Hadamard's theorem.	PSO-2	Evaluate
Unit	Proposed Course Content		Duration

1	Residues	
	The Calculus of Residues	16 hours
	The residue theorem, argument principle	
	Evaluation of definite integrals.	
Extra Rea	ading /Key Words: Residues and Complex Integration	
2	Harmonic functions	16 hours
	Harmonic functions – Definition and basic properties	
	Mean value property	
	Poisson's formula,	
	Schwarz's theorem and reflection principle	
Extra Rea	ading /Key Words: Harmonic functions	
3	Power series	
	Power series expansions	16 hours
	The Weierstrass theorem	
	The Taylor series	
	The Laurent series.	
Extra Rea	ading /Key Words: Taylor series and Laurent series.	
4	Partial fractions and Entire Functions	16 hours
	Partial fractions and factorization	
	Partial fractions, Mittag - Leffer's theorem	
	Infinite products, Canonical products,	
	The Gamma and Beta functions, Sterling's formula.	
	Entire functions – Jensen's formula, Hadamard's theorem	
Extra Rea	ading /Key Words: Entire functions and Infinite products	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Complex Analysis	L. V. Ahlfors	McGraw-Hill	3 rd	1979
2	Functions of one complex variable,	J. B. Conway	Narosa, New Delhi.	2 nd	1998
3	Invitation to Complex Analysis	R. P. Boas	The Random House	1 st	1987
4	An Introduction to Complex Function Theory	B. C. Palka	Springer	1 st	1991
5	Foundations of Complex Analysis,	S. Ponnusamy	Narosa	4 th	1995

	itle											
Course Type Sof		Soft Co	ore- Theory	Total Hours	64 Hours/We		ek	04	Credi	its	04	
Course Code			Evaluation	Internal	C			30 Mark	arks			
				External	Durat				r	70 Marks	KS	100
		(COURSE OB	JECTIVES ((COs)							
To introdu	ice ac	lvanced c	oncepts in lin	iear algebra.								
CO No.				Co	urse O	bject	ives					
CO-1	Τοι	To understand ODE and its standard properties of the solution.										
CO-2	To a	apply pov	ver series met	hod and some	standa	rd me	thods	to sol	ve th	em.		
CO-3	To i	interpret (the PDEs and	to find the inte	egral su	rface	s.					
CO-4	Τοι	To understand Heat, Laplace and Wave Equation										
completio	n of a	a course.	Map omes (CLOs) The CLO sta	ping of CLOs : The CLOs in tements are pr	with F ndicate repared	what by c	t a stu onside	dent I ring t	he co	ourse con	ntent co	overed in
completio each unit	n of a of a c	a course. course.Fo	Map omes (CLOs) The CLO sta	ping of CLOs : The CLOs in	with F ndicate repared	what by c	t a stu onside	dent I ring t	he co	ourse con	ntent co	overed in
completio each unit end of ea	n of a of a c ach u	a course. course.Fo unit to d	Map omes (CLOs) The CLO sta r every cours efine CLOs.	ping of CLOs in the CLOs in tements are pr there may be	with F ndicate repared 5 or	what by c more	t a stu onside	dent i ring t . The	he co key	ourse con	ntent co are use	overed in d at the
completio each unit	n of a c of a c ach u	a course. course.Fo unit to d	Map omes (CLOs) The CLO sta r every course efine CLOs. ourse Learni	ping of CLOs : The CLOs in tements are pr	with F ndicate repared 5 or 1 (CLOs	what by c more	t a stu onside CLOs	dent 1 ring 1 . The	he co	words a	ntent co	overed in d at the
completio each unit end of ea	n of a c of a c ach u	a course. course.Fo unit to d	Map omes (CLOs) The CLO sta r every course efine CLOs. ourse Learni	ping of CLOs in The CLOs in tements are pr te there may be	with F ndicate repared 5 or 1 (CLOs	what by c more	t a stu onside CLOs	dent i ring t . The P Add	he co key	ed	ntent co are use	overed in d at the Ds
completio each unit end of es CLOs No	n of a contract	a course. course.Fo unit to d C fter com	Map omes (CLOs) The CLO sta r every course efine CLOs. ourse Learni pleting this co	ping of CLOs in The CLOs in tements are pr te there may be	with F ndicate repared 5 or (CLOs ent will	what by c more	a stu onside CLOs	dent i ring t . The P Ado	he co key SOs Iress	ed	ntent co are used	overed in d at the Ds
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completio each unit end of each CLOs No CLO-1 CLO-2	n of a contract	a course. course.Fo unit to d C fter comp pply pow solve the terpret th	Map omes (CLOs) The CLO sta r every course efine CLOs. ourse Learni oleting this co er series meth e ODE's. e PDEs and to	ping of CLOs in the CLOs in tements are pr the there may be ing Outcomes ourse, the stude	with F ndicate repared 5 or 1 (CLOs ent will standard	what by c more s) be at d met	a stu onside CLOs ble to hods	dent i ring t . The Adc P: P: P: P:	he co key SOs Iress SO-1 SO-3	ed	ntent co are used CLI Unders	Dyered in d at the Ds stand ly Evaluate
completio each unit end of ea CLOs No CLO-1 CLO-2 CLO-3	n of a contract	a course. Fo course. Fo unit to d C fter comp pply pow solve the terpret th escribe H xpress rea fferential	Map omes (CLOs) The CLO star r every course efine CLOs. ourse Learnin pleting this con- er series mether oDE's. e PDEs and to feat, Laplace a	ping of CLOs in the CLOs in tements are pr e there may be ing Outcomes ourse, the stude nod and some s o find the integ and Wave Equa	with F ndicate repared 5 or (CLOs ent will standard gral sur- ation.	what by c more s) be at d met	a stu onside CLOs ble to hods	dent i ring t . The P Add P	he co key SOs Iress SO-1 SO-3 SO-2	ed	ntent co are used CLI Unders App nalyse, l	overed in d at the d at the Ds Stand ly Evaluate yse

FIRST YEAR - SEMESTER - II

1	Inner Products Space	16 hours
	Inner Products and Norms	
	The Gram-Schmidt, Orthogonalization Process	
	Orthogonal Complements	
Extra Rea	ading /Key Words: Inner Products Space	
2	Linear Operator	
	The Adjoint of a Linear Operator	16 hours
	Normal and Self-Adjoint Operators	
	Unitary and Orthogonal Operators and Their Matrices	
Extra Read	ding /Key Words: Linear Operator	
3	Orthogonal Projections	
	Orthogonal Projections	16 hours
	The Spectral Theorem	
	Bilinear and Quadratic Forms	
Extra Rea	ading /Key Words : Orthogonal Projections	
4	Canonical Forms	16 hours
	The Diagonal form, The Triangular form	
	The Jordan Canonical Form	
	The Minimal Polynomial; The Rational Canonical Form	
Extra Rea	ading /Key Words : Canonical Forms	1

Sl. No	Title of the book	Author(s)	Publisher	Edition	Year of publication
1	Linear Algebra	S. Friedberg, A. Insel, and L. Spence	PHI	4th	2009
2	Linear Algebra	K. Hoffman and R. Kunze	Prentice-Hall of India	2^{nd}	1978
3	Finite Dimensional Vector Space	P. R. Halmos	Princeton, N.J.D.Van Nostr and Company	3 rd	1958
4	Linear Algebra	Lang. S.	Addison Wesley Pub. Co. Reading, Mass	1 st	1972

FIRST YEAR - SEMESTER - II

	le I											
Course Ty	pe	Soft Co	ore- Theory	Total Hours	64	Ηοι	urs/W	'eek	04	Cre	edits	04
Course Co	de		Evaluation	Internal	C	1+C2	2 = 15	+15	15 30 Ma		arks	<s 100<="" td=""></s>
				External	Durat	ion	C3	03H	lrs	70 Ma	arks	
-				ral linear group, educible represe	-	-	group	, simp	listic g	group, u	initary	group
CO No.	Course Objectives											
CO-1	To re	emember	the simplex	and graphical	method	of L	PP to	solve	e the]	IPP.		
			d and apply d of decisions.	lynamic progra	mming	g prob	olems	in an	y mu	ltistage	e situat	ion to
CO-3	Unde	erstand a	nd apply the	procedure to n	nake de	cisio	ns in :	real li	fe pro	oblems	•	
CO-4	Unde	erstand t	he class of in	ventory models	s and ap	oplies	s the t	echni	ique t	o find s	solutio	n.
		-	comes (CLO	ng of CLOs w s): The CLO: The CLO state	s indica	ate v	vhat	a stu				
successful o content cov keywords	compl vered	letion o in each used at	comes (CLO of a course. a unit of a co the end of of	s): The CLO: The CLO state ourse.For ever each unit to	s indica ements y cours define	ate v are g se the CLO	vhat prepa ere m	a stu red b	oy co e 5 o	nsiderin or mor	ng the	course Ds. The
successful of content cov	compl vered	letion o in each used at	comes (CLO of a course. a unit of a co the end of of	s): The CLO The CLO state ourse.For ever	s indica ements y cours define	ate v are g se the CLO	vhat prepa ere m	a stu red t ay be	oy co e 5 o PSC	nsiderin or mor Os	ng the	course
successful of content cov keywords	compl vered are u	letion o in each used at	comes (CLO of a course. a unit of a co the end of of ourse Learn	s): The CLO: The CLO state ourse.For ever each unit to	s indica ements y cours define (CLOs	ate v are se the CLO	vhat prepa ere m)s.	a stu red b ay be	oy co e 5 o	nsiderin or mor Os	ng the	course Ds. The
successful o content cov keywords	compl vered are u Aft Unc	letion o in each used at C ter comp	comes (CLO of a course. a unit of a co the end of o ourse Learn pleting this co	bs): The CLO: The CLO state ourse.For ever each unit to ing Outcomes	s indicates indi	ate v are g se the CLO s) be al	vhat prepa ere m)s. ble to	a stu red b ay be	oy co e 5 o PSC	nsiderin or mor Os essed	ng the re CLC	course Ds. The
successful of content cov keywords CLOs No.	compl vered are u Aft Unc prol	letion o in each used at C ter comp derstand blems.	comes (CLO of a course. a unit of a co the end of o ourse Learn pleting this co the methods	(b): The CLO: The CLO state ourse.For ever each unit to ing Outcomes ourse, the stude	s indica ements y cours define (CLOs ent will eger pro	ate v are g se the CLO s) be al	vhat prepa ere m)s. ble to	a stu red b ay be	e 5 o PS(nsiderin or mor Os essed	ng the re CLC C Unde	course Ds. The LDs
successful of content cov keywords CLOs No.	compl vered are u Aft Unc prol Det	letion o in each ised at C ter comp derstand blems. termine	comes (CLO of a course. a unit of a co the end of o ourse Learn pleting this co the methods the solution f	(b): The CLO: The CLO state ourse.For ever each unit to ing Outcomes ourse, the stude	s indica ements y cours define (CLOs ent will eger pro- istage.	ate v are j se the CLO s) be all	what prepa ere m)s. ble to	a stu red b ay be	py co e 5 o PS(Addre	nsiderin or mor Os essed D-1	ng the re CLC C Unde	course Ds. The LDs erstand
successful of content cov keywords CLOs No. CLO-1 CLO-2	Aft Det Unc	letion o in each ised at C ter comp derstand blems. termine derstand	comes (CLO of a course. a unit of a co the end of o ourse Learn pleting this co the methods the solution f	(b): The CLO The CLO state ourse.For ever each unit to ing Outcomes ourse, the stude of solving inte	s indications indi	ate v are se the CLO s) be all ogram	what prepa ere m)s. ble to nming ms.	a stu red b ay be	PSC	nsiderin or mor Os essed D-1 D-2 D-5	ng the re CLC C Unde An Ev	course Ds. The LDs erstand alyze aluate
successful of content cov keywords CLOs No. CLO-1 CLO-2 CLO-3	Aft Aft Unc prol Det Unc Disc Proj	letion o in each ised at C ter comp derstand blems. termine derstand derstand cusses ogrammi	comes (CLO of a course. a unit of a co the end of o ourse Learn oleting this co the methods the solution f game theory the concept The Met ng Proble	as): The CLO: The CLO state ourse.For ever each unit to ing Outcomes ourse, the stude of solving inter for LPP in mult to find solution of EOQ model	s indica ements y cours define (CLOs ent will eger pro- istage. istage. ons to pro- s and it Solving Pro-	ate v are se the CLO s) be all ogram roble s typ	what prepa ere m)s. ble to nming ms. es. nteger	a stu red b ay be	PSC	nsiderin or mor Os essed D-1 D-2 D-5 D-3	ng the re CLC C Unde An Ev	course Ds. The LDs erstand

1	Classical Groups	
	General linear group,	
	Orthogonal group,	16 hours
	Symplectic group,	
	Unitary group.	
Extra Rea	ding /Key Words: Orthogonal and Symplectic group	
2	Group Representation	
	Group representation,	16 hours
	Conjugate representation,	
	G-invariant spaces – irreducible representations – Schur's lemma.	
Extra Rea	ading /Key Words: Group and Conjugate representation	
3	Applications	
	Maschke's theorem – characters.	16 hours
	Orthogonality relations for characters	
	Number of irreducible representations	
Extra Rea	ding /Key Words: Maschke's theorem and Orthogonality relations	
	Permutation representations	16 hours
	Regular representation.	
4	Representations of Symmetric groups.	
	Representation of Finite abelian groups – Dihedral groups.	
Extra Rea	ding /Key Words: Permutation representations	I
u	ang / 10 J	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Operation Research	Gupta P.K and Hira S.	S Chand &Co.Ltd.New Delhi.	2 nd	2005
2	Operation Research Methods & Applications.	Mariappan .P.	New Century Book House Private Limited	3 rd	2001
3	Operation Research	Panneer Sevvam	Prentice Hall of India Pvt , New Delhi	5 th	2003
4	Operation Research Theory & Applications	Sharma J.K.	Macmillan India Limited, Chennai	3 rd	2007
5	Operations Research An Introduction	Taha Hamady A	Pearson Education Publishing Limited, New Delhi.	4 th	2002

FIRST YEAR - SEMESTER - II

Course T	itle	Theory												
Course T	ype	Soft Co	ore- Theory	Total Hours	64	Ho	urs/W	'eek	eek 04		edits	04		
Course Co	e Code		Code		Evaluation	Internal	C	1+C2	2 = 15	+15		30 M	arks	100
			L'undution	External	Durat	tion	C3	03H	irs	70 M	arks	100		
COURSE	OB.	JECTIVI	ES (COs)											
formula ar	nd the	eir applica		generating fur t paves the way atities.										
CO No.				Cours	se Obje	ective	es							
CO-1	Тοι	understan	d the concept	ts of Partitions	of num	bers.								
CO-2	То	discuss Ja	cobi's triple p	product identity	y and it	s app	olicati	ons						
CO-3	Tos	study the	Rogers - Ran	nanujan Identit	ies.									
		•	_	-	41. DC/	2 0-	CDL	~						
	earni	ing Outo	Mappin comes (CLO	ng of CLOs with s): The CLOs The CLO state	s indica	ate w	/hat a	a stuc						
successful content co	earni com	ing Outo pletion o d in each	Mappin comes (CLO of a course. 7 a unit of a co	ng of CLOs wi	s indica ements y cours	ate w are p se the	/hat a prepar pre ma	a stuc ed by	con	siderin	ig the	course		
successful content co	earni com overea are	ing Oute pletion o d in each used at	Mappin comes (CLO of a course. 7 unit of a co the end of a	ng of CLOs wi s): The CLOs The CLO state ourse.For every each unit to	s indica ements y cours define	ate w are p se the CLC	/hat a prepar pre ma	a stuc ed by	con	siderin more	ig the e CLO	course		
successful content co keywords	earni com overed are	ing Outc pletion o d in each used at	Mappin comes (CLO of a course. 7 a unit of a co the end of a course Learn	ng of CLOs wi s): The CLOs The CLO state purse.For every	s indica ements y cours define	ate w are p se the CLC s)	vhat a prepar pre ma)s.	a stuc red by ay be	con 5 or	siderin more	ig the e CLO	course s. The		
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successful content co keywords CLOs No	earni com overed are • • A	ing Outo pletion o d in each used at C after comp nderstanc iscuss Jac	Mappin comes (CLO of a course. ' unit of a co the end of ourse Learn pleting this co the concepts cobi's triple pr	ng of CLOs wi s): The CLOs The CLO state ourse.For every each unit to ing Outcomes	s indica ements y cours define (CLO ent will of numl	ate w are p se the CLC s) l be all bers.	vhat a prepar pre ma)s.	a stuc red by ay be	y con 5 or PS(.ddre	Ds Ds D-3	c C Unde	course s. The LDs		
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2	Euler theorems and its applications Two theorems of Euler Jacobi's triple product identity and its applications	16 hours
Extra Rea	ading /Key Words: Jacobi's triple product identity	
3	Summation Formula and its Applications $1\psi1$ - summation formula and its applications Combinatorial proofs of Euler's identity Euler's pentagonal number theorem Franklin's combinatorial proof	16 hours
Extra Rea	ading /Key Words: 1ψ1 - summation formula	·
4	Congruence Properties Congruence properties of partition function The Rogers - Ramanujan Identities	16 hours
Extra Rea	ading /Key Words: Rogers - Ramanujan Identities	

Sl. No	Title of the book	Author(s)	Publisher	Edition	Year of publicati on
1	An Introduction to Theory of Numbers	G. H. Hardy and E. M. Wright	Oxford University Press	5th	1979
2	An Introduction to the Theory of Numbers	I. Niven, H. S. Zuckerman and H. L. Montgomery	John Wiley and Sons, Inc., New York	5th	2004
3	Ramanujan's Note Books Volume-1 to 5	Bruce C. Berndt	Springer		
4	The Theory of Partitions	G. E. Andrews	Addison Wesley	1 st	1976
5	Partition Theory	A. K. Agarwal, Padmavathamma, M. V. Subbarao	Atma Ram & Sons, Chandigarh	1 st	2005

Course Tit	le	Elemen										
Course Ty	pe	Hard C	ore- Theory	Total Hours	64	Ho	urs/W	/eek	04	Cre	edits	04
Course Co	de		Evaluation	Internal	C	1+C2	1+C2 = 15+15 30			30 Ma	arks	
			Lvaluation	External	Durat	ion	C3	03H	lrs	70 Ma	arks	
COURSE	OBJ	ECTIVI	ES (COs)									
To study the	e No	ormed lin	ear spaces, B	anach spaces,	Hilbert	Spac	es, ar	nd op	erator	s on th	ese sp	aces.
CO No.				Cours	se Obje	ective	es					
CO-1	Τοι	Inderstan	d the propert	ies of contracti	on map	ping	•					
CO-2	To k	now the	application o	f Open mappir	ng theor	rem.						
CO-3	To s	tudy the	orthogonal co	omplements an	d conju	igate	space	e.				
		0		s): The CLOs								
successful of content cov	comj verec	pletion o l in each	f a course.	s): The CLOs The CLO state ourse.For every each unit to	ements y cours	are p e the	orepar re ma	red by	y con	siderin	g the	course
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successful of content cov keywords	comj verec are A St	pletion o l in each used at C fter com	f a course. The unit of a contract of a cont	The CLO state ourse.For every each unit to ing Outcomes	ements y cours define (CLO: ent will	are p e the CLC s) be al	brepar re ma)s. ble to	red by ay be	y con 5 or PSC	siderin more Ds essed	g the CLO	course s. The LDs
successful of content cow keywords CLOs No.	A A Str Ba	fter computed at	f a course. The unit of a course the end of ourse Learns pleting this continuous linear orem.	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude	ements y cours define (CLO) ent will ons and	are p e the CLC s) be al the	brepar re ma Ds. ble to Hahn	red by ay be	y con 5 or PS(Addre	siderin more Os essed	g the cLO C	course s. The LDs erstanc
successful of content cov keywords CLOs No.	A A Sti Ba Un ap	nderstand pletion o l in each used at C fter comp udy Cont unach the plication	f a course. The unit of a course the end of	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude r transformatio	ements y cours define (CLO) ent will ons and 'heoren	are p e the CLC s) be al the 1 n an	ble to Hahn	A A	y con 5 or PSC	siderin more Ds essed D-1	g the cLO C Undo	course s. The
successful of content cov keywords CLOs No. CLO-1 CLO-2	A A Sti Ba Un ap	pletion o l in each used at C fter comp udy Cont udy Cont udy Cont udy Cont udy Cont udy Cont udy Cont udy Cont udy Cont udy Cont unach the plication otain Ort njugate s	f a course. The unit of a contract of a cont	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude r transformatio Mapping T	ements y cours define (CLO) ent will ons and Theorem	are p e the CLC s) be al the 1 n an	ble to Hahn	A A	y con 5 or PSC ddre PSC	siderin more Ds essed D-1	g the CLO	course bs. The LDs erstand

2	Normed Linear Space	
	Linear spaces and linear operators,	16 hours
	Norm of a bounded operator	
	The Hahn – Banach extension theorem	
	Stone - Weirstrass theorem	
Extra Rea	ading /Key Words: Defining Norm and Hilbert Space	L
3	Banach Space	
	Open mapping theorem,	16 hours
	Closed Graph theorems	
	The Banach – Steinhaus Principle Of Uniform Boundedness	
Extra Rea	ading /Key Words: Projections on Banach spaces	L
4	Hilbert Spaces	16 hours
	The orthogonal projection	
	Nearly orthogonal elements,	
	Riesz's lemma,	
	Riesz's representation theorem.	
Extra Res	ading /Key Words: Orthonormal spaces	
	unig/ixey words. Orthonormal spaces	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Introduction to Topology and Modern Analysis	G. F. Simmons	Tata McGraw-Hill	2 nd	2002
2	Introduction to Functional Analysis	A. E. Taylor	Wiley, New York,	1 st	1958
3	Elements of Functional Analysis	A. Page and A. L. Brown	Van Nostrand Reinhold Company	1 st	1970
4	Functional Analysis	George Bachman and Lawrence Narici	Dover Publications	2 nd	2000
5	A Course in Functional Analysis	J. B. Conway	Springer	2 nd	1985
6.	Introductory functional analysis with applications	Erwin Kreyszig	Wiley, New York	1 st	1978

le Topolog	gy-I								
pe Hard C	ore- Theory	Total Hours	64	Ho	urs/W	/eek	04	Credi	its 04
de	Evaluation	Internal	C	1+C2	2 = 15	5+15 30		30 Mark	ks 100
	Lvaluation	External	Durat	ion	C3	03H	rs	70 Mark	
OBJECTIV	ES (COs)		I				I		
		spaces and the	ir prope	erties	in ter	ms of	fcont	inuity,	
		Cours	e Obje	ctive	es				
To discuss th	e continuous	functions							
Toanalyze th	e connected s	paces.							
					JS.		PSC)s	CLDs
					ble to	A			CLDS
Understand	the topologie	cal spaces					PSO	-3 I	Understand
Discuss Co	ontinuous func	ctions					PSO	-2	Apply
Analyze Co	onnected spac	ees					PSO	-1	Analyze
	Proposed Course Content								
	Proposed Co	ourse Content							Duration
	pe Hard C de Image: Completion of the compl	pe Hard Core- Theory de Evaluation DBJECTIVES (COs) e essentials of topological sess and compactness. To understand the topolog To discuss the continuous To analyze the connected set Mappin arning Outcomes (CLOs) completion of a course. The course Learning After completing this completing this completion of the topological set the topological set. Discuss Continuous function	pe Hard Core- Theory Total Hours de Evaluation Internal Evaluation External OBJECTIVES (COs) External e essentials of topological spaces and their External OBJECTIVES (COs) External e essentials of topological spaces and their External OBJECTIVES (COs) External e essentials of topological spaces and their External Course Course To understand the topological spaces. To discuss the continuous functions To analyze the connected spaces. Mapping of CLOs with arning Outcomes (CLOs): The CLOs state The cLO state rered in each unit of a course. 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Course Learning Outcomes (CLOs) After completing this course, the student will be able to Addressed Understand the topological spaces PSO-3 1 Discuss Continuous functions PSO-2 1

2	Continuous Functions	
	Continuous functions	16 hours
	The product topology	
	The metric topology	
	The quotient topology	
Extra Read	ing /Key Words: Normality of continuous functions, Convexity and cor	ntinuity
3	Connectedness	
	Connected spaces	16 hours
	Connected sets on the real line	
	Path connectedness	
Extra Read	ing /Key Words: continuity and connectedness	
4	Compactness	16 hours
	Compact spaces	
	Compact sets on the real line	
	Limit point compactness	
	Local compactness	
Extra Read	ing /Key Words: continuity and compactness	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	A First Course in Topology	J. R. Munkres	Prentice Hall India	2nd	2000
2	Introduction to Topology and Modern Analysis	G. F. Simmons	McGraw-Hill, Kogakusha	1 st	1968
3	General Topology	S. Willard	Addison Wesley, New York	1 st	1970
4	Topology	J. Dugundji	Allyn and Bacon, Boston	1 st	1966
5	Introduction to topology	Bert Mendelson	Dover Publication	3 rd	1990

Course Ti	tle	Graph T	heory									
Course Ty	pe	Soft Co	ore- Theory	Total Hours	64	Ho	urs/W	Veek	04	Cre	edits	04
Course Co	de		Evaluation	Internal	C	1+C2	2 = 15	5+15		30 Ma	arks	100
				External	Durat	ion	C3	03H	03Hrs 70 N		arks	
COURSE	OBJI	ECTIVI	ES (COs)					•				
				oncepts of graph relations betwo		•				ibe the	idea o	f line
CO No.				Cours	æ Obje	ective	es					
CO-1				ons namely, cu			idge a	nd blo	ocks	of a gra	iph.	
CO-2	To st	udy the	properties of	trees and conn	ectivity	/.						
CO-3	To id	lentify E	ulerian graph	ns and apply rea	sults to	iden	tify H	Iamilt	oniai	n graph	s.	
CO-4	To ur	nderstan	d the concept	ts Planarity inc	luding	Eule	r iden	tity.				
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successful content cov keywords	comp vered	letion o in each	f a course. T	s): The CLOs The CLO state purse.For every	indica ments cours	ate w are p e the	vhat a prepai ere ma	a stud red by	y con 5 oi	nsiderin r more	g the cLO	course s. The
successful content cov	comp vered	letion o in each ised at	nomes (CLO) f a course. T a unit of a co the end of o	s): The CLOs The CLO state purse.For every	indica ments cours define	ate w are j e the CLC	vhat a prepai ere ma	a stuc red b <u>y</u> ay be	y con 5 or PS (nsiderin r more Os	g the cLO	course
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successful content cov keywords CLOs No.	Afr Afr Und and Iden Han Dis	c in each ised at C fter comp derstand l blocks ntify Eu miltonia scuss and	the end of of a graph. I the definition of a graphs. I the definition of a graphs. I the definition of a graphs. I understand in the definition of a graphs.	s): The CLOs The CLO state ourse.For every each unit to ing Outcomes ourse, the stude ons namely, c and apply resu	indica ments cours define (CLO: ent will cut vert	ate w are I e the CLC s) be a tex, denti	vhat a prepare ere ma Ds. ble to bridge	a stud red by ay be	y con 5 or PSC	Os essed	g the CLO	course s. The LDs erstand
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2	Trees	
	Characterization of trees, Spanning Tree, Centers and centroids.	16 hours
	Cutpoints, bridges, and blocks	
	Block graphs and cutpoint graphs	
Extra Re	ading /Key Words: Spanning tree	·
3	Connectivity and Traversability	
	Connectivity and line-connectivity	16 hours
	Graphical variations of Menger's theorem	
	Euler graphs and Hamiltonian graphs	
Extra Re	ading /Key Words: Hypo hamiltonian , Hypo traceable	
4	Planar graphs and colourability	16 hours
	Planar graphs and Euler's formula	
	Vertex colouring	
	Chromatic number and Five colour theorem	

			ויוות		Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Graph Theory	Frank Harary	Addition Wesley Reading Mass	3 rd	1969
2	Graph Theory with applications	J. A. Bondy and U. S. R. Murthy	Elsevier	2 nd	1976
3	Graph Theory With Applications to Engineering and Computer Science	N. Deo	Prentice Hall of India	1 st	1987
4	Basic Graph Theory	K. R. Parthasarathy	Tata McGraw-Hill, New Delhi	2 nd	1994
5	Introduction to Graph Theory	D. B. West	Pearson Education Inc.	2 nd	2001
6	Collage Graph Theory	V. R. Kulli	Vishwa International Publications	1 st	2012
7	Graphs and Diagraphs	G. Chartand and L. Lesniak	Qwadsworth and Brooks	2 nd	1986
8	A First Look at Graph Theory	Clark and D. A. Holton	Allied publishers	1 st	1991

	tle	Commu	tative Algebr	a								
Course Ty	pe	Saft Co	ore- Theory	Total Hours	64	Ho	urs/W	'eek	04	Cre	dits	04
Course Co	ode		Evaluation	Internal	C	1+C2	2 = 15	+15		30 Ma	arks	100
				External	Durat	ion	C3	03H	Irs	70 Ma	arks	
COURSE	OBJ	IECTIVI	ES (COs)		1							
-			-	eals, nilpotent, etherian modu		nilrac	licals,	mod	ules, .	Artinia	n and	
CO No.				Cours	se Obje	ective	es					
CO-1	То д	give the e	xtended idea	of rings, ideals	s, nilpo	tent,	units,	nil ra	dical	s		
CO-2			module theor	_	-							
CO-3	Tos	study Art	inian and Noe	etherian modul	es.							
content on		piction 0	of a course.	The CLO state	ements	are p	prepar	ed by	y con	siderin	g the	
	vered	d in each	unit of a co	The CLO state ourse.For every each unit to	y cours	e the	ere ma	•			•	
	vered are	d in each used at C	the end of a co the end of co ourse Learn	ourse.For every	y cours define	e the CLC s)	pre ma	ay be		more	CLO	course
keywords	A Ui	d in each used at C	the end of a contract of a con	ourse.For every each unit to ing Outcomes	y cours define (CLO ent will	e the CLC s) be a	ble to	ay be	5 or PSC	more Ds ssed	CLO	course s. The LDs
keywords CLOs No.	A A U rad	d in each used at C fter comp nderstand dicals	the end of a contract of a con	ourse.For every each unit to ing Outcomes ourse, the stude rties of Nilra	y cours define (CLO ent will	e the CLC s) be a	ble to	ay be	5 or PSC	more Ds ssed -1	CLO C	course s. The LDs
keywords CLOs No. CLO-1	A Dirac	d in each used at C fter comp nderstand dicals	the end of a contract of a con	ourse.For every each unit to ing Outcomes ourse, the stude rties of Nilra	y cours define (CLO ent will adicals,	e the CLC s) be a	ble to	ay be	5 or PSC	more Ds ssed -1 -2	CLO Cl Unde	course s. The LDs erstand
keywords CLOs No. CLO-1 CLO-2	A Dirac	d in each used at C fter comp nderstand dicals xplain Mo entify No	the end of a contract of a con	ourse.For every each unit to ing Outcomes ourse, the stude rties of Nilra	y cours define (CLO ent will adicals,	e the CLC s) be a	ble to	ay be	5 or PSC ddre PSO PSO	more Ds ssed -1 -2	CLO Cl Unde An	course s. The L Ds erstand alyze
keywords CLOs No. CLO-1 CLO-2 CLO-3	A A U I I C I C Z	d in each used at C fter comp nderstance dicals xplain Mo entify No Rings and leals and ero-divis	the end of a contract of a con	ourse.For every each unit to ing Outcomes ourse, the stude rties of Nilra ties Artinian Modu ourse Content orphisms, gs elements and p	y cours define (CLO ent will adicals,	e the CLC s) be a	ble to	ay be	5 or PSC ddre PSO PSO	more Ds ssed -1 -2	CLO Cl Unde An	course s. The LDs erstand alyze pply ration

2	Radicals	
	The prime spectrum of a ring	16 hours
	The nil radical and Jacobson radical	
	Operation on ideals	
	Extension and contraction	
Extra Read	ling /Key Words: Operation on ideals	
3	Modules	
	Modules and modules	16 hours
	Homomorphisms	
	Submodules and quotient modules	
Extra Read	ling /Key Words: Modules	I
4	Direct sums and Free module	16 hours
	Direct sums, Free modules	
	Finitely generated modules	
	Nakayama Lemma, Simple modules	
	Exact sequences of modules	
Extra Read	ling /Key Words: Schur's Lemma	<u> </u>

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Introduction to	M. F. Atiyah and I. G.	Avalon Publishing	1 st	1994
	Commutative Algebra,	Macdonald			
2	Introduction to Rings and Modules	C. Musili	Narosa Publishing House	1 st	1997
3	Under-graduate	Miles Reid	Cambridge	1 st	1995
	Commutative Algebra		University Press		
4	Commutative Algebra	N. S. Gopalakrishnan,	Oxonian Press	1 st	1984
5	Commutative algebra- With a view toward algebraic geometry.	David Eisenbud,	Springer-Verlag,	1 st	1995

Course T	itle	Algebra	lic Nulliber 1	heory								
Course T	уре	Soft Co	ore- Theory	Total Hours	64	Hour	rs/W	eek	04	Cre	edits	04
Course Co	ode		Evaluation	Internal	C	1+C2 =	= 15	+15		30 M	arks	100
				External	Durat	tion (C3	03H	rs	70 M	arks	100
COURSE	OBJ	JECTIVI	ES (COs)									
To learn Dedekind	basic l don	knowled nains, fini	ge of quadra teness of the	tic fields, Diop class group, cl	hantine ass nur	e equat nber co	tion, omp	facto utatio	rizat ns.	ion of i	ideals ·	-
CO No.				Cours	e Obje	ectives						
CO-1	Τοι	understan	d Ramanujan	- Nagell theor	em.							
CO-2	_		Factorization of									
CO-3	Тос	discuss P	rime factoriza	ation of ideals								
	com	-		The CLO state ourse.For every		-	-	ed by	con		ig the	course
content co keywords	com overed are	d in each used at	unit of a co the end of	ourse.For every each unit to	cours define	e there CLOs	e ma	ed by	7 con 5 oi	nsiderin r more	ng the e CLO	course s. The
content co	com overed are	d in each used at C	the end of a contract of a con	ourse.For every	cours define (CLO	the there $CLOs$	e ma	ed by iy be	7 con 5 or PS	nsiderin r more	ng the e CLO	course
content co keywords	com overed are ·	d in each used at C	the end of a co the end of a course Learn pleting this co	ourse.For every each unit to ing Outcomes	cours define (CLO ent will	the there $CLOs$	e ma	ed by iy be	7 con 5 or PS	nsiderin r more Os essed	the CLO	course s. The LDs
content co keywords CLOs No	com overed are · A U	d in each used at C after comp nderstand	the end of a co the end of a course Learn pleting this co	ourse.For every each unit to ing Outcomes ourse, the stude jan - Nagell the	cours define (CLO ent will	the there $CLOs$	e ma	ed by iy be	/ con 5 or PSC	nsiderin r more Os essed	e CLO C.	course s. The LDs
content co keywords CLOs No CLO-1	com overed are A U D	d in each used at C After comp nderstand	the end of a co the end of a course Learn pleting this co the Ramanu Factorization	ourse.For every each unit to ing Outcomes ourse, the stude jan - Nagell the	cours define (CLO ent will eorem	the there $CLOs$	e ma	ed by iy be	7 con 5 or PSC	nsiderin r more Os essed D-3 D-2	e CLO C Unde	course s. The L Ds erstand
content co keywords CLOs No CLO-1 CLO-2	com overed are A U D	d in each used at C After comp nderstand	the end of a contract of a con	ourse.For every each unit to ing Outcomes ourse, the stude jan - Nagell the n of Ideals	cours define (CLO ent will eorem	the there $CLOs$	e ma	ed by iy be	PSC	nsiderin r more Os essed D-3 D-2	e CLO C Unde A	course s. The LDs erstand
content co keywords CLOs No CLO-1 CLO-2 CLO-3	com overed are A U D A A D	d in each used at C After comp nderstand iscuss the pply the l umber T	the end of a contract of a con	ourse.For every each unit to ing Outcomes ourse, the stude jan - Nagell the n of Ideals zation of ideals ourse Content	y cours define (CLO ent will eorem	e there CLOs s) be abl	le to	ed by iy be	PSC	nsiderin r more Os essed D-3 D-2	e CLO C Unde A	course s. The LDs erstand pply pply ration
content co keywords CLOs No CLO-1 CLO-2 CLO-3 Unit 1	com overed are A U D A I N A	d in each used at C After comp nderstand iscuss the pply the l umber T umber the lgebraic i	the end of a contract of a con	ourse.For every each unit to ing Outcomes ourse, the stude jan - Nagell the n of Ideals zation of ideals ourse Content pplications ications of unio	y cours define (CLO ent will eorem	e there CLOs s) be abl	le to	ed by iy be	PSC	nsiderin r more Os essed D-3 D-2	e CLO C. Unde A Du	course s. The LDs erstand pply pply ration

3	Factorization	
	Factorization of Ideals - Dedekind domains	16 hours
	Fractional ideals	
	Invertible ideals	
	Prime factorization of ideals	
tra Re		
tra Re	ading /Key Words: Prime factorization of ideals	16 hours
		16 hours
	ading /Key Words: Prime factorization of ideals Class group and Class number	16 hours
	ading /Key Words: Prime factorization of ideals Class group and Class number Class group and Class number	16 hours

					Year of
S1.	Title of the book	Author(s)	Publisher	Edition	publication
No					
1	Abstract Algebra with	Karlheinz Spindler	Marcel Dekker, Inc.	1 st	1994
	Applications, Vol. II,				
	Rings and Fields				
2	Algebraic Number	I. N. Stewart and	Chapman and Hall	1 st	2016
	Theory	David Tall			
3	Problems in Algebraic	Jody Esmonde and	Springer Verlag	1 st	2005
	Number Theory	M. Ram Murthy			
4	Algebra Vol. II: Rings	I. S. Luthar and I. B.	Narosa Publishing	1 st	1999
		S. Passi	House		

Course Ty	pe	Soft Co	ore- Theory	Total Hours	64	Ho	urs/W	/eek	04	Cree	dits	04
Course Co	de		Evaluation	Internal	C	1+C2	2 = 15	+15		30 Ma	rks	100
			Livuluulion	External	Durat	ion	C3	03Hrs 7		70 Ma	rks	100
COURSE	OBJ	IECTIVI	ES (COs)						ľ		•	
To learn the in a field.	e ide	a of Galo	ois Theory in	abstract algebr	a it also	o ext	ends t	the co	ncept	of Gale	ois Th	eory
CO No.				Cours	se Obje	ective	es					
CO-1	To I	Discuss T	The basic ison	norphisms of a	lgebrai	c fiel	d the	ory.				
CO-2	To S	Study the	field extension	on.								
CO-3	Τοι	understan	d the element	ts of Galois Th	eory.							
successful content cov	com verec	pletion o d in each	f a course. ' unit of a co	s): The CLOs The CLO state purse.For every	ements y cours	are p e the	prepar ere m	red by	y con	sidering	g the o	cours
successful content cov keywords	com verec are	pletion o 1 in each used at	f a course. ' unit of a co the end of	The CLO state ourse.For every each unit to	ements y cours define	are p e the CLC	prepar ere m	red by	y con 5 or	sidering more	g the o CLOs	cours 5. Th
successful content cov	com verec are	pletion o d in each used at C	f a course. ' unit of a co the end of ourse Learn	The CLO state ourse.For every	ements y cours define (CLO	are I e the CLC s)	prepar ere ma Ds.	red by	y con	sidering more	g the o CLOs	cours
successful content cov keywords	are	pletion o d in each used at C after comp	f a course. ' unit of a co the end of ourse Learn pleting this co	The CLO state ourse.For every each unit to ing Outcomes	ements y cours define (CLO ent will	are I e the CLC s) be a	prepare ere ma Ds. ble to	red by	y cons 5 or PSC	sidering more Ds ssed	g the o CLOs	cours 5. Th ∠Ds
successful content cov keywords CLOs No.	are	pletion o d in each used at C .fter comp iscuss Th eory.	f a course. ' unit of a co the end of ourse Learn pleting this co	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude orphisms of alg	ements y cours define (CLO ent will	are I e the CLC s) be a	prepare ere ma Ds. ble to	red by	y cons 5 or PSC	sidering more Ds ssed -3	g the o CLOs CI Unde	courses. The
successful content cov keywords CLOs No.	A A Di the St	pletion o d in each used at C after comp iscuss Th eory. udy the fi	f a course. ' unit of a co the end of ourse Learn pleting this co e basic isomo	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude orphisms of alg	ements y cours define (CLO) ent will gebraic	are I e the CLC s) be a	prepare ere ma Ds. ble to	red by	y cons 5 or PSC Addre	sidering more Ds ssed 3	g the of CLOs	courses. The Ds
successful content cov keywords CLOs No. CLO-1 CLO-2 CLO-2 CLO-3 Unit	A A Di the St	pletion o d in each used at C fter comp iscuss Th eory. udy the finderstand	f a course. ' unit of a co the end of ourse Learn pleting this co e basic isomo ield extension	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude orphisms of alg	ements y cours define (CLO ent will gebraic	are I e the CLC s) be a	prepare ere ma Ds. ble to	red by	y cons 5 or PSC Addre PSO	sidering more Ds ssed 3	g the of CLOs CLOs CI Unde	course . The . Ds rstance ply
successful content cov keywords CLOs No. CLO-1 CLO-2 CLO-2	A A Di tha St Un Al Al Al	pletion o d in each used at C fter comp iscuss Th eory. udy the finderstand lgebraical ne exister	f a course. ' unit of a co the end of ourse Learn pleting this co e basic isomo ield extension the elements Proposed Co study of field lly closed fiel ace of an alge	The CLO state ourse.For every each unit to ing Outcomes ourse, the stude orphisms of alg n s of Galois The ourse Content	ements y cours define (CLO ent will gebraic eory	are per the CLC s) be a field ures	prepare ere ma Ds. ble to	red by	y cons 5 or PSC Addre PSO	sidering more Ds ssed 3	g the of CLOs CLOs CI Unde	course The Ds rstand ply ply ation

2	Algebraic study of fields	
	Automorphisms and fixed fields	16 hours
	The Frobenius automorphism	
	The isomorphism extension theorem	
Extra Re	ading /Key Words: Isomorphism extension theorem	
3	Field extension	
	The index of a field extension	16 hours
	Splitting fields	
	Separable extensions	
	Perfect fields	
	Normal extensions	
Extra Re	ading /Key Words: Galois groups over the rationals	
4	Galois theory	16 hours
	The main theorem of Galois theory	
	Galois groups over finite fields	
	Symmetric functions	
	Cyclotomic extensions	
	Constructible numbers	
E-4-12 Da		
Extra Re	ading /Key Words: solvability by radicals	

					Year of
Sl.	Title of the book	Author(s)	Publisher	Edition	publication
No					
1	A First Course in	J. B. Fraleigh	Narosa Publishing	3 rd	2013
	Abstract Algebra		House		
2	Galois Theory	Ian Steward	Chapman and Hall	3 rd	1945
3	Galois Theory	Joseph Rotman	Universitext Springer	2 nd	1998
4	Algebra	Michael Artin	Prentice-Hall of	5 th	1991
			India, New Delhi		
5	Contemporary	Joseph A. Gallian	Narosa Publishing	4th	1999
	Abstract Algebra		House		
6	Abstract Algebra	D. S. Dummit and R.	John Wiley and Sons	5 th	1999
		M. Foote			
7	Topics in Algebra	I. N. Herstein	Vikas Publishing	4 th	1997
			House, New Delhi		

Course Title Mathematical Computation Course Type Interdisciplinary Total Hours 64 Hours/Week 04 Credits 04 Paper Course Code C1+C2Internal 30 Marks 100 Evaluation External Duration C3 02Hrs 70Marks **Course Objectives** To understand fundamental concepts in graph theory, lattices, matrices and Boolean algebra and to introduce MATLAB programming with few examples CO No. **Course Objectives** CO-1 To illustrate the applications of graph theory CO-2 To Solve problems using matlab CLOs No. **Course Learning Outcomes (CLOs) PSOs CLDs** Addressed After completing this course, the student will be able to CLO-1 Understand the essence of theory in PSO-1 Understand graph interdisciplinary fields CLO-2 PSO-2 Analyse the problems of matrices Analyze CLO-3 PSO-3 Apply the computer knowledge for solving mathematical Apply problems. Unit **Proposed Course Content** Duration 1 16 hours **Graph Theory And Lattices Theory** Partially ordered sets, lattices, complete lattices, distributed lattices Complements, Boolean algebra, Boolean expressions, application to switching circuits Graphs, vertices of graphs, walks and connectedness, degrees, operations on graphs Trees: elementary properties of trees Extra Reading /Key Words: Connectivity of graph 2 **Matrix Algebra** 16 hours Matrix definition, types of matrix, transpose of matrix Determinants, properties of determinants, co -factors matrix Cramer's rule, adjoint matrix, inverse of a matrix Problems on singular and non-singular matrix

Extra Re	ading /Key Words: Eigen values, eigen vector	
3	Introduction to Matlab	
	Basics of MATLAB programming: Reading data from files, Plotting	
	data Calculating statistics, Exporting graphics,	
	Array operations: Performing calculations with vectors, Creating	
	multiple plots	32 hours
	Loops and execution control : Programming constructs, User interaction,	52 110 115
	Flow control, Loops	
	Functions: Creating functions, Calling functions, Setting the MATLAB	
	path, Debugging	
Extra Re	ading /Key Words: MATLAB path	

Sl.					Year of
No	Title of the book	Author(s)	Publisher	Edition	publication
1	General Lattice theory	Gratzer, George A	Birkhauser publisher,	2 nd	1998
2	Basic graph theory	K.R.Parthasarathy	Tata McGraw Hill, New Delhi	1 st	1994
3	Elements of discrete mathematics	L.Liu	McGraw Hill	1 st	1986
4	The theory of matrices with applications	Lancaster and Tismenetsky	Academic Press	2 nd	1985
5	Programming in MATLAB	Marc E Herniter			
6	Getting started with Matlab	Rudra Pratap	oxford publisher	7 th	2016
7	Basics of mathematics	Kate S.K Bhapkar H.R	Pune: Technical publications	1^{st}	2009
8	Theory and problems of discrete mathematics – Schaum series, tat	S.Lipschutz and M.Lipson	McGraw hill	2 nd	2000

-		Total Hours	64	тт							
de	e Open Elective- Total Hours 64 Hours/We Theory		1		1		/eek	04	Cre	edits	02
	Internal C1+C2					30 Ma	urks 100				
	EvaluationExternalDurationC3		02H	Irs	70Ma	ırks					
		Course Ob	•								
	edge of Pern	nutations and (Combin	atio	ns, the	eory c	of mat	rices ai	nd give	s an	
		Cours	se Obje	ectiv	es						
To illustrate	the applicatio	ns of Logarith	ms and	Prog	gressi	on					
					-						
Γο Solve few	real world si	imple problem	s using	perr	nutati	on an	d con	nbinatio	on		
										<u> </u>	
	Course Learn	ing Outcome	s (CLC	Js)			_ 10		CL	Ds	
After com	pleting this c	ourse, the stud	lent wil	l be	able t			cost cu			
Understand	the Cramer'	s Rule					PSC)-1	Understand		
Analyse the	e Pigeon-hol	e principle					PSC	D-2	Analyze		
		f factorial and	the ba	sic p	orincip	oal	PSC	D-3	Ap	ply	
	Proposed Co	ourse Content					Durati		ation		
U	e				1	.1			14 ho	urs	
		-		-							
problems th	nereon		U		1						
		ations of AP,	GP, H	P							
Types of m Transpose Definition Singular & Co-factors	atrices : Defi of a matrix ar and Propertie non-singular matrix, Cram	nd problems s of determinat matrix and pro- per's Rule	nts (wit		t proo	f).			18 ho	ours	
	robability Fo illustrate to Fo Solve few Constant After com Understand Analyse the of counting Logarithm Definitions Arithmetic, problems th ing /Key W Matrix Alg Types of m Transpose Definition a Singular & Co-factors Adjoint ma	robability Fo illustrate the applicatio Fo Solve few real world si Course Learn After completing this c Understand the Cramer' Analyse the Pigeon-hole Express the concepts of of counting Proposed Co Logarithms and Progre Definitions and propertie Arithmetic, Geometric a problems thereon ing /Key Words: Applic Matrix Algebra Types of matrices : Defi Transpose of a matrix ar Definition and Propertie Singular & non-singular Co-factors matrix, Cram Adjoint matrix, inverse of	To bability Course Fo illustrate the applications of Logarith To Solve few real world simple problem Course Learning Outcome After completing this course, the stud Understand the Cramer's Rule Analyse the Pigeon-hole principle Express the concepts of factorial and of counting Proposed Course Content Logarithms and Progression Definitions and properties of Logarithm Arithmetic, Geometric and Harmonic p problems thereon ing /Key Words: Applications of AP, Matrix Algebra Types of matrices : Definitions, Examp Transpose of a matrix and problems Definition and Properties of determina Singular & non-singular matrix and pro Co-factors matrix, Cramer's Rule Adjoint matrix, inverse of a matrix	To bability Course Objections of Logarithms and To Solve few real world simple problems using Course Learning Outcomes (CLC After completing this course, the student will Understand the Cramer's Rule Analyse the Pigeon-hole principle Express the concepts of factorial and the ba of counting Proposed Course Content Logarithms and Progression Definitions and properties of Logarithms and Arithmetic, Geometric and Harmonic progress problems thereon ing /Key Words: Applications of AP, GP, HI Matrix Algebra Types of matrices : Definitions, Examples Transpose of a matrix and problems Definition and Properties of determinants (wit Singular & non-singular matrix and problems Co-factors matrix, inverse of a matrix	Course Objectiv Course Objective Fo Solve few real world simple problems using perr Course Learning Outcomes (CLOs) After completing this course, the student will be Understand the Cramer's Rule Analyse the Pigeon-hole principle Express the concepts of factorial and the basic pof counting Proposed Course Content Logarithms and Progression Definitions and properties of Logarithms and prob Arithmetic, Geometric and Harmonic progression: problems thereon ing /Key Words: Applications of AP, GP, HP Matrix Algebra Types of matrices : Definitions, Examples Transpose of a matrix and problems Definition and Properties of determinants (without Singular & non-singular matrix and problems	Course Objectives Fo illustrate the applications of Logarithms and Progression Fo Solve few real world simple problems using permutati Course Learning Outcomes (CLOs) After completing this course, the student will be able to Understand the Cramer's Rule Analyse the Pigeon-hole principle Express the concepts of factorial and the basic princip of counting Proposed Course Content Logarithms and Progression Definitions and properties of Logarithms and problems thereon ing /Key Words: Applications of AP, GP, HP Matrix Algebra Types of matrices : Definitions, Examples Transpose of a matrix and problems Definition and Properties of determinants (without proo Singular & non-singular matrix and problems Co-factors matrix, Cramer's Rule Adjoint matrix, inverse of a matrix	Course Objectives Fo illustrate the applications of Logarithms and Progression Fo Solve few real world simple problems using permutation an Course Learning Outcomes (CLOs) After completing this course, the student will be able to Understand the Cramer's Rule Analyse the Pigeon-hole principle Express the concepts of factorial and the basic principal of counting Proposed Course Content Logarithms and Progression Definitions and properties of Logarithms and problems thered Arithmetic, Geometric and Harmonic progression: Properties problems thereon ing /Key Words: Applications of AP, GP, HP Matrix Algebra Types of matrices : Definitions, Examples Transpose of a matrix and problems Definition and Properties of determinants (without proof). Singular & non-singular matrix and problems Co-factors matrix, Cramer's Rule Adjoint matrix, inverse of a matrix	Course Objectives Course Objectives Fo illustrate the applications of Logarithms and Progression Fo Solve few real world simple problems using permutation and con Course Learning Outcomes (CLOs) PSG After completing this course, the student will be able to PSG Understand the Cramer's Rule PSG Analyse the Pigeon-hole principle PSG Express the concepts of factorial and the basic principal of counting PSG Proposed Course Content PSG Logarithms and Progression PSG Definitions and properties of Logarithms and problems thereon Arithmetic, Geometric and Harmonic progression: Properties and problems thereon Img /Key Words: Applications of AP, GP, HP Matrix Algebra Types of matrices : Definitions, Examples Transpose of a matrix and problems Definition and Properties of determinants (without proof). Singular & non-singular matrix and problems Co-factors matrix, Cramer's Rule Adjoint matrix, inverse of a matrix Adjoint matrix, inverse of a matrix	Course Objectives Course Objectives Fo illustrate the applications of Logarithms and Progression Fo Solve few real world simple problems using permutation and combination Course Learning Outcomes (CLOs) After completing this course, the student will be able to PSOs Addressed Addressed Understand the Cramer's Rule PSO-1 Analyse the Pigeon-hole principle PSO-2 Express the concepts of factorial and the basic principal of counting PSO-3 Proposed Course Content Logarithms and Progression Peroperities of Logarithms and problems thereon Arithmetic, Geometric and Harmonic progression: Properties and problems thereon ing /Key Words: Applications of AP, GP, HP Matrix Algebra Types of matrices : Definitions, Examples Transpose of a matrix and problems Definition and Properties of determinants (without proof). Singular & non-singular matrix and problems Co-factors matrix, Cramer's Rule Adjoint matrix, inverse of a matrix	Course Objectives Fo illustrate the applications of Logarithms and Progression Fo Solve few real world simple problems using permutation and combination Course Learning Outcomes (CLOs) PSOs After completing this course, the student will be able to PSO-1 Understand the Cramer's Rule PSO-1 Understand the Cramer's Rule PSO-2 Analyse the Pigeon-hole principle PSO-2 Ana Express the concepts of factorial and the basic principal of counting PSO-3 Ap Ap Proposed Course Content Durr Logarithms and Progression 14 ho 14 ho Definitions and properties of Logarithms and problems thereon 14 ho 18 ho Arithmetic, Geometric and Harmonic progression: Properties and problems thereon 18 ho 18 ho Taraspose of a matrix and problems Definition and Properties of determinants (without proof). 18 ho Singular & non-singular matrix and problems Co-factors matrix, Cramer's Rule 18 ho	

3	Permutations and CombinationsPermutations and CombinationsPigeon-hole principlePrinciple of inclusion and exclusion	16 hours
Extra Rea	ading /Key Words: Principle of inclusion and exclusion	
4	Probability	16 hours
	Probability of events	
	Condition probability	
	Baye's theorem	
	Distribution function: Binomial	
Extra Rea	ading /Key Words: Baye`s theorem	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	A Primer on Logarithms	Shirali, Shailesh	Universities Press, Hyder abad	1 st	2002
2	Basics Of Mathematics	Kate, S.K. Bhapkar, H.R.	Technical Publications, Pune	1 st	2009
3	Handbook of Combinatorics	Gerard Meurant, Ronald Lewis Graham, Martin Grotschel, Laszlo Lovasz	North Holland	1 st	1995
4	Theory and Problems of Discrete Mathematics. Schaum Series	S. Lipschutz and M. Lipson	Tata McGraw Hill	2 nd	2000
5	An Introduction to Probability and Statistics	A.K. Md. Ehsanes Saleh Vijay K. Rohatgi	Wiley	3 rd	2015
6	Fundamentals of Mathematical Statistics	S.C. Gupta, , Sultan Chand & Sons	Sultan Chand & Sons	1 st	2014

Course T	Title	Measur	e and Integrat	tion							
Course T	ype	Hard Core- TheoryTotal Hours64Hours/Week04Credits						04			
Course C	ode		Evaluation	Internal	C	1+C2	2 = 15	5+15		30 Marks	100
				External	Durat	ion	C3	03H	lrs	70 Marks	100
-	tive o	f this cou	urse is to gene	eralize the conc stract situations	5.			ı usinş	g mea	sures and to	
CU N0.				Cours	se Obje	ecuv	es				
CO – 1	Und	lerstand t	he Lebesgue	measure and L	ebesgu	e me	asura	ble se	ts.		
CO – 2	Disc	cuss the p	properties of r	neasurable fun	ction.						
CO – 3	App	bly the co	ncepts of inte	gration to Leb	esgue i	nteg	ral.				
CO – 4	Und	lerstand t	he absolute co	ontinuous func	tion an	d dif	ferent	iation	of de	efinite integra	al.
CO – 5	Des	cribe the	properties of	general measu	re spac	e an	d Rad	on -N	ikody	m theorem.	
	1		Марріі	ng of CLOs wi	ith PSO	Os &	CDL	s			

Course Learning Outcomes (CLOs): The CLOs indicate what a student has learnt after the successful completion of a course. The CLO statements are prepared by considering the course content covered in each unit of a course.For every course there may be 5 or more CLOs. The keywords are used at the end of each unit to define CLOs.

CLOs No.	Course Learning Outcomes (CLOs) After completing this course, the student will be able to	PSOs Addressed	CLDs
CLO-1	Explain the lebesgue measure and lebesgue measurable sets.	PSO-1	Understand
CLO-2	Derive the properties of lebesgue measurable function.	PSO-1	Apply
CLO-3	Illustrate the relation between Riemann integral and the lebesgue integral of bounded and non-negative functions.	PSO-4	Analyze
CLO-4	Express the properties of general measure space and prove Radon -Nikodym theorem.	PSO-5	Evaluate
Unit	Proposed Course Content		Duration

1	Lebesgue Measure	12 hours
	Lebesgue outer measure,	
	Measurable sets,	
	Lebesgue measure,	
	A non-measurable set,	
	Measurable functions	
Extra Rea	ading /Key Words: Hausdorff measure, complex measure	
2	The Lebesgue Integral	
	Lebesgue Integral of a bounded function over as set of finite measure,	12 hours
	The integral of a non-negative function	
	The general Lebesgue integral	
	Differentiating indefinite integrals	
Extra Rea	ading /Key Words: Ergodic measure, fractals.	
3	Differentiation and Integration	
	Continuity of monotone functions	12 hours
	Differentability of monotone function	
	Lebesgue's theorem	
	Functions of bounded variation	
	Jordan's theorem	
	Absolutely continuous functions	
	Differentiating indefinite integrals	
Extra Rea	ading /Key Words: Convex functions, Bounded linear functions on Lp S	pace.
4	Measure and Integration	12 hours
	Measure spaces,	
	Measurable functions, integration	
	Signed measures, the Radon - Nikodym theorem,	
	Outer measure and measurability.	
Extra Rea	ading /Key Words: Ergodic measure, fractals.	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Real Analysis	Royden H.L. and Fitzpatrick P.M	PHI learning Pvt Ltd, Delhi,	4 th	2013
2	Measure And Integration	Barra G.De	New age International Ltd., New Delhi.	2 nd	2006
3	Real Analysis	Carthers N. L	Cambridge University Press	3 rd	2006
4	Real Mathematical Analysis	Charles Chapman Pugh	Springer-New York	1 st	2004

Course Tit	tle T	opolog	y-II									
Course Ty	pe H	Hard Co	ore- Theory	Total Hours	48	Ho	urs/W	'eek	04	Cre	edits	04
Course Co	de		Evaluation	Internal	C	1+C2	2 = 15	+15		30 M	arks	100
			Evaluation	valuationExternalDurationC3		C3	03H	Irs	70 M	arks	100	
COURSE	OBJE	CTIVE	CS (COs)		I							<u> </u>
To generali analysis in		-	-	on using measu	ures and	l it h	elps t	o dev	elop t	the cor	ncept o	f
CO No.				Cours	e Obje	ctive	es					
CO-1	To Dis	stinguis	h Urysohn's	lemma and the	e Tietze	exte	ensior	theo	rem.			
	To Dis spaces.	•	ychonoff's th	neorem, locally	^r compa	ict sp	aces,	Com	pactn	ess of	metric	
	1		d Fundamen	tal group of a c	circle ar	nd pu	inctur	ed pla	ane.			
successful of content cov	comple vered in	etion of n each	omes (CLO) f a course. T unit of a co	ng of CLOs wi s): The CLOs The CLO state purse.For every each unit to	indica ments course	ite w are p e the	vhat a prepai pre ma	a stud red by	y con	siderir	ig the	cours
successful content cov keywords	comple vered in	etion of n each ed at t	omes (CLO) f a course. T unit of a co he end of o	s): The CLOs The CLO state ourse.For every each unit to	indica ments course define	ate w are p e the CLC	vhat a prepai pre ma	a stud red by	y con 5 or	siderin more	ng the e CLC	cours os. Th
successful of content cov	comple /ered in are use	etion of n each ed at t	omes (CLO) f a course. T unit of a co he end of o ourse Learni	s): The CLOs The CLO state purse.For every	indica ments course define (CLOs	ate ware p e the CLC s)	vhat a prepai pre ma Ds.	a stud red by ay be	y con	siderin more	ng the e CLC	cours
successful content cov keywords	comple vered in are us e Afte	etion of n each ed at t Co er comp inguish	omes (CLO) f a course. T unit of a co he end of o ourse Learni oleting this co	s): The CLOs The CLO state ourse.For every each unit to ing Outcomes	indica ments course define (CLO s ent will	are p are p e the CLC s) be a	vhat a prepar pre ma ble to	a stud red by ay be	y con 5 or PSC	siderin more Ds essed	e CLC	cours bs. The LDs
successful content cov keywords CLOs No.	Afte Disti theor	etion of n each ed at t Co er comp inguish rem uss Tyc pactnes	omes (CLO) f a course. T unit of a co he end of o ourse Learni oleting this co Urysohn's 1 chonoff's the ss of metric s	s): The CLOs The CLO state ourse.For every each unit to ing Outcomes ourse, the stude emma and the orem, locally c	indica ments course define (CLO s ent will Tietze	tte ware p e the CLC s) be all e exte	vhat a prepare pre ma)s. ble to ension	a stud red by ay be	y con 5 or PS(Addre	Siderin more Ds essed	e CLC	cours os. Th
successful of content cov keywords CLOs No.	Afte Disti theor Disco Desc	etion of n each ed at t Co er comp inguish rem uss Tyc pactnes oli's the cribe Fu	omes (CLO) f a course. T unit of a co he end of a ourse Learni oleting this co Urysohn's 1 chonoff's the so of metric s	s): The CLOs The CLO state ourse.For every each unit to ing Outcomes ourse, the stude emma and the orem, locally c	indica ments course define (CLOs ent will Tietze compac	tte ware p e the CLC s) be all e exte	vhat a prepare pre ma)s. ble to ension	a stud red by ay be	y con 5 or PS(Addre	Ds essed	c C Und	cours bs. The LDs erstand
successful of content cov keywords CLOs No. CLO-1 CLO-2	Afte Disti theor Disco Desc	etion of n each ed at t Co er comp inguish rem uss Tyc pactnes oli's the cribe Fu punctur	omes (CLO) f a course. T unit of a co he end of a ourse Learni oleting this co Urysohn's 1 chonoff's the so of metric s orem indamental g ed plane	s): The CLOs The CLO state ourse.For every each unit to ing Outcomes ourse, the stude emma and the orem, locally concerning	indica ments course define (CLOs ent will Tietze compac	tte ware p e the CLC s) be all e exte	vhat a prepare pre ma)s. ble to ension	a stud red by ay be	y con 5 or PSC ddre PSC	Ds essed	c C Und A	cours bs. The LDs erstand

2	Applications of Countability and Separation Axioms	
	Urysohn's lemma	12 hours
	Tietze's extension theorem	
	Urysohn's metrization theorem	
	Partitions of unity	
Extra Re	ading /Key Words: Partitions of unity	I
3	Tychonoff's Theorem	
	Tychonoff's theorem on the product of compact spaces	12 hours
	Local finiteness	
	Paracompactness	
	Normality of a paracompact space	
Extra Re	ading /Key Words: Tychonoff's Theorem	I
4	The Fundamental Group	
	Definition of fundamental group	12 hours
	The Fundamental group of a circle	
	The Fundamental group of the punctured plane	
	Essential and Inessential Maps	
	The Fundamental Theorem of Algebra	
Extra Re	ading /Key Words: Fundamental group of a circle	
EALLA NO	aung /ixcy morus. Fundamental group of a circle	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	A First Course in Topology	J. R. Munkres	Prentice Hall India	2 nd	2000
2	Introduction to Topology and Modern Analysis	G. F. Simmons	McGraw-Hill, Kogakusha	1 st	1968
3	General Topology	S. Willard	Addison Wesley, New York	1 st	1968
4	Topology	J. Dugundji	Allyn and Bacon, Boston	1 st	1966
5	General Topology	J. L. Kelley	Van Nostrand and Reinhold Co., New York	1 st	1955

Project Work

Type: Minor Project

A project workinvolves self-study to be carried out by the student (on a research problem of current interest or on an advanced topic not covered in the syllabus) under theguidance of a faculty member. Project work shall be initiated in the third semester itself through literature survey and theproject report (dissertation) shall be submitted at the end of the fourth semester.

Project Evaluation

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his / her progress in the form of seminars in addition to the regular discussion with the guide. Components of evaluation are as follows:

Component – I (C₁): Periodic Progress and Progress Reports (15)

Component – II (C₂): Results of Work and Draft Report (15)

Component – III (C₃): Final Viva Voce and evaluation (70). The report evaluation is for 40 and the Viva –voce examination is for 30.

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Course Ty	ype	Soft Co	ore- Theory	Total Hours	64	Hou	irs/W	/eek	04	Cre	edits 04		
Course Co	ode		Evaluation	Internal		C1	+C2			30 Mark		100	
				External	Durat	tion	C3	02H	lrs	70Ma	rks		
				Course Ob									
To stress the differential			e of Different	ial equations a	nd to i	ntrodu	ice fi	ından	nenta	l conce	pts of		
CO No.	1			Cours	e Obje	ective	S						
CO-1	To i	llustrate	the applicatio	ns of Ordinary	and Pa	artial	Diffe	rentia	ıl Eq	uations			
CO-2	Точ	understan	d the Picard's	s Theorem									
CLOs No.			ourse Learn	ing Outcome	s (CI ()]c)			Þ	SOs	CI	Ds	
	,	C		ing Outcome	S (CL	J 8)				ressed	CL	105	
	1	After com	pleting this c	ourse, the stud	ent wil	ll be a	ble to	C C		• • • • • •			
CLO-1	U	nderstand	I the Picard's	Theorem						PSO-1 Un		Understand	
CLO-2	A	nalyze the	e Legendre di	ifferential equa	tions				PS	O-2	Analyze		
CLO-3	A	pply the	fundamental	concepts of C	rdinar	y and	Parti	ial	PS	0-3	Ap	ply	
	D	ifferentia	l Equations										
Unit			Proposed Co	ourse Content							Dura	ation	
1	Li	inear Sec	cond Order H	Equations							16 ho	ours	
			e problem										
			-	ss by Picard's									
				nd comparison	theore	ems							
		-	hase plane										
Extra Rea			of parameters ords: Poinca	re phase plan	e								
2		•		and Application									
				nd regular sing		oint					16 ho	ours	
			•	nal power serie	-								
		-		uations with th		pertie	S						
	1										1		

3	Types differential equations their propertiesBessel differential equations with their propertiesHermite differential equations with their propertiesLaguerre and hypergeometric differential equations with their properties	16 hours
Extra Rea	ding /Key Words: Hermite differential equations	
4	Partial differential equationClassification of Second order PDE'sReduction to canonical forms	16 hours
	Derivation of the equations of mathematical physics and their solutions by separation of variables.	
Extra Rea	ding /Key Words: Reduction to canonical forms	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Theory of Ordinary Differential equations	E. A. Coddington and N. Levinson	Tata McGraw-Hill, New Delhi	1 st	1955
2	Methods of Mathermatical Physics, Vol. I. & II	R. Courant and D. Hilbert	Tata McGraw-Hill, New Delhi	1 st	1975
3	Differential Equations with applications and Historical Notes	G. F. Simmons	Tata McGraw-Hill, New Delhi	1 st	1991
4	Theory of Partial differential equations	I. N. Sneddon	McGraw-Hill, International Student Edition	1 st	1950
5	Ordinary Differential Equations and Stability Theory	S. G. Deo and V. Raghavendra	Tata McGraw-Hill, New Delhi	1st	1980

	itle	Theory	of Numbers									
Course Ty	ype	Soft Co	ore- Theory	Total Hours	64	Ho	urs/W	/eek	04	Cr	edits	04
Course Co	ode		Evaluation	Internal	C	1+C2	2 = 15	+15		30 M	30 Marks	
			L'unumon	External	Durat	ion	C3	03H	lrs	70 M	arks	100
		-		COURSE O	e arithm	netica	al, Mc	bius				
CO No.				Cours	se Obje	ective	es					
CO-1	Τοι	understan	d the Fundam	nental theorem	of Arit	hme	tic.					
CO-2	To I	Discuss A	Arithmetical F	unctions.								
CO-3	To i	ntroduce	the application	on of continued	1 fractio	on						
		-		The CLO state		-	-	red by	y cor	nsiderir	ng the	course
content co keywords	verec are	d in each used at	unit of a co the end of o	ourse.For every each unit to	y cours define	e the CLC	ere ma	red by	y cor 5 or	nsiderir r mor	ng the e CLC	course ls. The
content co	vered are	d in each used at	the end of a co the end of o ourse Learni	ourse.For every	define	e the CLC	bre ma	red by ay be	y cor 5 or PS	nsiderir r mor	ng the e CLC	course
content co keywords	vered are	d in each used at Co	the end of a co the end of o ourse Learni pleting this co	each unit to	define define (CLO ent will	e the CLC (s) be a	ble to	red by ay be	y cor 5 or PS	nsiderin r mor Os essed	ng the e CLC	course os. The LDs
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content co keywords CLOs No.	A Un Di A	d in each used at Co fter comp nderstand	a unit of a co the end of a ourse Learni pleting this co I the Fundame e Arithmetical knowledge of	ourse.For every each unit to ng Outcomes ourse, the stude ental theorem o	y cours define (CLO ent will of Arith	e the CLC s) be a meti	ble to	red by ay be	y cor 5 or PS Addro PSC	Os essed	c C C Und A	os. The LDs erstand
content co keywords CLOs No. CLO-1 CLO-2	A Un Di A	in each used at Content offer components offer components	a unit of a co the end of o ourse Learni pleting this co l the Fundamo e Arithmetical knowledge of tion	ourse.For every each unit to ng Outcomes ourse, the stude ental theorem o	y cours define (CLO ent will of Arith	e the CLC s) be a meti	ble to	red by ay be	y cor 5 or PS(Addro PS(PS(Os essed	c C C Und A A	course os. The LDs erstand pply
content co keywords CLOs No. CLO-1 CLO-2 CLO-3	A A U D D D D D D D D D D D D D D D D D	time num ne Fundan e Euclid urey serie	a unit of a co the end of a ourse Learni pleting this co l the Fundama e Arithmetical knowledge of tion Proposed Co mbers and Fa bers mental theore of Reciprocal ean Algorithr s, Farey disse	ourse.For every each unit to ng Outcomes ourse, the stude ental theorem of l Functions continued frac ourse Content arey series m of Arithmet	ic cours	e the CLC	ble to	red by ay be	y cor 5 or PS(Addro PS(PS(Os essed	e CLC C Und A Du	course os. The LDs erstand pply pply

Sigma function The Dirichlet product of Arithmetical functions Multiplicative functions Averages of Arithmetical functions – Euler summation formula, Some elementary asymptotic formulas The average orders of $d(n)$, $\sigma(n)$, $\phi(n)$, $\mu(n)$ An application to the distribution of lattice points visible from the originExtra Reading /Key Words : Arithmetical Functions and Multiplicative functions3Continued fractions-I Finite continued fractions Convergent of a continued fraction fraction Continued fractions (SCF) The representation of an irreducible rational fraction by a SCF16 hours4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours	2	Arithmetical Functions	
The Dirichlet product of Arithmetical functions Multiplicative functions Averages of Arithmetical functions – Euler summation formula, Some elementary asymptotic formulas The average orders of d(n), σ(n), φ(n), μ(n) An application to the distribution of lattice points visible from the originExtra Reading /Key Words : Arithmetical Functions and Multiplicative functions3Continued fractions-I Finite continued fractions Convergent of a continued fraction Continued fractions(SCF) The representation of an irreducible rational fraction by a SCF4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued		Arithmetical Functions – The Mobius function, The Euler' function and	16 hours
Multiplicative functions Averages of Arithmetical functions – Euler summation formula, Some elementary asymptotic formulas The average orders of $d(n)$, $\sigma(n)$, $\phi(n)$, $\mu(n)$ An application to the distribution of lattice points visible from the originExtra Reading /Key Words : Arithmetical Functions and Multiplicative functions3Continued fractions-I Finite continued fractions Convergent of a continued fraction Continued fractions(SCF) The representation of an irreducible rational fraction by a SCF4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued		Sigma function	
Averages of Arithmetical functions – Euler summation formula, Some elementary asymptotic formulas The average orders of d(n), σ(n), φ(n), μ(n) An application to the distribution of lattice points visible from the originExtra Reading /Key Words : Arithmetical Functions and Multiplicative functions3Continued fractions-I Finite continued fractions Convergent of a continued fraction Continued fractions with positive quotients Simple continued fractions(SCF) The representation of an irreducible rational fraction by a SCF16 hours4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours		The Dirichlet product of Arithmetical functions	
elementary asymptotic formulas The average orders of d(n), σ(n), φ(n), μ(n) An application to the distribution of lattice points visible from the originExtra Reading /Key Words : Arithmetical Functions and Multiplicative functions3Continued fractions-I Finite continued fractions Convergent of a continued fraction Continued fractions with positive quotients Simple continued fractions(SCF) The representation of an irreducible rational fraction by a SCF16 hours4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours		Multiplicative functions	
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An application to the distribution of lattice points visible from the originExtra Reading /Key Words : Arithmetical Functions and Multiplicative functions3Continued fractions-I Finite continued fractions Convergent of a continued fraction Continued fractions with positive quotients Simple continued fractions(SCF) The representation of an irreducible rational fraction by a SCF16 hoursExtra Reading /Key Words : Finite Continued fractions16 hours4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours		elementary asymptotic formulas	
Extra Reading /Key Words : Arithmetical Functions and Multiplicative functions3Continued fractions-I Finite continued fractions Convergent of a continued fraction Continued fractions with positive quotients Simple continued fractions(SCF) The representation of an irreducible rational fraction by a SCF16 hoursExtra Reading /Key Words : Finite Continued fractions16 hours4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours		The average orders of $d(n)$, $\sigma(n)$, $\phi(n)$, $\mu(n)$	
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Convergent of a continued fraction Continued fractions with positive quotients Simple continued fractions(SCF) The representation of an irreducible rational fraction by a SCFExtra Reading /Key Words : Finite Continued fractions4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours	3	Continued fractions-I	
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Simple continued fractions(SCF) The representation of an irreducible rational fraction by a SCFExtra Reading /Key Words : Finite Continued fractions4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours		Convergent of a continued fraction	
The representation of an irreducible rational fraction by a SCFExtra Reading /Key Words : Finite Continued fractions4Continued fractions-II16 hours4Continued fraction algorithm and Euclid's algorithm The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued		Continued fractions with positive quotients	
Extra Reading /Key Words : Finite Continued fractions 4 Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued		Simple continued fractions(SCF)	
4Continued fractions-II The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued16 hours		The representation of an irreducible rational fraction by a SCF	
The continued fraction algorithm and Euclid's algorithm The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued	Extra Rea	ding /Key Words : Finite Continued fractions	<u>I</u>
The difference between the fraction and its convergent Infinite simple continued fractions The representation of an irrational number by an infinite continued	4	Continued fractions-II	16 hours
Infinite simple continued fractions The representation of an irrational number by an infinite continued		The continued fraction algorithm and Euclid's algorithm	
The representation of an irrational number by an infinite continued		The difference between the fraction and its convergent	
		Infinite simple continued fractions	
		The representation of an irrational number by an infinite continued	
traction		fraction	
Equivalent numbers and periodic continued fractions, some special		Equivalent numbers and periodic continued fractions, some special	
quadratic surds		quadratic surds	
Extra Reading /Key Words : Infinite Continued fractions	Extra Rea		<u> </u>

Sl.					Year of
No	Title of the book	Author(s)	Publisher	Edition	publication
1	An Introduction to	G. H. Hardy and E.	Oxford University	5 th	1979
	Theory of Numbers	M. Wright	Press		
2	An Introduction to the	I. Niven, H. S.	John Wiley and Sons,	5 th	2004
	Theory of Numbers	Zuckerman and H.	Inc., New York		
		L. Montgomery			
3	Ramanujan's Note Books	Bruce C. Berndt	Springer	1^{st}	1985
	Volume-1 to 5				
4	Number Theory	G. E. Andrews	Dover Books	1 st	1994
5	Introduction to	T. M. Apostol	Narosa Publishing	1^{st}	1998
	Analytic Number Theory		House, New Delhi		

Course T	itle			Advar	iced Gr	aph 7	Theor	у				
Course T	ype Sc	oft Co	ore- Theory	Total Hours	64	Ho	urs/W	'eek	04	04 Credits		04
Course Co	ode		Evaluation	Internal	C	1+C2	2 = 15+15			30 Ma	urks	100
				External	Durat	ion	C3	03H	rs	70 Ma	urks	100
				COURSE O	BJECT	FIVE	S (CO	Os)				
To underst	and the f	undai	mentals of c	oncepts of grag	ph theo	ry. A	lso al	ole to	descr	ibe the	idea o	of line
graphs, dis	stance cor	ncept	, colorablity,	relations betw	een gra	phs a	and m	atrice	s.			
CON												
CO No.				Cours	æ Obje	ective	es					
CO-1	To unde	rstan	d and apply t	he fundamenta	l conce	pts o	of grap	oh the	ory			
CO-2	To apply	y graj	oh theory bas	ed tools in solv	ving pra	actica	al pro	blems	•			
CO-3	To ident	Γο identify distances in graphs and its applications.										
CO-4	To understand the concepts domination theory.											
content co	overed in	each	unit of a co	The CLO state ourse.For every each unit to	cours	e the	re ma	•			-	
CLOs No.	•	Co	ourse Learni	ng Outcomes	(CLO	s)			PSC)s	C	LDs
	After	com	oleting this co	ourse, the stude	ent will	be a	ble to	A	ddre	ssed		
CLO-1	Under	stand	the definitio	n of line graph	l				PSO	-1	Unde	erstand
CLO-2	Identif	fy dis	tances in graj	phs.					PSO	-2	Aj	oply
CLO-3	Discus	ss and	lunderstand	algebraic grap	h theor	у			PSO	-5	Aj	oply
Unit			Proposed Co	ourse Content				•			Dui	ation
1	Charao	tion a			graphs						16 h	ours

Extra Reading /Key Words: Total graph

2	Algebraic Graph Theory	
	Matrices – The adjacency matrix	16 hours
	The incidence matrix	
	The cycle matrix	
	Adjacency Eigen Values	
Extra Rea	ding /Key Words: Eigen Values	
3	Distances in graphs	
	Distances in graphs and its applications	16 hours
	Distance matrix	
	Characteristic polynomial and Distance Eigen Values	
Extra Rea	ding /Key Words: Distance matrix	
4	Domination Theory	16 hours
	Definition, types of Domination	
	Domination numbers -Some elementary properties	
Extra Rea	ding /Key Words: Domination Theory	

					Year of
Sl. No	Title of the book	Author(s)	Publisher	Edition	publication
1	Graph Theory	Frank Harary	Addition Wesley Reading Mass	3 rd	1969
2	Graph Theory with applications	J. A. Bondy and U. S. R. Murthy	Elsevier	2 nd	1976
3	Graph Theory With Applications to Engineering and Computer Science	N. Deo	Prentice Hall of India	1 st	1987
4	Basic Graph Theory	K. R. Parthasarathy	Tata McGraw-Hill, New Delhi	2 nd	1994
5	Introduction to Graph Theory	D. B. West	Pearson Education Inc.	2 nd	2001
6	Domination Theory	V. R. Kulli	Vishwa International Publications	4 th	2012
7	Graphs and Diagraphs	G. Chartand and L. Lesniak	Qwadsworth and Brooks	2 nd	1986
8	A First Look at Graph Theory	Clark and D. A. Holton	Allied publishers	1 st	1991

Course Tit	tle	Differer	ntial Geometr	V								
		Differen		9								
Course Ty	pe	Soft Co	ore- Theory	Total Hours	64	Ho	urs/W	/eek	04	Cre	dits	04
Course Co	de		Evaluation	Internal	C	1+C2	2 = 15	+15		30 Marks		100
			Lvaluation	External	Durat	ion	n C3		lrs	70 Ma	arks	100
				COURSE O	BJECT	TVF	S (C	Os)				
To find the	proj	perties of	a surface and									
CO No.				Cours	e Obje	ective	es					
CO-1	Τοι	understan	d the plane cu	urves and Spac	e curve	es.						
CO-2	To s	study the	properties the	e four vertex th	eorem.							
CO-3	To i	dentify Is	sometries of s	urfaces.								
CO-4	Τοι	understan	d the first fur	damental form	n of cur	ves.						
successful content cov keywords	com verec	pletion o d in each used at	of a course. The unit of a course of the end of of the end of the	s): The CLOs The CLO state ourse.For every each unit to	ments / cours define	are p e the CLC	orepar re ma	red by	y con 5 or	siderin; more	g the CLO	course s. The
CLOs No.		C	ourse Learni	ng Outcomes	(CLO	s)			PSC		Cl	L D s
	A	fter com	pleting this co	ourse, the stude	ent will	be a	ble to		ddre	ssed		
CLO-1	U	nderstand	the plane cur	rves and Space	curves	5.			PSO	-1	Unde	erstand
CLO-2	Id	entify Isc	ometries of su	rfaces.					PSO	-2	Ap	oply
CLO-3		iscuss and irves.	d understand	the first fundar	mental	form	of		PSO	-5	Aţ	oply
Unit			Proposed Co	ourse Content							Dur	ation
1	Pl Gl	ane curve lobal proj	es and Space	ential Geometricurves – Frene ves – Simple cl ality	t-Serre			2			16 ho	ours
Extra Rea	ding	/Key W	ords: Frenet	-Serret Form	ulae						<u> </u>	

2	Four Vertex theorem and its applications	
	The Four Vertex theorem	16 hours
	Surfaces in three dimensions – Smooth surfaces	
	Tangents, Normals and Orientability, Quadric surfaces	
Extra Re	ading /Key Words: Quadric surfaces	
3	First fundamental Form of Curves	
	The First Fundamental form – The lengths of curves on surfaces	16 hours
	Isometries of surfaces	
	Conformal mappings of surfaces	
	Surface area	
	Equiareal Maps and a theorem of Archimedes	
Extra Re	ading /Key Words: Conformal mappings of surfaces	
4	Second Fundamental Form of Curves	16 hours
	Curvature of surfaces	
	The Second Fundamental form	
	The Curvature of curves on a surface	

Sl. No	Title of the book	Author(s)	Publisher	Edition	Year of publication
1	Elementary Differential Geometry, Under- graduate Mathematics Series	A. Pressley	Springer.	1 st	2010
2	An Introduction to Differential Geometry	T. J. Willmore	Oxford University Press	1 st	1997
3	Differential Geometry: A First Course	D. Somasundaram	Narosa	1 st	2005

St. Philomena's College (Autonomous), Mysore M. Sc-Mathematics (CBCS) I/II/III/IV- Semester Examination: 2018-19 Subject:

Time: 3 Hours

Max Marks: 70

Answer all the questions, SI. No Marks All question carries equal marks 1 2 а 2 b 2 С d 2 2 е f 2 2 g 2 14 OR 3 14 14 4 OR 5 14 6 14 OR 7 14 8 14 OR 9 14

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