॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषद बैठकीतील विषय क्रमांक १६/६१–२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसारचे पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यास मा. विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी. एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. Agriculture Microbiology	11	B.Sc. Physics
02	B.Sc. Botany	12	B.Sc. Seed Technology
03	B.Sc. Dairy Science	13	B.Sc. Horticulture
04	B.Sc. Electronics	14	B.Sc. Statistics
05	B.Sc. Environmental Science	15	B.Sc. Biochemistry
06	B.Sc. Fishery Science	16	B.Sc. Analytical Chemistry
07	B.Sc. Food Science	17	B.Sc. Agrochemical & Fertilizers
08	B.Sc. Geology	18	B.Sc. Industrial Chemistry
09	B.Sc./B.A. Mathematics	19	B.Sc. Industrial Microbiology
10	B.Sc. Microbiology		

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२५–२६/११६
दिनांक ०५.०६.२०२५

सहाय्यक कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.

१) मा. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY, NANDED - 431 606

(Structure and Syllabus up to Second Year Multidisciplinary Program with Multiple Entry and Exit Option)

BACHELOR OF ARTS/SCIENCE

BA/B.Sc.-II(Level -5.0)

Major **Mathematics (DSC)**

Under the Faculty of
Science and Technology

Effective from Academic year 2025 – 2026
(As per NEP-2020)

Index

From Desk of Chairman, Board of Studies in the Subject Mathematics

Preamble:

One of the significant reforms in the undergraduate education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive, and outcome-oriented with well-defined aims, objectives, and goals to achieve. Mathematics is a necessary tool for much of science and engineering. It provides the basic language for understanding the world and gives precision to scientific thought. With the maturing of the Indian industry, there is a large demand for people with strong analytical skills and broad-based background in the mathematical sciences. The curriculum of B.A./B.Sc. Mathematics is structured in such a way that the students acquire in-depth knowledge to perceive the principles of the core subjects like Algebra, Calculus, Analytical Geometry, Differential Equations, Real Analysis, etc are covered exclusively to prepare the students to proceed to the next level of Higher Mathematics of Linear Algebra, Advanced Analysis, Mechanics. A list of varied electives like Operations Research, Graph Theory, Number Theory, Numerical Analysis, Topology, Integral Transform etc are furnished to bridge between the Pure and Applied Mathematics. The comprehensive curriculum design yields an excellent career opportunity in Research, Education, Public and Private Sectors, Business sectors, Banking, IT Industries and in every domain of contemporaries.

The overall aim of B.Sc. Mathematics is to:

- Develop broad and balanced knowledge and understanding of definitions, concepts, principles, and theorems.
- Provide students sufficient knowledge and skills enabling them to undertake further studies in mathematics and its allied areas.
- Create deep interest in learning mathematics.
- Encourage the students to develop a range of generic skills helpful in employment, internships, and social activities.
- Familiarize the students with suitable tools of mathematical analysis to handle issues

and problems in mathematics and related sciences.

- Enhance Computational skills and Mathematical reasoning
- Qualify competitive examinations like IIT-IAM, NBHM etc
- Promote and apply mathematics knowledge to do Research/Case Study /Field Project etc.

B.Sc. (Mathematics) Programme Outcomes (POs):

PO1	**Disciplinary Knowledge:** B.A/ B.Sc in Mathematics is the zenith of in-depth knowledge of Algebra, Analysis, Geometry, Calculus and several other branches of mathematics. This also leads to study interdisciplinary areas such as computer science and other allied subjects.
PO2	**Communication Skills:** Ability to communicate various mathematical concepts effectively using examples and their geometrical visualization. Skill and Knowledge attained during program will increase the ability to solve real world problems.
PO3	**Digital Proficiency:** The completion of this programme will enable the learner to use appropriate software's to solve mathematical problems
PO4	**Ability to work Independently:** The Learner completing this program will grow the capacity to do work independently.
PO5	**Critical Thinking and Logical Reasoning:** Student will acquire ability of critical thinking and logical reasoning.
PO6	**Mathematical Principles:** students will understand mathematical principles and their applications.
PO7	**Confidence of Learning: The** B.Sc. Programme will develop learners mathematical knowledge and oral, written, and practical skills in a way which will encourage confidence, satisfaction and learning enjoyment.
PO8	**Ability to peruse advanced studies and research**: Students will be motivated high for doing higher education and research in Academically strong institution
PO9	**Skill/Vocational Courses:** Students will have to study skill/Vocational courses related to pure and applied Mathematics.
PO10	**Generic /Open Elective :** As an interdisciplinary approach student will study GE/OE course in Mathematics

Lt. Dr. Mahesh Sahebrao Wavare

Chairman, Board of Studies of the Mathematics

S.R.T. M. U. Nanded

List of Members in Board of Studies (Mathematics)under the faculty of Science and Technology

Sr No	Name of the Member	Designation	Address	Contact Number and Email ID
1	Prof. Lt. Dr. Mahesh Sahebrao Wavare	BoS Chairman (Ad hoc)under Section26(18) and BoS Member under section *40(2)(c)*	Rajarshi Shahu Mahavidyalaya (Autonomous), Latur, Tq. & Dist. Latur.	9890620620 maheshwavare@gmail.com
2	Prof. Dr. Dnyaneshwar Dadaji Pawar	*VC Nominated BoS Member Under Section 40(2)(a)*	Director School of Mathematical Sciences, SRTM University, Nanded	*9423124662* *dypawar@yahoo.com*
3	Dr. B. Surendranath Reddy	*VC Nominated BoS Member Under Section 40(2)(b)(i)*	School of Mathematical Sciences, SRTM University, Nanded	9096077789 surendra.phd@gmail.com bsreddy@srtmun.ac.in
4	Dr. Arun Babarao Jadhav	*VC Nominated BoS Member Under Section 40(2)(b)(ii)*	DSM's College of Arts, Commerce and Science, Parbhani.	7875118707 arunbjadhao@gmail.com
5	Dr. S. S. Handibag	*BoS Member Under Section 40(2)(b)(ii)*	Mahatma Basweshwar Mahavidylaya, Latur	9011491162 960417748 sujitmaths@gmail.com
6	Prof. Dr. Vandeo Chimnaji Borkar	*BoS Member Under Section 40(2)(b)(iii)*	Yeshwant Mahavidyalaya, Nanded	9421769217 borkarvc@gmail.com
7	Dr. Kishor Ramrao Gaikwad,	*BoS Member Under Section 40(2)(b)(iii)*	Science College, Nanded	9923295556 drkr.gaikwad@yahoo.in
8	Dr. Hemant Kishor Undegaonkar,	*BoS Member Under Section 40(2)(b)(iii)*	Bahairji Smarak College, Basmat, Dist. Hingoli	9822546874 hkundegaonkar@gmail.com
9	Dr. S. S. Bellale	*BoS Member Under Section 40(2)(c)*	Dayanand Science College, Latur, Tq. & Dist. Latur – 413512	9405417417 sidhesh.bellale@gmail.com
10	Dr. Ram Govindrao Metkar	*BoS Member Under Section 40(2)(c)*	Indira Gandhi Sr. College, Cidco, New Nanded, Tq. & Dist. Nanded.:	9822312176 rammetkarmath@gmail.com
11	Miss. Jyoti G Narwade	*PG Student*	Pratibha College of Education Kalbhor Nagar Pune	Jyotinarwade790@gmail.com
12	Sukane Sushima Santosh	*UG Student*	C/O Shri Shivaji College Udgir Dist Latur	smusrcollege2007@rediffmail.com

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Structure up to Second Year Multidisciplinary Degree Program

Subject: Mathematics (Major and Minor)

Year & Level	Semester	Optional-1	Optional -2	Optional -3	Generic Elective (GE) (Basket 2) *(Select one each from Group A and B of Basket 2, should not be related to DSC / DSM in col. 3 and 4)*	Vocational & Skill Enhancement Course (VSEC) *(Related to DSC Mathematics)*	Ability Enhancement Course (AEC) (Basket 3 for L2) Value Education Courses (VEC) / Indian Knowledge System (IKS) *(Common across faculty)*	Field Work / Project/ Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CC) (Basket 4 for CC) *(Common across faculty)*	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10	
	I	SMATCT1101- Topics in Algebra (2Cr) (Theory) SMATCP1102 Lab Course-I (Calculus Using SAGE) (2Cr) (Practical) **(4cr)**	**Other than Mathematics (4cr)**	**Other than Mathematics (4cr)**	GE-1 SMATGE1101 Foundation of Mathematics (2Cr)	SEC SMATSC1101 (2Cr) Basics of MATLAB /Scilab (2cr)	AECENG1101 (2Cr) ACEMIL1101 (MAR/HIN/URD/KANPAL)(2Cr) IKSXXX1101 (2Cr) 6 Credits	--	22	44

1 (4.5)	**II**	SMATCT1151 Analytical Geometry (2Cr) (Theory) SMATCP1152 Lab Course-II (Integral Calculus) (2Cr) (Practical) (4cr)	**Other than Mathematics (4cr)**	**Other than Mathematics (4cr)**	GE-2 SMATGE1151 Basic Algebra (2Cr)	SEC SMATSC1151 (2Cr) Programming Using MATLAB/Scilab (2cr)	**AECENG1101 (2Cr) AECMIL1151 (MAR/HIN/URD/KAN/PAL)(2Cr) VECCOI1151 (2Cr) Constitution of India 6 Credits**	--	**22**	
***Exit option*: UG Certificate in Major Mathematics on completion of 44 credits** and additional **4 credits from NSQF / Internship**										
2 (5.0)	**III**	SMATCT1201 (2Cr) (Theory) Real Analysis-I SMATCT1202 (2Cr) (Theory) Group Theory SMATCP1201 (2Cr) (Practical) Lab Course-III (Based on Real Analysis -I) SMATCP1202 (2Cr) (Practical)Lab Course-IV (Based on Group Theory) **8 Credits**	SMATMT1201 Fundamentals of Sequence and Group Theory (2Cr) SMATMP1201 DSM Lab Course-I (On Fundamentals of Sequence and Group Theory) (2Cr) **4 Credits**	--	GE-3 SMATGE1201 (2Cr) Quantitative Aptitude and Logical Reasoning (संख्यात्मक अभियोग्यता आणि तार्किक तर्क) **2 credits**	VSC-1 SMATVC1201 (2Cr) Essential Mathematics for Data Science **2 Credits**	**AECENG1201 (2cr) AECMIL1201 (2Cr) (MAR/HIN/URD/KAN/PAL) 4 Credits**	**CCCXXX1201(2Cr)** (NCC/NSS/ SPT(sports)/ CLS(Cultural Studies) /HWS (Health Wellness)/ YGE(Yoga Education) / FIT(Fitness) **2Credits**	**22**	**44**
	IV	SMATCT1251 (2Cr) (Theory) Real Analysis-II SMATCT1252 (2Cr) (Theory) Ring Theory SMATCP1251 (2Cr) (Practical) Lab Course-V (Based on Real Analysis -II) SMATCP1252(2 Cr) (Practical)Lab Course-VI (Based on Ring Theory) **8 Credits**	SMATMT1251 Introduction to Infinite Series and Ring Theory (2 Cr) SMATMP1251 DSM Lab Course-II (On Introduction to Infinite Series and Ring Theory) **4 Credits**	--	GE-4 SMATGE1251 (2Cr) Mathematics for Competitive Examination (स्पर्धा परीक्षेसाठी गणित) **2 credits**	VSC-2 SMATVC1251 Introduction to R Programming **2 Credits**	**AECENG1201 (2cr) AECMIL1201 (2Cr) (MAR/HIN/URD/KAN/PAL) VECEVS1251 (2Cr) EVS 6 Credits**	--	**22**	
Exit option: UG Diploma in Major Mathematics and Minor Mathematics on completion of 88 credits and additional **4 credits NSQF / internship in DSC**										

Basket : Generic Elective course (GE) Structure

Note*: Generic Elective Courses for semesters III and IV*

Sem	BoS	CODE	Credits for Course	Open/Generic Elective Corse	Nature of Course
Sem III	BoS in Mathematics	SMATGE1201 (GE-3)	2 Cr	Quantitative Aptitude and Logical Reasoning (संख्यात्मक अभियोग्यता आणि तार्किक तर्क)	Theory
Sem IV	BoS in Mathematics	SMATGE1251 (GE-4)	2 Cr	Mathematics for Competitive Examination (स्पर्धा परीक्षेसाठी गणित)	Theory

B.A./B. Sc. Second Year Semester III *(Level 5.0)*

Teaching Scheme of Semester-III

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major (DSC): Mathematics	SMATCT1201	Real Analysis-I	02	--	**02**	02	--
	SMATCT1202	Group Theory	02	--	**02**	02	--
	SMATCP1201	Lab Course on Real Analysis-I	--	02	**02**	--	04
	SMATCP1202	Lab Course on Group Theory	--	02	**02**	--	04
Minor (DSM): Mathematics	SMATMT1201	Fundamentals of Sequence and Group Theory	02	--	**02**	02	--
	SMATMP1201	DSM Lab Course-I(on Fundamentals of Sequence and Group Theory)	--	02	**02**	--	04
GE-3	SMATGE1201	Quantitative Aptitude and Logical Reasoning	02	--	**02**	02	--
VSC-I	SMATVC1201	Essential Mathematics for Data Science	--	02	**02**	--	04
AEC	AECENG1201	Title from BoS of English	02	--	**02**	02	--
AEC	AECMIL1201	Title from concern BoS	02	--	**02**	02	--
CC Course	CCCXXX1201	NCC /NSS/SPT/CLS/FIT /Yoga	02	-	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B.A/B. Sc. Second Year *(Level 5.0)*

Examination Scheme of Semester -III

[Theory :20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

[Practical :40% Continuous Assessment (***CA***) and 60% End Semester Assessment (***ESA***)]

	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)	CA (8)	ESA (9)	
Major (DSC): Mathematics	SMATCT1201	Real Analysis-I	10	10	10	40	--	--	50
	SMATCT1202	Group Theory	10	10	10	40	--	--	50
	SMATCP1201	Lab Course on Real Analysis-I	--	--	--	--	20	30	50
	SMATCP1202	Lab Course on Group Theory	--	--	--	--	20	30	50
Minor (DSM): Mathematics	SMATMT1201	Fundamentals of Sequence and Group Theory	10	10	10	40	--	--	50
	SMATMP1201	DSM Lab Course-I (on Fundamentals of Sequence and Group Theory)	--	--	--	--	20	30	50
GE-3	SMATGE1201	Quantitative Aptitude and Logical Reasoning	10	10	10	40	--	--	50
VSC-I	SMATVC1201	Essential Mathematics for Data Science	--	--	--	--	20	30	50
AEC	AECENG1201	Title from BoS of English	10	10	10	40	--	--	50
AEC	AECMIL1201	Title from concern BoS	10	10	10	40	--	--	50
CC Course	CCCXXX1201	NCC /NSS/SPT/CLS/FIT /Yoga etc	--	--	--	--	20	30	50

Abbreviations:

1.	DSC	: Discipline Specific Core (Major)
2.	CT	: Core Course /Core Theory(Related Major)
3.	CP	: Core Practical
4.	DSE	: Discipline Specific Elective (Major)
5.	ET	: Elective Course /Elective Theory
6.	EP	: Elective Practical
7.	MT	: Minor Course /Minor Theory
8.	MP	: Minor Practical
9.	DSM	: Discipline Specific Minor
10.	GE/OE	: Generic/Open Elective
11.	VSEC	: Vocational Skill and Skill Enhancement Course
12.	VSC	: Vocational Skill Courses
13.	VC	: Vocational Course
14.	SEC	: Skill Enhancement Course
15.	SC	: Skill Course
16.	AEC	: Ability Enhancement Course
17.	IKS	: Indian Knowledge System
18.	VEC	: Value Education Courses
19.	OJ	: On Job Training
20.	FP	: Field Projects
21.	CC	: Co-Curricular Courses
22.	RP	: Research Project/Dissertation
23.	FP	: Field Project
24.	IP	: Internship Program
25.	CS	: Case Study
26.	CLS	: Cultural Studies

27.	FIT	: Fitness
28.	HWS	: Health and Wellness
29.	YGE	: Yoga
30.	NCC	: National Cadet Core
31.	NSS	: National Service Scheme
32.	SPT	: Sports
33.	MIL	: Modern Indian languages
34.	RM	: Research Methodology

Semester - III

Mathematics Curriculum

B.A. / B.Sc. II (SEMESTER-III)

DSC-3(Theory) Real Analysis-I

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: III
Prerequisites:			
Course Code: SMATCT1201	Course Title: Real Analysis I		

Course Outcomes:

After successful completion of the course student will be able to

CO1: Understand the basic concept of sets and their properties.

CO2: Apply the concept of a neighbourhood of a point, interior points of a set, open set.

CO3: Discuss concept of limit points of a set, closed set, closure of a set, dense set.

CO4: Study the basic concept of sequences, sub-sequences, bounds of sequences, limit point of sequences, general principle of convergence, different types of sequences.

Credits: 2	DSC-3
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0	

Real Analysis -I

Module	Topic	No of Lectures
I	**Sets and Properties:** Field structure and order structure, Intervals, Bounded and unbounded sets, Supremum, Infimum, Completeness in the set of real numbers, Order completeness in R, Archimedean property of real numbers, Dedekind's Property, Complete-ordered field, Representation of real numbers as points of a straight line.	08
II	**Fundamental Concepts of Calculus:** Neighbourhood of a point, Interior point of a set, Open set, Limit point of a set, Bolzano-Weierstrass theorem, Closed sets, Closure of a set, Dense sets, Some important theorems, Countable and uncountable sets.	07
III	**Sequences:** Sequence, Range set, Bounds of a sequence, Convergence of sequences, Some theorem, Limit point of a sequence, Existence of limit points, Convergent sequences, non-convergent sequences.	07
IV	**Cauchy Sequence and Algebra of Sequences**: Cauchy's general principle of convergence, Cauchy's sequence, Algebra of sequences, Some important theorem, Monotonic sequences, Subsequence's.	08

	Text Books
1	**S.C.Malik and Savita Arora,** *Mathematical Analysis*, New Age International (P) Ltd, Fourth Edition 2014. **Scope:** **Unit I:** Chapter 1: Art 2,2.1,2.2,2.3,2.4,2.6,3,4,4.1,4.2 (Corollary's 1,2,3,4,5 only statement), 4.3,4.5,4.6, **Unit 2:** Chapter 2: Art 1.1, 1.2, 1.3 (Corollary's only statement), 2, 2.1(Theorem only statement), 2.2,3,3.1,3.2,3.3,3.4,3.5 (Theorems 10,11,12 and Corollary only statement), 4. **Unit-III:** Chapter 3: Art 1,1.1,1.2,1.3,1.4,2,2.1,2.2,2.3,4,4.1,4.2,5(Only definitions and statement of

	theorem 13). **Unit-IV:** Chapter 3:6,6.1,7 (Only Theorem 16 and its Lemma), 8 (Theorem 20,21,22,23 and 24 and examples 8,9,10 only), 9,9.1(Definition, Examples 14,15,16 only).
	Reference Books
1	**Richard R. Goldberg**, Methods of Real Analysis, Oxford & IBH Publishing Co. Pvt.Ltd.,New Delhi
2	**Shanti Narayan and Dr. M.D. Raisinghania**, Elements of Real Analysis, S. Chand & Company Ltd., New Delhi.
3	**R.G.Bartle and D.R.Sherbert**, Introduction to Real Analysis, John Wiley & Sons (Asia) P.Ltd, 2002.
4	**K.A.Ross**, Elementary Analysis-The Theory of Calculus Series-Undergraduate Text in Mathematics, Springer Verlag, 2003.
5	**William F.Trench**, Introduction to Real Analysis, Pearson Education Pub.
6	**T.M.Apostol**, Calculus (Vol.1), John Wiley & Sons (Asia) Pvt .Ltd., 2002.

B.A. / B.Sc. II (SEMESTER-III)

DSC-4(Theory) Group Theory

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: III
Prerequisites:			
Course Code: SMATCT1202	Course Title: Group Theory		

Course Outcomes:

After successful completion of the course student will be able to

CO 1. Categorize group structures

CO 2. Compute subgroups of a given cyclic group.

CO-3. Solve examples based on permutation groups.

CO-4. Compute Normal Subgroup, factor group and apply first fundamental Isomorphism theorem.

Credits: 2	DSC-4
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0	

Group Theory		
Module	Topic	No of Lectures
I	**Groups:** Definition and Examples of group, Elementary Properties of Group, Finite Groups, Subgroups, Subgroup Tests, Centre of group, Centralizer of a in G	08
II	**Cyclic Groups:** Properties of Cyclic Groups, Classifications of Subgroups of Cyclic groups, Permutation groups, Properties of Permutation, Even odd permutation.	08
III	**Isomorphisms, Cosets and Lagrange's Theorem**: Definition and examples, Cayley's Theorem, Properties of Isomorphisms, Automorphisms, Properties of Cosets, Lagrange's Theorem, An application of Cosets to Permutation group.	07
IV	**Normal Subgroup and Factor Group:** Normal Subgroups, Normal Subgroup Test, Group Homomorphisms Definition and Examples, Properties of Group Homomorphisms. The first isomorphism Theorem	07
	Text Books	
1	Joseph A Gallian, Contemporary Abstract Algebra (Fourth Edition) Narosa Publishing House. **Scope:** Unit I: Chapter 2, Chapter 3 Unit II: Chapter 4, Chapter 5 (excluding article on A Check -Digit Scheme based on D_5) Unit III: Chapter 6 and Chapter 7 Unit IV: Chapter 9 (exclude Internal Direct product) Chapter 10	
	Reference Books	
1	J.B. Fraleigh, "A first Course in Abstract Algebra", Narosa Publication.	
2	I. N. Herstein, "Topics in Algebra", Second Edition.	
3	V.K. Khanna, S.K. Bhambri, "A Course in Abstract Algebra", Vikas Publishing House.	

	(Second Edition)
4	David Dummit and Richard Foote, “Abstract Algebra”, John Wiley and Sons
5	P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul, “Basic Abstract Algebra”, (Second Ed.), Cambridge Univ. Press (Indian Ed.1995)

B.A. / B.Sc. II (SEMESTER-III)

DSC-3(Practical): Lab Course -III (Based on **Real Analysis-I**)

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: III
Prerequisites:			
Course Code: SMATCP1201	Course Title: Lab Course-III (Based on Real Analysis-I)		
Course Outcomes: After successful completion of the course student will be able to **CO1:** Understand the concept of Bounded and unbounded sets, Supremum, Infimum. **CO2:** Apply the concept of open sets, closed sets and countable sets. **CO3**: Identify whether sequences are bounded, monotonic, and convergent or divergent. **CO4:** Investigate the conditions under which a sequence oscillates and does not have a limit.			
Credits: 2	DSC-3		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 0-0-4			

List of Practical's

Sr	Title of Practical	Number of Examples
1	To solve the examples/exercise on bounded and unbounded sets: Supremum, Infimum.	02
2	To solve the examples/exercise on Completeness in the set of real numbers.	02
3	To solve the examples/exercise on open and closed sets.	02
4	To solve the examples/exercise on Countable and uncountable sets.	02
5	To solve the examples/exercise under which conditions a bounded sequence converges.	
6	To solve the examples/exercise on sequences that approach zero and nonzero limits.	02
7	To solve the examples/exercise on Convergent and non-Convergent sequences.	03
8	To solve the examples/exercise on Limit point of a sequence.	02
9	To solve the examples/exercise on Existence of limit points.	03
10	To solve the examples/exercise on oscillates finitely and infinitely.	02
11	To solve the examples/exercise on Cauchy's sequence.	02
12	To solve the examples/exercise on Sandwich theorem and Cauchy's first theorem on limits.	02
13	To solve the examples/exercise on Monotonic sequences.	02
14	To solve the examples/exercise on Cauchy's general principle of convergence of sequence	02

	Text Books
1	**S.C.Malik and Savita Arora,** *Mathematical Analysis*, New Age International (P) Ltd, Fourth Edition 2014.
	Reference Books

1	**Richard R. Goldberg**, Methods of Real Analysis, Oxford & IBH Publishing Co. Pvt. Ltd.,New Delhi
2	**Shanti Narayan and Dr. M.D. Raisinghania**, Elements of Real Analysis, S. Chand & Company Ltd., New Delhi.
3	**R.G.Bartle and D.R.Sherbert**, Introduction to Real Analysis, John Wiley & Sons (Asia) P.Ltd, 2002.
4	**K.A.Ross**, Elementary Analysis-The Theory of Calculus Series-Undergraduate Text in Mathematics, Springer Verlag, 2003.
5	**William F.Trench**, Introduction to Real Analysis, Pearson Education Pub.
6	**T.M.Apostol**, Calculus (Vol.1), John Wiley & Sons (Asia) P.Ltd., 2002.

Note: Record book will consist of at least 80% practical's/examples. Practical's/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

B.A. / B.Sc. II (SEMESTER-III)

DSC- 4(Practical): Lab Course -IV (Based on Group Theory)

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: III
Prerequisites:			
Course Code: SMATCP1202	Course Title: Lab Course-IV (Based on Group Theory)		
Course Outcomes: After successful completion of the course student will be able to **CO1:** Apply SageMath for elementary concepts in group theory **CO2:** Visualize group using SageMath/likewise software **CO3**: Solve examples on homomorphisms, Isomorphism and automorphisms of groups. **CO4:** Prepare quotient group and apply fundamental theorems of homomorphism.			
Credits: 2	DSC-4(Practical)		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 0-0-4			

List of Practical's

Sr	Title of Practical	Number of Programs/Examples
1	Create Group cyclic groups, symmetric groups, and dihedral groups using SageMath	03
2	Perform group operations such as multiplication and inversion using SageMath	02
3	Compute order of group and decide whether given group is abelian using SageMath	02
4	Generate subgroups using SageMath	02
5	Create Permutation group using SageMath	02
6	Compute cosets of a subgroup using SageMath	02
7	Theory based examples on computation of Centre of group	02
8	Use SageMath to visualize group G as Cayley graph	02
9	Theory based examples on Automorphism of G	02
10	Theory based examples on even odd permutation	03
11	Theory based examples on centralizer of a in G	02
12	Theory based examples on Group homomorphisms	02
13	Theory based examples on Group isomorphisms	02
14	Theory based examples on factor group	02

Note : For software based practical use SageMath/likewise software

Recommended Books

1. Group Theory An Expedition With SageMath, By Ajit Kumar, Narosa Publication
2. Joseph A Gallian, Contemporary Abstract Algebra (Fourth Edition) Narosa Publishing House.
3. J.B. Fraleigh, "A first Course in Abstract Algebra", Narosa Publication.
4. I. N. Herstein, "Topics in Algebra", Second Edition.
5. V.K. Khanna, S.K. Bhambri, "A Course in Abstract Algebra", Vikas Publishing House. (Second Edition)

6. David Dummit and Richard Foote, “Abstract Algebra”, John Wiley and Sons
7. P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul, “Basic Abstract Algebra”, (Second Ed.), Cambridge Univ. Press (Indian Ed.1995)

Note: Record book will consist of at least 80% practical’s/examples. Practical’s/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

B.A. / B.Sc. II (SEMESTER-III)
DSM-1(Theory) Fundamentals of Sequence and Group Theory

Programme: Certificate course in Mathematics. Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSM	Semester: III
Prerequisites: Knowledge and properties of Real numbers and Set Theory.			
Course Code: SMATMT1201		Course Title: Fundamentals of Sequence and Group Theory	

Course Outcomes:

After successful completion of the course student will be able to

CO1: Understand the basic concept of sets and their properties.

CO2: Apply the concept of a neighbourhood of a point, interior points of a set, open set.

CO3: Study the basic concept of sequences, sub-sequences, bounds of sequences, limit point of sequences, general principle of convergence, different types of sequences

CO 4. Categorize group structures

CO 5. Compute subgroups of a given cyclic group.

CO-6. Solve examples based on permutation groups.

CO-7. Compute Normal Subgroup, factor group and apply first fundamental Isomorphism theorem.

Credits: 2	DSM-1
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0	

Fundamentals of Sequence and Group Theory		
Module	Topic	No of Lectures
I	**Sets and Properties:** Field structure and order structure, Intervals, Bounded and unbounded sets, Supremum, Infimum, Completeness in the set of real numbers, Order completeness in R, Archimedean property of real numbers, Dedekind's Property, Complete-ordered field, Representation of real numbers as points of a straight line.	08
II	**Sequences:** Sequence, Range set, Bounds of a sequence, Convergence of sequences, Some theorem, Limit point of a sequence, Existence of limit points, Convergent sequences, Non-Convergent sequences	07

III	**Groups:** Definition and Examples of group, Elementary Properties of Group, Finite Groups, Subgroups, Subgroup Tests, Centre of group, Centralizer of a in G.	08
IV	**Cyclic Groups:** Properties of Cyclic Groups, Classifications of Subgroups of Cyclic groups, Permutation groups, Properties of Permutation, Even odd permutation.	07
Text Books		
1	S.C. Malik and Savita Arora, Mathematical Analysis, New Age International (P) Ltd, Fourth Edition 2014. **Scope:** Module I: Chapter 1: Art 2,2.1,2.2,2.3,2.4,2.6,3,4,4.1,4.2 (Corollary's 1,2,3,4,5 only statement),4.3,4.5,4.6, Module-II: Chapter 3: Art 1,1.1,1.2,1.3,1.4,2,2.1,2.2,2.3,4,4.1,4.2,5(Only definitions and statement of Theorem 13)	
2	Joseph A Gallian, Contemporary Abstract Algebra (Fourth Edition) Narosa Publishing House. Scope: Module III: Chapter 2, Chapter 3 Module IV: Chapter 4, Chapter 5 (excluding article on A Check -Digit Scheme based onD5)	
Reference Books		
1	Richard R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Co. Pvt.Ltd., New Delhi	
2	R.G.Bartle and D.R.Sherbert, Introduction to Real Analysis, John Wiley & Sons(Asia) P.Ltd, 2002.	
3	J.B. Fraleigh, “A first Course in Abstract Algebra”, Narosa Publication.	
4	I. N. Herstein, “Topics in Algebra”, Second Edition.	

DSM-(Practical) : DSM Lab Course -I (Fundamentals of Sequence and Group Theory)

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSM	Semester: III
Prerequisites: Knowledge and properties of Real numbers.			
Course Code: SMATMP1201		Course Title: DSM Lab Course-I (Based on Fundamentals of Sequence and Group Theory)	

Course Outcomes:

After successful completion of the course student will be able to

CO1: Understand the basic concept of sets and their properties.

CO2: Apply the concept of a neighbourhood of a point, interior points of a set, open set.

CO3: Study the basic concept of sequences, sub-sequences, bounds of sequences, limit point of sequences, general principle of convergence, different types of sequences

CO 1. Categorize group structures

CO 4. Compute subgroups of a given cyclic group.

CO-5. Solve examples based on permutation groups.

CO-6. Compute Normal Subgroup, factor group and apply first fundamental Isomorphism theorem.

Credits: 2	DSM-1
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 0-0-4	

List of Practical's

Sr No	**Title of Practical**	**Number of Examples**
1	To solve the examples/exercise on bounded and unbounded sets: Supremum, Infimum.	02
2	To solve the examples/exercise on Completeness in the set of real numbers.	02

3	To solve the examples/exercise under which conditions a bounded sequence converges.	02
4	To solve the examples/exercise on Countable and uncountable sets.	03
5	To solve the examples/exercise on sequences that approach zero and nonzero limits.	03
6	To solve the examples/exercise on Convergent and non-Convergent Sequences	03
7	Examples on sub Group	02
8	Examples on Centre and Centralizers of Groups	02
9	Examples Permutation of a group	02
10	Create Group cyclic groups, symmetric groups, and dihedral groups using SageMath	02
11	Perform group operations such as multiplication and inversion using SageMath	02
12	Compute order of group and decide whether given group is abelian using SageMath	02
13	Generate subgroups using SageMath	02
14	Compute cosets of a subgroup using SageMath	02
Text Books		
1	S.C.Malik and Savita Arora, Mathematical Analysis, New Age International (P) Ltd,Fourth Edition 2014.	
2	Joseph A Gallian, Contemporary Abstract Algebra (Fourth Edition) Narosa Publishing House.	
3	Group Theory An Expedition With SageMath, By Ajit Kumar ,Narosa Publication	
Reference Books		
1	Richard R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi	
2	R.G.Bartle and D.R.Sherbert, Introduction to Real Analysis, John Wiley & Sons (Asia) P.Ltd, 2002.	
3	J.B. Fraleigh, “A first Course in Abstract Algebra”, Narosa Publication.	

4	I. N. Herstein, “Topics in Algebra”, Second Edition.

Note: Record book will consist of at least 80% practical’s/examples. Practical’s/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

B.A. / B.Sc. II (SEMESTER-III)

GE-3(Theory) Quantitative Aptitude and Logical Reasoning

(संख्यात्मक अभियोग्यता आणि तार्किक तर्क)

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type GE	Semester: III
Prerequisites:			
Course Code: SMATGE1201	Course Title: Quantitative Aptitude and Logical Reasoning (संख्यात्मक अभियोग्यता आणि तार्किक तर्क)		
Course Outcomes: After successful completion of the course student will be able to **CO1:** Compute HCF and LCM of a given number. **CO2:** Describe how to compute Fractions and how-to interpreter data. **CO3**: Perform calculations & predictions based on given datasets **CO4:** Attempt aptitude test of different multinational companies/Banking Examinations			
Credits: 2	GE-3		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0			

Quantitative Aptitude and Logical Reasoning (संख्यात्मक अभियोग्यता आणि तार्किक तर्क)		
Module	Topic	No of Lectures
I	Number Systems, HCF and LCM of numbers, Decimal Fractions, Simplification, Square Roots & Cube roots. संख्या पद्धती, संख्यांचा ल.सा.वी. आणि म.सा.वी., दशांश अपूर्णांक, सोपे रूप, वर्ग मूळे आणि घन मूळे	08
II	Average, Problems on Age, Surds and Indices. सरासरी, वय वरील प्रश्न, वर्ग आणि निर्देशांक.	07
III	Percentage, Profit & Loss, Ratio and Proportion. टक्केवारी, नफा आणि तोटा, गुणोत्तर व प्रमाण.	07
IV	Partnership, Chain Rule, Time & Work, Time & Distance. भागीदारी, शृंखला नियम, वेळ आणि कार्य, वेळ आणि अंतर.	08
	Text Books	
1	Quantitative Aptitude by Dr. R. S. Agrawal, S. Chand Publisher, Revised Edition. (Quantitative Aptitude (Marathi Avrutti) R S Agrawal S Chand And Company Limited 2021) Scope : Module I – Chapter 1 to 5 Module II – Chapter 6 to 9 Module III– Chapter 11 to 13 Module IV– Chapter 14,15,17,18.	
	Reference Books	
1	How to Prepare for Quantitative Aptitude for CAT by Arun Sharma.	
2	How to Prepare for Logical Reasoning for CAT by Arun Sharma.	
3	A Modern Approach to Verbal & Non- Verbal Reasoning, Dr. R S Agrawal & S. Cha	

B.A. / B.Sc. II (SEMESTER-III)

VSC-1: Essential Mathematics for Data Science

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type VSC (Theory+ Practical)	Semester: III
Prerequisites:			
Course Code: SMATVC1201	Course Title: Essential Mathematics for Data Science		
Course Outcomes: After successful completion of the course student will be able to **CO1:** Use the mathematical concepts in the field of data science. **CO2:** Employ the techniques and methods related to the area of data science in variety of applications. **CO3**: Handle concepts of regression and corelation analysis. **CO4:** Apply logical thinking to understand and solve the problem in context.			
Credits: 2	VSC-1		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-2			

Essential Mathematics for Data Science		
Module	Topic	No of Lectures
I	**Organization of Data:** Pereto diagrams and Dot diagrams, Frequency Distributions, Graphs of Frequency Distributions, Stem-and-leaf Displays	08T+7P
II	**Description of data:** Descriptive measures, Quartiles and percentiles, Mean and Variance, Case study Examples.	07T+8P
III	**Regression Analysis:** The method of least squares, Inference Based on the least squares estimators, Curvilinear Regression, Multiple Regression.	08T+7P
IV	**Corelation:** Corelation and causation, Population Corelation coefficient, Fisher Z transformation, Multiple Linear Regression.	08T+7P
	Text Books	
1	Miller & Freund's, "Probability and Statistics for Engineers" Pearson Scope : Module I : Chapter 2- Article 2.1 to 2.4 Module II: Chapter 2 -Article 2.5 to 2.8 Module III: Chapter 11- Article 11.1 to 11.4 Module IV: Chapter 11 Article 11.5 to 11.7	
	Reference Books	
1	Peter Bruce, Andrew Bruce& Peter Gedeck,"Practical Statistics For Data Scientists" Second edition , O'Reilly Media, Inc.	
2	Gareth M. James, Daniela Witten, Trevor Hastie, Robert Tibshirani , "An Introduction to	

	Statistical Learning", Springer Publications .
3	Alien B Downey, "Think Stats", O'Reilly Media, Inc.
4	A M Goon,M K Gupta,B Dasgupta, "Fundamentals of Statistics", Volume 1,The word press Private LTD
5	Hadrien Jean, "Essential Math for Data Science" O'Reilly Media, Inc. 2019

List of Practical's

Sr	Title of Practical	Number of Examples
1	Draw a Pareto chart.	02
2	Construction of a dot diagram.	02
3	Draw a histogram using the equal length classes	02
4	Construct a stem-and-leaf display	02
5	Calculation of the sample mean and median	03
6	Calculation of sample variance	03
7	Calculation of sample standard deviation	02
8	Computation of Range and Interquartile Range	02
9	Construction of Box Plot	02
10	Examples of fitting a straight line by least squares.	02
11	Examples on calculation or regression coefficient	02
12	Computation of sample correlation coefficients	02
13	Examples on Population Correlation coefficient.	02
14	Examples to construct a confidence interval for ρ on the basis of the Fisher Z transformation	01
15	Examples to construct a confidence interval for ρ on the basis of the Fisher Z transformation	01

Note: Record book will consist of at least 80% practical's/examples. Practical's/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

Semester - IV

B.A./B. Sc. Second Year Semester IV*(Level 5.0)*

Teaching Scheme of Semester-IV

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major (DSC): Mathematics	SMATCT1251	Real Analysis-II	02	--	**02**	02	--
	SMATCT1252	Ring Theory	02	--	**02**	02	--
	SMATCP1251	Lab Course on Real Analysis-II	--	02	**02**	--	04
	SMATCP1252	Lab Course on Ring Theory	--	02	**02**	--	04
Minor (DSM): Mathematics	SMATMT1251	Introduction to Infinite Series and Ring Theory	02	--	**02**	02	--
	SMATMP1251	DSM Lab Course-II on Introduction to Infinite Series and Ring Theory	--	02	**02**	--	04
GE-4	SMATGE1251	Mathematics for Competitive Examination	02	--	**02**	02	--
VSC-2	SMATVC1251	Introduction to R Programming	--	02	**02**	--	04
AEC	AECENG1251	Title from BoS of English	02	--	**02**	02	--
AEC	AECMIL1251	Title from concern BoS	02	--	**02**	02	--
VEC	**VECEVS1251**	EVS	02	-	**02**	02	--
Total Credits			14	08	22	14	16

B.A/B. Sc. Second Year *(Level 5.0)*

Examination Scheme of Semester -IV

[Theory :20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

[Practical :40% Continuous Assessment (***CA***) and 60% End Semester Assessment (***ESA***)]

	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)	CA (8)	ESA (9)	
Major (DSC): Mathematics	SMATCT1251	Real Analysis-II	10	10	10	40	--	--	50
	SMATCT1252	Ring Theory	10	10	10	40	--	--	50
	SMATCP1251	Lab Course on Real Analysis-II	--	--	--	--	20	30	50
	SMATCP1252	Lab Course on Ring Theory	--	--	--	--	20	30	50
Minor (DSM): Mathematics	SMATMT1251	Introduction to Infinite Series and Ring Theory	10	10	10	40	--	--	50
	SMATMP1251	DSM Lab Course-II(On Introduction to Infinite Series and Ring Theory)	--	--	--	--	20	30	50
GE-3	SMATGE1251	Mathematics for Competitive Examination	10	10	10	40	--	--	50
VSC-I	SMATVC1251	Introduction to R Programming	--	--	--	--	20	30	50
AEC	AECENG1251	Title from BoS of English	10	10	10	40	--	--	50
AEC	AECMIL1251	Title from concern BoS	10	10	10	40	--	--	50
VEC	VECEVS1251	EVS	10	10	10	40	--	--	--

B.A. / B.Sc. II (SEMESTER-IV)

DSC-5(Theory) Real Analysis -II

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: IV
Prerequisites: Basic Knowledge of Analysis			
Course Code: SMATCT1251	Course Title: Real Analysis -II		

Course Outcomes:

After successful completion of the course student will be able to

CO1: Define and identify infinite series, distinguishing between convergent and divergent series.

CO2: Understand the sum and behaviour of an infinite series as the number of terms approaches infinity.

CO3: Analyse the conditions under which a series converges or diverges.

CO4: Apply various convergence tests to determine the behaviour of infinite series.

Credits: 2	DSC-5
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0	

Real Analysis -II		
Module	Topic	No of Lectures
I	**Series:** Introduction, Definitions, Necessary condition for convergence, Cauchy's general principle of convergence for series, Some preliminary theorems, Positive term series, Necessary condition for convergence of positive term series, Geometric series, Comparison series.	08
II	**Tests for Convergence:** Comparison test (first and second type), Cauchy's root test, D-Alembert's root test.	07
III	**More Tests for Convergence:** Raabe's test, Logarithmic test, Test for series of arbitrary term.	07
IV	**Absolute and Conditionally Convergence of Series:** Series with arbitrary terms, Alternating series, Absolute convergence, Rearrangement of terms.	08
	Text Books	
1	**S.C.Malik and Savita Arora,** *Mathematical Analysis*, New Age International (P) Ltd, Fourth Edition 2014. **Scope:** **Unit I:** Chapter 4: Art 1,1.1,1.2,1.3,1.4,2,2.1,2.2,2.3. **Unit 2:** Chapter 4: Art 3,3.1, 3.2, 3.3, 4, 5. **Unit-III:** Chapter 4: Art 6, 7,10.3 **Unit-IV:** Chapter 4 : Art 10,10.1, 10.2, 11 .	
	Reference Books	

1	**Richard R. Goldberg**, Methods of Real Analysis, Oxford & IBH Publishing Co. Pvt.Ltd.,New Delhi
2	**Shanti Narayan and Dr. M.D. Raisinghania**, Elements of Real Analysis, S. Chand & Company Ltd., New Delhi.
3	**R.G.Bartle and D.R.Sherbert**, Introduction to Real Analysis, John Wiley & Sons (Asia) P.Ltd, 2002.
4	**K.A.Ross**, Elementary Analysis-The Theory of Calculus Series-Undergraduate Text in Mathematics, Springer Verlag, 2003.
5	**William F.Trench**, Introduction to Real Analysis, Pearson Education Pub.
6	**T.M.Apostol**, Calculus (Vol.1), John Wiley & Sons (Asia) P.Ltd., 2002.

B.A. / B.Sc. II (SEMESTER-IV)

DSC-6(Theory) Ring Theory

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: IV
Prerequisites: Basic Set Theory knowledge			
Course Code: SMATCT1252	Course Title: Ring Theory		
Course Outcomes: **After successful Completion of the course students are able to** **CO1:** Grasp the definitions and properties of rings, fields, integral domains, subrings, etc., **CO2:** Construct composition tables for finite quotient rings and understand the relationship between ideals and quotient rings. **CO3**: Study the properties of homomorphisms and isomorphisms, and apply them to solve problems. **CO4:** Understand the division algorithm for polynomials over fields and its applications.			
Credits: 2	DSC-3		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0			

Ring Theory		
Module	Topic	No of Lectures
I	**Introduction to Rings and Integral Domains:** Definition of Rings, Examples of Rings, Properties of Rings, Subrings, Subring Tests, Integral Domains definition and examples, Zero divisors, Fields, Characteristics of rings	08
II	**Ideals and Factor Rings:** Ideals, Ideal Tests, Factor rings, Prime Ideals and Maximal ideals.	06
III	**Ring Homomorphisms:** Ring Homomorphism, Ring Isomorphism**,** Properties of Ring Homomorphism, The Field of quotients.	06
IV	**Polynomial Rings:** Rings of Polynomials over R, The Division Algorithm and consequences, Principal Ideal Domain, Factorization of Polynomials, Reducibility Tests, Content of Polynomial, Primitive Polynomial, irreducibility Tests, Eisenstein's Criterion, Unique Factorization in Z[x].	10
	Text Books	
1	Joseph A Gallian, Contemporary Abstract Algebra (Fourth Edition) Narosa Publishing House. **Scope:** Unit I: Chapter 12, Chapter 13 Unit II: Chapter 14, Unit III: Chapter 15 Unit IV: Chapter 16, Chapter 17(only Statement for Eisenstein's Criterion and Unique Factorization in Z[x].)	
	Reference Books	
1	J.B. Fraleigh, "A first Course in Abstract Algebra", Narosa Publication.	
2	I. N. Herstein, "Topics in Algebra", Second Edition.	
3	V.K. Khanna, S.K. Bhambri, "A Course in Abstract Algebra", Vikas Publishing House. (2^{nd} Edition)	
4	David Dummit and Richard Foote, "Abstract Algebra", John Wiley and Sons	
5	P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul, "Basic Abstract Algebra", (Second Ed.), Cambridge Univ. Press (Indian Ed.1995)	

B.A. / B.Sc. II (SEMESTER-IV)

DSC- 6(Practical) Lab Course -V (Based on Real Analysis -II)

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: IV
Prerequisites: Basic Knowledge of analysis			
Course Code: SMATCP1251	Course Title: Lab Course-V (Based on Real Analysis -II)		

Course Outcomes:

After successful completion of the course student will be able to

CO1: Understand the role of partial sums in determining the behaviour of an infinite series.

CO2: Identify when a series converges or diverges.

CO3: Apply tests for convergence such as the Comparison Test, Cauchy's root test, D-Alembert's root test.

CO4: Differentiate between absolute and conditional convergence.

Credits: 2	DSC-2
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-2	

List of Practical's

Sr	Title of Practical	Number of Examples
1	To solve the examples/exercise on convergence and divergence of series.	02
2	To solve the examples/exercise on Cauchy's general principle of convergence for series.	02
3	To solve the examples/exercise on Positive term series.	02
4	To solve the examples/exercise on Geometric series.	02
5	To solve the examples/exercise on Necessary condition for convergence of positive term series.	02
6	To solve the examples/exercise on Comparison test for Positive term series.	02
7	To solve the examples/exercise on Cauchy's root test.	03
8	To solve the examples/exercise on D-Alembert's root test.	02
9	To solve the examples/exercise on Raabe's test.	03
10	To solve the examples/exercise on Logarithmic test.	02
11	To solve the examples/exercise on Alternating series.	02
12	To solve the examples/exercise on Absolute convergence.	02
13	To solve the examples/exercise on conditionally convergence.	02
14	To solve the examples/exercise on Rearrangement of terms.	02

Text Books

1. **S.C.Malik and Savita Arora,** *Mathematical Analysis*, New Age International (P) Ltd, Fourth Edition 2014.

Reference Books

1. **Richard R. Goldberg**, Methods of Real Analysis, Oxford & IBH Publishing Co. Pvt.Ltd.,New Delhi
2. **Shanti Narayan and Dr. M.D. Raisinghania**, Elements of Real Analysis, S. Chand

	& Company Ltd., New Delhi.
3	**R.G.Bartle and D.R.Sherbert**, Introduction to Real Analysis, John Wiley & Sons (Asia) P.Ltd, 2002.
4	**K.A.Ross**, Elementary Analysis-The Theory of Calculus Series-Undergraduate Text in Mathematics, Springer Verlag, 2003.
5	**William F.Trench**, Introduction to Real Analysis, Pearson Education Pub.
6	**T.M.Apostol**, Calculus (Vol.1), John Wiley & Sons (Asia) P.Ltd., 2002.

Note: Record book will consist of at least 80% practical's/examples. Practical's/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

B.A. / B.Sc. II (SEMESTER-IV)
DSC-6 (Practical): Lab Course -VI (Based on Ring Theory)

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSC	Semester: IV
Prerequisites:			
Course Code: SMATCP1252	Course Title: Lab Course-VI		
Course Outcomes: After successful completion of the course student will be able to **CO1:** Study of Ring Theory using SageMath. **CO2:** Create ideals and check ideal membership. **CO3**: Define and verify ring homomorphisms between two rings. **CO4:** Apply Eisenstein's criterion in Sage to test the irreducibility of polynomials			
Credits: 2	DSC-6		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-2			

List of Practical's

Sr	Title of Practical	Number of programs
1	Creating and Exploring Rings using SageMath	03
2	Test if a given ring is commutative using SageMath	02
3	Define a ring homomorphism between two rings and verify properties using SageMath	02
4	Create ideals and check if an element belongs to them Using SageMath	02
5	Construct a quotient ring Using SageMath	02
6	Find all units (invertible elements) in Z_n Using SageMath.	03
7	Find all zero divisors in in Z_n Using SageMath.	02
8	Apply Eisenstein's criterion in Sage to test the irreducibility of polynomials	02
9	Theory based examples for applying Division algorithm for two polynomials	02
10	Theory based examples on Zero divisors and Integral domain	02
11	Theory based examples on Prime and Maximal ideals	02
12	Theory based examples on reducibility of polynomial	02
13	Theory based examples on irreducibility of polynomial	02
14	Theory based examples on Eisenstein's criterion	02

Recommended Books/Resources

1. General Rings, Ideals, and Morphisms Release 10.6 by Sage Development Team April 2025.
2. **https://doc.sagemath.org/html/en/tutorial/tour_rings.html**
3. Group Theory An Expedition With SageMath, By Ajit Kumar ,Narosa Publication
4. Paul Zimmermann, Alexandre Casamayou and Team ," Mathematical Computation with SageMath"

Note: Record book will consist of at least 80% practical's/examples. Practical's/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

Mathematics Curriculum

B.A. / B.Sc. II (SEMESTER-III)

DSM-2(Theory) Introduction to Infinite Series and Ring Theory

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSM	Semester :IV
Prerequisites: Knowledge and properties of sequence Real numbers and algebraic structures.			
Course Code: SMATMT1251		Course Title: Introduction to Infinite Series and Ring Theory	

Course Outcomes:

After successful completion of the course student will be able to

CO1: Define and identify infinite series, distinguishing between convergent and divergent series.

CO2: Understand the sum and behaviour of an infinite series as the number of terms approaches infinity.

CO3: Analyse the conditions under which a series converges or diverges

CO4: Grasp the definitions and properties of rings, fields, integral domains, subrings, etc.,

CO5: Construct composition tables for finite quotient rings and understand the relationship between ideals and quotient rings.

CO6: Study the properties of homomorphisms and isomorphisms, and apply them to solve problems.

Credits: 2	DSM-2
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0	

Introduction to Infinite Series and Ring Theory		
Module	Topic	No of Lectures
I	**Series:** Introduction, Definitions, Necessary condition for convergence, Cauchy's general principle of convergence for series, Some preliminary theorems, Positive term series, Necessary condition for convergence of positive term series, Geometric series, Comparison series	08
II	**Tests for Convergence:** Comparison test (first and second type), Cauchy's root test, D-Alembert's root test.	07
III	**Introduction to Rings and Integral Domains:** Definition of Rings, Examples of Rings, Properties of Rings, Subrings, Subring Tests, Integral Domains definition and examples, Zero divisors,	08

	Fields, Characteristics of rings	
IV	**Ideals and Factor Rings:** Ideals, Ideal Tests, Factor rings, Prime Ideals and Maximal ideals.	07
Text Book		
1	S.C. Malik and Savita Arora, Mathematical Analysis, New Age International (P) Ltd, Fourth Edition 2014. Scope: Module I: Chapter 4: Art 1,1.1,1.2,1.3,1.4,2,2.1,2.2,2.3. Module II: Chapter 4: Art 3,3.1, 3.2, 3.3, 4, 5.	
2	Joseph A Gallian, Contemporary Abstract Algebra (Fourth Edition) Narosa Publishing House. Scope: Module III: Chapter 12, Chapter 13 Module IV: Chapter 14,	
Reference Books		
1	Richard R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Co.Pvt.Ltd.,New Delhi	
2	R.G.Bartle and D.R.Sherbert, Introduction to Real Analysis, John Wiley & Sons (Asia) P.Ltd, 2002.	
3	J.B. Fraleigh, “A first Course in Abstract Algebra”, Narosa Publication.	
4	I. N. Herstein, “Topics in Algebra”, Second Edition.	

DSM-(Practical) :DSM Lab Course -II (Introduction to Infinite Series and Ring Theory)

Programme: Certificate Course in Mathematics. Class: B.A./B.Sc. II	Year: Second Level 5	Course Type DSM	Semester: IV
Prerequisites: Knowledge of Set Theory and Properties of Real numbers.			
Course Code: SMATMP1251		Course Title: DSM Lab Course-II (Introduction to Infinite Series and Ring Theory)	

Course Outcomes:

After successful completion of the course student will be able to

CO1: Understand the role of partial sums in determining the behaviour of an infinite series.

CO2: Identify when a series converges or diverges.

CO3: Apply tests for convergence such as the Comparison Test, Cauchy's root test, D-Alembert's root test.

CO4: Study of Ring Theory using SageMath.

CO5: Grasp the definitions and properties of rings, fields, integral domains, subrings, etc.,

CO6: Construct composition tables for finite quotient rings and understand the relationship between ideals and quotient rings

Credits: 2	DSM-2
Max. Marks: 50	Min. Passing Marks:20
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 0-0-4	

List of Practical's

Sr No	Title of Practical	Number of Examples
1	To solve the examples/exercise on convergence and divergence of series.	02
2	To solve the examples/exercise on Cauchy's general principle of convergence for series.	02
3	To solve the examples/exercise on Positive term series.	02
4	To solve the examples/exercise on Geometric series.	02

5	To solve the examples/exercise on Necessary condition for convergence of positive term series	02
6	To solve the examples/exercise on Cauchy's root test	03
7	To solve the examples/exercise on D-Alembert's root test.	02
8	Creating and Exploring Rings using SageMath	03
9	Test if a given ring is commutative using SageMath	02
10	Construct a quotient ring Using SageMath	02
11	Examples on Zero divisor	02
12	Examples on factor Ring	02
13	Examples on Prime Ideals	02
14	Examples on Maximal Ideals	02
Text Books		
1	S.C. Malik and Savita Arora, Mathematical Analysis, New Age International (P) Ltd,Fourth Edition 2014.	
2	Joseph A Gallian, Contemporary Abstract Algebra (Fourth Edition) Narosa Publishing House.	
Reference Books		
1	Richard R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Co.Pvt.Ltd.,New Delhi	
2	R.G.Bartle and D.R.Sherbert, Introduction to Real Analysis, John Wiley & Sons (Asia) P.Ltd, 2002.	
3	J.B. Fraleigh, "A first Course in Abstract Algebra", Narosa Publication.	
4	I. N. Herstein, "Topics in Algebra", Second Edition.	
5	General Rings, Ideals, and Morphisms Release 10.6 by Sage Development Team April 2025.	
6	https://doc.sagemath.org/html/en/tutorial/tour_rings.html	
7	Group Theory An Expedition With SageMath, By Ajit Kumar ,Narosa Publication	
8	Paul Zimmermann, Alexandre Casamayou and Team ," Mathematical Computation with SageMath"	

Note: Record book will consist of at least 80% practical's/examples. Practical's/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

Mathematics Curriculum

B.A. / B.Sc. II (SEMESTER-IV)

GE-4(Theory) Mathematics for Competitive Examination

(स्पर्धा परीक्षेसाठी गणित)

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type GE	Semester: IV
Prerequisites:			
Course Code: SMATGE1251	Course Title: Mathematics for Competitive Examination (स्पर्धा परीक्षेसाठी गणित)		
Course Outcomes: After successful completion of the course student will be able to **CO1:** Solve examples of various competitive examinations. **CO2:** Compute Simple and Compound interest. **CO3**: Perform calculations based on permutations and Combinations. **CO4:** Attempt aptitude test of different multinational companies/Banking Examinations			
Credits: 2	GE-4		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-0			

Mathematics for Competitive Examination (स्पर्धा परीक्षेसाठी गणित)		
Module	Topic	No of Lectures
I	Boats and Streams, Problems on Train, Alligation or Mixture. बोट आणि प्रवाह, ट्रेनवरील गणिती प्रश्न, अडचणी किंवा मिश्रण.	08
II	Simple interest, Compound interest, Area, Volume and Surface Area. सरळ व्याज, चक्रवाढ व्याज, क्षेत्रफळ, आकारमान आणि पृष्ठभागाचे क्षेत्रफळ.	07
III	Races and Games of skills, Calendar, Clocks. शर्यत आणि कौशल्य पूर्ण खेळ, दिनदर्शिका, घड्याळ.	07
IV	Permutations and Combinations, Probability, Bankers Discount, Odd Man Out Series. क्रमचयन आणि संचयन, संभाव्यता, बँकाची सवलत, मालिकेत न जुळणारी संख्या शोधा.	08
	Text Books	
1	Quantitative Aptitude by Dr. R. S. Agrawal, S. Chand Publisher, Revised Edition. (Quantitative Aptitude (Marathi Avrutti) by R S Agrawal S Chand and Company Limited 2021) Scope: Module I – Chapter 19,20,21 Module II – Chapter 22,23,24,25 Module III– Chapter 26,27,28 Module IV– Chapter 30,31,32,35	
	Reference Books	
1	How to Prepare for Quantitative Aptitude for CAT by Arun Sharma.	
2	How to Prepare for Logical Reasoning for CAT by Arun Sharma.	
3	A Modern Approach to Verbal & Non- Verbal Reasoning, Dr. R S Agrawal & S. Chand	

Mathematics Curriculum

B.A. / B.Sc. II (SEMESTER-IV)

VSC-2: Introduction to R Programming

Programme: Certificate Course in Mathematics Class: B.A./B.Sc. II	Year: Second Level 5	Course Type VSC	Semester: IV
Prerequisites:			
Course Code: SMATVC1251	Course Title: Introduction to R Programming		
Course Outcomes: After successful completion of the course student will be able to **CO1:** Learn the syntax and semantics of R, including data types, variables, and control structures. **CO2:** Perform basic statistical analysis, including descriptive statistics and inferential statistics. **CO3**: Import, manipulate, and visualize data in R. **CO4:** Create informative and attractive data visualizations using R			
Credits: 2	VSC-2		
Max. Marks: 50	Min. Passing Marks:20		
Total No. of Lectures – Tutorials – Practical (in hours per week): L-T-P: 2-0-2			

Introduction to R Programming		
Module	Topic	No of Lectures +Practical's
I	**Introduction to R:** Why use R? R and Statistics, R and plots, First steps in R, Using R Commander, Launching R Commander Handling data with R Commander, A few statistical tasks with R Commander, Adding functionalities to the R Commander interface, Using R with the console ,The strength to R shown on an example, A brief introduction of R syntax through some instructions to type.	08T +7P
II	**Basic concepts and data organization**: R is a calculator Displaying results and variable redirecting, Work strategy, Using functions, Data in R Data nature (or type, or mode) Numeric type(numeric), Complex type(complex),Boolean or logical type(logical), Missing data(NA), Character string type(character),Raw data(raw), Data structures, Vectors(vector), Matrices(matrix)and arrays(array), Lists(list), The individual variable table(data. Frame) Factors(factor), ordinal variables(ordered)	07T+8P
III	**Loading and handling Data in R:** Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File –R -Excel File – Reading the Excel file.	07T+8P
IV	**Descriptive Statistics:** Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Datawith Visualization Pie Charts: Pie Chart title and Colours – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colours.	08T+7P

	Text Books
1	Pierre Lafaye de Micheaux, Remy Drouilhet and Benoit Liquet, "The R Software Fundamentals of Programming and Statistical Analysis" Springer 2013.
	Reference Books
1	Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016
2	A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009.
3	Navarro Omar Trejo,"R Programming By Example",Packt Publishing Limited
4	Heumann, Christian, Schomaker, Michael, Shalabh ,"Introduction to Statistics and Data Analysis With Exercises, Solutions and Applications in R" Springer 2016
5	Douglas C. Montgomery, George C. Runger ,"Applied Statistics and Probability for Engineers, , 2018, Wiley (Low price edition available)
6	Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.
7	https://onlinecourses.nptel.ac.in/noc19_ma33/preview

List of Practical's

Sr	Title of Practical	Number of Examples
1	Programs for assigning values to variables and perform basic operations.	02
2	Programs on Simple manipulations; numbers and vectors.	03
3	Create and manipulate vectors, and perform basic operations like indexing and subsetting.	02
4	Programs on Matrix arithmetic operations	02
5	Programs on Finding Inverse of matrix	03
6	Programs on exporting and importing .csv and excel files	02
7	Programs on handling data frames	02
8	Programs on Basic Statistical operations	02
9	Programs to create basic plots using the `ggplot2` package	03
10	Programs to customize plots, including adding titles, labels, and legends.	03
11	Programs on visualizing distributions using histograms, box plots, and density plots	03
12	Programs to visualize relationships between variables using scatter plots and bar charts	03

Note: Record book will consist of at least 80% practical's/examples. Practical's/examples may vary college to college and for internal assessment 10 marks for record books and for 10 marks conduct two internal practical examination and take the average of it.

Assessment Scheme for Major/Minor/GE (Theory)

Course Code (1)	Course Name (2)	Theory				Practical		Total Col (5+6)] (10)
		CA			ESA (6)	CA (7)	ESA (8)	
		Test I (3)	Test II (4)	Avg (T1+T2)/2 (5)				
Major(Theory)/Minor /OE/GE	Major(Theory)/Minor /OE/GE	10	10	10	40	--	--	50

Assessment Scheme for VSC/Practical(based on DSC/DSM)

Course Name (1)	Theory				Practical		Total Col (6+7)] (8)
	CA			ESA (5)	CA (6)	ESA (7)	
	Test I (2)	Test II (3)	Avg (T1+T2)/2 (4)				
Major/Minor Practical/VSC	--	--	--	--	20	30	50

Guidelines for Course Assessment:

A. Continuous Assessment (CA) (20% of the Maximum Marks):

This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his **CA** score (col 6).

B. End Semester Assessment (80% of the Maximum Marks):

(For illustration we have considered a paper of 02 credits, 50 marks and need to be modified depending upon credits of an individual paper)

1. **ESA Question paper will consists of 6 questions, each of 10 marks.**
2. **Students are required to solve a total of 4 Questions.**
3. **Question No.1 will be compulsory and shall be based on entire syllabus.**
4. Students need to solve **ANY THREE** of the remaining Five Questions (Q.2 to Q.6) and shall be based on entire syllabus.

C. Assessment of Co-Curricular courses (CC):

a. Continuous Assessment (CA) of the CC course shall be done by the respective course coordinator depending on the regularity, performance of a student and his participation in the international, national, state, university, college level events or camps, wherever applicable.

b. End Semester Assessment (ESA) shall be done based on the write-up and presentation by the student on the activities that he has carried out throughout the semester.

c. Students have freedom to take more than one CC courses, however, score of the best performing CES shall be considered for final assessment.

d. Syllabi, Teaching Scheme and Examination Scheme for the courses in Column 7 and Column 8 (AEC, VEC, IKS, CI, EVS, CCs, etc.) shall be common for all the students from different faculties.

Note: Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.

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