



Re-Accredited B++ 2.86 CGPA by NAAC

**VEER NARMAD SOUTH GUJARAT UNIVERSITY**

University Campus, Udhna-Magdalla Road, SURAT - 395 007. Gujarat, India.

**વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી**

યુનિવર્સિટી કેમ્પસ, ઉદ્ધના-મગદલા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

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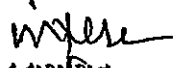
## **-:પરિપત્ર:-**

યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ અને યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, NEP-2020 અંતર્ગત શૈક્ષણિક વર્ષ ૨૦૨૬-૨૭ થી અમલમાં આવનાર B.Sc. Mathematics Sem.-7 & 8 Honours (with OJT / without OJT) અને Honours with Research નો અભ્યાસક્રમ ગણિતશાસ્ત્ર વિષયની અભ્યાસ સમિતિ ના ચેરમેનશ્રીએ અભ્યાસ સમિતિવતી મંજૂર કરી વિજ્ઞાન વિદ્યાશાખાને કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાની તા.૦૪/૦૬/૨૦૨૬ ની સભાના ઠરાવ ક્રમાંક:૩૬ થી મંજૂર કરવા એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૧૮/૦૬/૨૦૨૬ ની સભાના ઠરાવ ક્રમાંક:૨૪ થી મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

(બિડાણ:ઉપર મુજબ)

ક્રમાંક:ઓથો./પરિપત્ર/૧૩૬૫૩/૨૦૨૬

તા.૧૮/૦૬/૨૦૨૬

  
કુલસચિવ

પ્રતિ,

(૧) યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ.

(૨) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.

... આપશ્રીના વિભાગ/કોલેજના સંબંધિત શિક્ષકો/વિદ્યાર્થીઓને જાણ કરી અમલ કરવા સારું.

(૩) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.

(૪) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારું.

## Structure of Program (Semester – 7<sup>th</sup>) – HONS. With OJT/RP

Course Category	Course Code	Course Title	Mark sheet Title in English	Level of Course	Teaching Hours/Week		Exam Duration		Credit		Internal Marks		External Marks		Total Marks	
					TH	PR	TH	PR	TH	PR	TH	PR	TH	PR	TH	PR
					MAJOR	MH-MJ-701	Ring Theory	Ring Theory	400-499	2	-	1	-	2	-	25
MHP-MJ-701	Practical based on Ring Theory	Practical based on Ring Theory	400-499	-		4	-	2	-	2	-	25	-	25	-	50
MH-MJ-702	Linear Algebra	Linear Algebra	400-499	2		-	1	-	2	-	25	-	25	-	50	-
MHP-MJ-702	Practical based on Linear Algebra	Practical based on Linear Algebra	400-499	-		4	-	2	-	2	-	25	-	25	-	50
MH-MJ-703	Metric Spaces	Metric Spaces	400-499	2		-	1	-	2	-	25	-	25	-	50	-
MHP-MJ-701	Practical based on Metric Spaces	Practical based on Metric Spaces	400-499	-		4	-	2	-	2	-	25	-	25	-	50
MH-MJ-704	Number Theory-II	Number Theory-II	400-499	4		-	2	-	4	-	50	-	50	-	100	-
RP/OJT	ZO – RP/OJT -701	Research Project/ On Job Training	Research Project/ On Job Training	400 – 499	12	-	----	----	06	-	75		75		150	

\*Research Methodology syllabus if permitted by VNSGU, SURAT will be offered to students of OJT/RP in place of Fundamentals of Cyber Security.

\*Research Methodology syllabus will be prepared by Adhoc Board of Research Methodology, VNSGU, SURAT.

\*Fundamentals of Cyber Security syllabus will be prepared by Computer Faculty of VNSGU, SURAT.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY,  
SURAT**



**Undergraduate Programme  
In  
Mathematics**

**[3 Years (Degree) & 4 Years (Honours)]  
With OJT/RP.**

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

### PROGRAM TITLE

<b>Name of Program</b>	<b>B. Sc. Mathematics</b>
<b>Program Abbreviation</b>	MH: Mathematics, MJ: Major, MHP: Mathematics Practical, ME: Minor Elective.
<b>Duration</b>	Four Year
<b>Eligibility Criteria</b>	As per university norms
<b>Pre-requisite</b>	B.Sc in Mathematics
<b>Medium of Instruction</b>	English / Gujarati
<b>Objective of Program</b>	The B.Sc. Mathematics program aims to provide students with a strong foundation in mathematical concepts, principles, and methods while developing analytical, logical, and problem solving skills. The program prepares students for higher education .research, and diverse professional careers by fostering critical thinking, computational competence, effective communication, ethical values, and a commitment to lifelong learning. It also enables students to apply mathematical knowledge to address real world problems in science, technology. Industry and society.
<b>Program Outcome (PO)</b>	<p><b>PO-01-<u>Scientific Knowledge &amp; Conceptual Understanding:</u></b> Develop a strong foundation in scientific principles, theories and concepts across disciplines, fostering interdisciplinary learning, advance knowledge and problem-solving abilities.</p> <p><b>PO-02-<u>Analytical &amp; Critical Thinking:</u></b> Apply critical thinking and analytical reasoning to evaluate scientific data, hypothesis and real-world problems, leading to evidence –based conclusions.</p> <p><b>PO-03-<u>Research &amp; Inquiry-based Learning:</u></b> Develop investigative skills through experimentation, data analysis and scientific inquiry to contribute to research and innovation.</p> <p><b>PO-04-<u>Laboratory &amp; Technical skills:</u></b> Gain hands –on experience with laboratory techniques, instrumentation and computational tools relevant to scientific research and industry applications.</p> <p><b>PO-05-<u>Digital &amp; Computational Literacy:</u></b> Utilize digital tools, computational techniques and emerging technologies such as AI, bioinformatics and statistical modeling to enhance scientific learning and problem solving.</p> <p><b>PO-06-<u>Environmental &amp; Societal Responsibility:</u></b> Understanding the role of science in addressing environmental, health and social challenges, promoting sustainability and ethical responsibility.</p>

	<p><b>PO-07-Effective Communication &amp; Collaboration:</b> Develop proficiency in scientific communication, both written and oral, for effective dissemination of knowledge while collaborating in multidisciplinary teams.</p> <p><b>PO-08-Innovation &amp; Entrepreneurship:</b> Foster an entrepreneurial mind-set by applying scientific knowledge for innovation, technology development, and industry –oriented applications. Develop sustainable solutions to address real – world challenges in research and environmental management.</p> <p><b>PO-09-Lifelong Learning &amp; Professional Growth:</b> Cultivate curiosity and adaptability for continuous learning, equipping students for higher education, research and professional careers.</p> <p><b>PO-10-Ethical Leadership &amp; Value-based education:</b> Develop leadership qualities, ethical values, and a sense of responsibility in applying science for societal progress, aligning with Indian knowledge system and global perspective.</p>								
<p><b>Program Specific Outcomes (PSO)</b></p>	<p><b>PSO1:</b> Develop and strengthen the fundamental core concepts that are required to solve complex problems</p> <p><b>PSO2:</b> Develop the skills that needs independent logical and analytical thinking, teamwork and leadership</p> <p><b>PSO3:</b> Nurture the students to investigate and development of a workable solution for a real world problem</p> <p><b>PSO4:</b> Develop students for self-learning and practicing challenging problem solution</p> <p><b>PSO5:</b> Train students to apply mathematical skills for new investigation.</p> <p><b>PSO6:</b> Train students to expand their knowledge of fields related to their current areas of professional specialization.</p> <p><b>PSO7:</b> Train students to take-up the real world challenges to develop workable solution to a domain specific problem.</p> <p><b>PSO8:</b> Inculcate the passion for continuous learning and doing research for making a successful professional career.</p>								
<p><b>Mapping between POs and PSOs</b></p> <p><b>Convention used:</b>  ✓✓✓ Strong correlation  ✓✓ Moderate correlation  ✓ Slight correlation</p>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
PO1	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
PO2	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
PO3	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
PO4	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
PO5	✓	✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓
PO6	✓	✓	✓	✓	✓	✓	✓	✓	✓
PO7	✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓	✓✓

	PO8	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
	PO9	✓	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	✓✓✓
	PO10	✓	✓✓✓	✓	✓	✓	✓	✓✓	✓✓

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	7								
<b>NCrF Credit Level</b>	6.0								
<b>Course Type</b>	Major								
<b>Course Subtype</b>	Nil								
<b>Subject Type</b>	Discipline Specific								
<b>Course Code</b>	MH-MJ-701								
<b>Course Level</b>	400-499								
<b>Course Title</b>	Ring Theory								
<b>Credit</b>	<b>Theory:</b>	2	<b>Practical:</b>	0	<b>Total:</b>	2			
<b>Effective From</b>	Academic Year: 2026-27								
<b>Course Outcomes</b>	<p>The course will enable students to understand:</p> <p><b>CO1</b> – Concepts of rings, integral domains, fields and Boolean rings  <b>CO2</b> – Ring homomorphisms and isomorphisms with examples  <b>CO3</b> – Ideals, principal ideals, maximal ideals and quotient rings  <b>CO4</b> – Divisibility and Euclidean rings  <b>CO5</b> – Concepts of GCD, units and associates in rings</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Unit - 1</b> Definition of a Ring, Examples of Ring, Integral Domain, Field, Boolean Ring, Ring Homomorphism and Isomorphism, Ideals &amp; Quotient rings, Maximal Ideal, Principal Ideal.</p> <p><b>Unit - 2</b> Euclidean rings, Divisibility in commutative ring, GCD of two elements in a ring, Units and Associates in rings, Prime element in a Euclidean Ring, Unique factorization theorem in a Euclidean ring (without proof), Ring of Gaussian integers, Fermat's Theorem.</p>								
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. I. N. Herstein: Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1983.</li> <li>2. I. H. Sheth: Abstract Algebra, Nirav Prakashan, Ahmedabad.</li> <li>3. N. S. Gopal Krishnan: University Algebra, Wiley Eastern Ltd.</li> <li>4. P. R. Bhattacharya, S. K. Jain and S. R. Nagpaul: Basic Abstract Algebra, Cambridge University Press, Indian Edition, 1997.</li> </ol>								

	5. Shantinayakan: Modern Algebra, S. Chand & Co.
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Theory): 25 Marks External Assessment (Theory): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	7								
<b>NCrF Credit Level</b>	6.0								
<b>Course Type</b>	Major								
<b>Course Subtype</b>	Nil								
<b>Subject Type</b>	Discipline Specific								
<b>Course Code</b>	MHP-MJ-7001								
<b>Course Level</b>	400-499								
<b>Course Title</b>	Practical Based on Ring Theory								
<b>Credit</b>	<b>Theory:</b>	<b>0</b>	<b>Practical:</b>	<b>2</b>	<b>Total:</b>	<b>2</b>			
<b>Effective From</b>	Academic Year: 2026-27								
<b>Course Outcomes</b>	<p>The course will enable students to understand:</p> <p><b>CO1</b> – Examples of rings and related structures</p> <p><b>CO2</b> – Properties of homomorphisms and isomorphisms</p> <p><b>CO3</b> – Problems related to ideals and quotient rings</p> <p><b>CO4</b> – Computations in Euclidean rings</p> <p><b>CO5</b> – GCD, units and associates in rings</p> <p><b>CO6</b> – Ring of Gaussian integers and Fermat's theorem</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Practical-1:</b> Practical based on examples of Ring, Integral Domain, Boolean Ring.</p> <p><b>Practical-2:</b> Practical based on Ring Homomorphism and Isomorphism.</p> <p><b>Practical-3:</b> Practical based on Ideals-I.</p> <p><b>Practical-4:</b> Practical based on Ideals-II.</p> <p><b>Practical-5:</b> Practical based on Euclidean rings.</p> <p><b>Practical-6:</b> Practical based on divisibility and GCD of two elements in a ring.</p> <p><b>Practical-7:</b> Practical based on Units and Associates in rings.</p> <p><b>Practical-8:</b> Practical based on ring of Gaussian integers, Fermat's Theorem</p>								
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. I. N. Herstein: Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1983.</li> <li>2. I. H. Sheth: Abstract Algebra, Nirav Prakashan, Ahmedabad.</li> <li>3. N. S. Gopal Krishnan: University Algebra, Wiley Eastern Ltd.</li> <li>4. P. R. Bhattacharya, S. K. Jain and S. R. Nagpaul: Basic Abstract Algebra,</li> </ol>								

	Cambridge University Press, Indian Edition, 1997. 5. Shantinarayan: Modern Algebra, S. Chand & Co.
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Practical): 25 Marks External Assessment (Practical): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	7								
<b>NCrF Credit Level</b>	6.0								
<b>Course Type</b>	Major								
<b>Course Subtype</b>	Nil								
<b>Subject Type</b>	Discipline Specific								
<b>Course Code</b>	MH-MJ-702								
<b>Course Level</b>	400-499								
<b>Course Title</b>	Linear Algebra								
<b>Credit</b>	<b>Theory:</b>	2	<b>Practical:</b>	0	<b>Total:</b>	2			
<b>Effective From</b>	Academic Year: 2026-27								
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p><b>CO1</b> – Understand basis and dimension of vector spaces</p> <p><b>CO2</b> – Explain linear transformations and their properties</p> <p><b>CO3</b> – Describe kernel, range and Rank-Nullity Theorem</p> <p><b>CO4</b> – Interpret matrix representation of linear transformations</p> <p><b>CO5</b> – Understand inner product spaces, norm and orthogonality</p> <p><b>CO6</b> – Explain Gram-Schmidt process and orthonormal sets</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Unit - 1</b> Dimension and Basis of a vector space, Extension of a linearly independent set to a basis, Dimension of sum, Linear transformation, Range and kernel of a linear transformation, Rank-Nullity Theorem, Inverse of a linear transformation, Consequences of Rank-Nullity Theorem, Composition of linear transformations.</p> <p><b>Unit – 2</b> Matrix associated with Linear transformations, Linear transformation associated with a matrix, Application of Rank-Nullity Theorem for matrix, Inner product spaces, Norm of a vector, Cauchy-Schwarz's inequality, Triangular inequality, Orthogonal vectors, Vector Projection, Gram-Schmidt Orthogonalization Process, Orthonormal Set.</p>								

<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. V. Krishnamurthy, V. P. Mainra &amp; J. L. Arora: An Introduction to Linear Algebra, Affiliated East-West Press Pvt. Ltd., New Delhi.</li> <li>2. I. H. Sheth: Linear Algebra, Nirav Prakashan.</li> <li>3. S. Kumaresan: Linear Algebra, Prentice Hall of India, 2000.</li> <li>4. Serge Lang: Linear Algebra, Addison-Wesley Pub. Co. (Student Ed.).</li> <li>5. Balakrishnan: Linear Algebra, Tata-McGraw Hill Ed.</li> </ol>
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Theory): 25 Marks External Assessment (Theory): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	7								
<b>NCrF Credit Level</b>	6.0								
<b>Course Type</b>	Major								
<b>Course Subtype</b>	Nil								
<b>Subject Type</b>	Discipline Specific								
<b>Course Code</b>	MHP-MJ-7002								
<b>Course Level</b>	400-499								
<b>Course Title</b>	Practical Based on Linear Algebra								
<b>Credit</b>	<b>Theory:</b>	<b>0</b>	<b>Practical:</b>	<b>2</b>	<b>Total:</b>	<b>2</b>			
<b>Effective From</b>	Academic Year: 2026-27								
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p><b>CO1</b> – Determine basis and dimension of finite dimensional vector spaces through examples</p> <p><b>CO2</b> – Compute kernel and range of linear transformations using standard methods</p> <p><b>CO3</b> – Verify Rank-Nullity Theorem for given linear transformations</p> <p><b>CO4</b> – Construct and interpret matrix representation of linear transformations</p> <p><b>CO5</b> – Compute inner product, norm, orthogonality and vector projections</p> <p><b>CO6</b> – Apply Gram-Schmidt orthogonalization process to obtain orthonormal sets</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Practical-1:</b> Practical based on Dimension and Basis of a vector space.</p> <p><b>Practical-2:</b> Practical based on Linear transformation.</p> <p><b>Practical-3:</b> Practical based on Range and kernel of a linear transformation.</p> <p><b>Practical-4:</b> Practical based on Rank-Nullity Theorem.</p> <p><b>Practical-5:</b> Practical based on Matrix associated with Linear transformations.</p> <p><b>Practical-6:</b> Practical based on Linear transformation associated with a matrix.</p> <p><b>Practical-7:</b> Practical based on Inner product spaces.</p> <p><b>Practical-8:</b> Practical based on Gram-Schmidt Orthogonalization Process.</p>								
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>V. Krishnamurthy, V. P. Mainra &amp; J. L. Arora: An Introduction to Linear Algebra, Affiliated East-West Press Pvt. Ltd., New Delhi.</li> <li>I. H. Sheth: Linear Algebra, Nirav Prakashan.</li> </ol>								

	<ol style="list-style-type: none"><li>3. S. Kumaresan: Linear Algebra, Prentice Hall of India,2000.</li><li>4. Serge Lang: Linear Algebra, Addition-Wesley Pub. Co. (Student Ed.).</li><li>5. Balakrishnan: Linear Algebra, Tata-McGraw Hill Ed.</li></ol>
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Practical): 25 Marks External Assessment (Practical): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>																																																																						
<b>Semester</b>	7																																																																						
<b>NCrF Credit Level</b>	6.0																																																																						
<b>Course Type</b>	Major																																																																						
<b>Course Subtype</b>	Nil																																																																						
<b>Subject Type</b>	Discipline Specific																																																																						
<b>Course Code</b>	MH-MJ-703																																																																						
<b>Course Level</b>	400-499																																																																						
<b>Course Title</b>	Metric Spaces																																																																						
<b>Credit</b>	<b>Theory:</b>	2	<b>Practical:</b>	00	<b>Total:</b>	2																																																																	
<b>Effective From</b>	Academic Year: 2026-27																																																																						
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p><b>CO1</b> – Understand metric spaces and related concepts  <b>CO2</b> – Explain convergence and Cauchy sequences in metric spaces  <b>CO3</b> – Describe continuity of functions on metric spaces  <b>CO4</b> – Understand open sets and their properties  <b>CO5</b> – Describe closed sets, dense sets and homeomorphisms  <b>CO6</b> – Understand boundedness, completeness, compactness</p>																																																																						
<b>Mapping between COs and PSOs</b>	<table border="1"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> <th>PSO6</th> <th>PSO7</th> <th>PSO8</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO2</td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO3</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO4</td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO5</td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO6</td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> </tr> </tbody> </table>									PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	CO1									CO2									CO3									CO4									CO5									CO6								
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8																																																															
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CO4																																																																							
CO5																																																																							
CO6																																																																							
<b>Course Content</b>	<p><b>Unit - 1</b> Metric spaces, Limit, Convergence and Cauchy sequence in metric space, Equivalent metrics, Functions continuous on metric spaces, Open sets, More about open sets</p> <p><b>Unit – 2</b> Closed sets, Homeomorphism, Dense set, Connected sets, Bounded sets, Totally bounded sets, Complete metric spaces, Contraction mapping, Picard’s fixed-point theorem, Compact metric spaces.</p>																																																																						
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. R. R. Goldberg : Method of Real Analysis, Oxford &amp; IBH Pub. Co. Ltd., New Delhi.</li> <li>2. T. M. Apostol : Mathematical Analysis, Narosa Publishing House, New Delhi,1985.</li> <li>3. S. Lang : Undergraduate Analysis, Springer-Verlag, New York,1983.</li> </ol>																																																																						

	<p>4. S. C. Malik : Real Analysis, Wiley-Eastern Pub. Co., New Delhi.</p> <p>5. S. Kumaresan: Topology of Metric Spaces, Narosa Publishing House, New Delhi, 2014</p> <p>6. W. Rudin Principles of mathematical Analysis, McGraw Hill</p>
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Theory): 25 Marks External Assessment (Theory): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	7								
<b>NCrF Credit Level</b>	6.0								
<b>Course Type</b>	Major								
<b>Course Subtype</b>	Nil								
<b>Subject Type</b>	Discipline Specific								
<b>Course Code</b>	MHP-MJ-7003								
<b>Course Level</b>	400-499								
<b>Course Title</b>	Practical Based on Metric Spaces								
<b>Credit</b>	<b>Theory:</b>	0	<b>Practical:</b>	2	<b>Total:</b>	2			
<b>Effective From</b>	Academic Year: 2026-27								
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p><b>CO1</b> – Solve problems on sequences, limits and Cauchy sequences in metric spaces</p> <p><b>CO2</b> – Verify properties of open sets in metric spaces</p> <p><b>CO3</b> – Solve problems related to closed sets and dense sets</p> <p><b>CO4</b> – Work with equivalent metrics through examples</p> <p><b>CO5</b> – Solve problems on completeness of metric spaces</p> <p><b>CO6</b> – Analyze compactness and connectedness through examples</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Practical-1:</b> Revision of Limit and Continuity of a function on the real line.</p> <p><b>Practical-2:</b> Practical based on Metric spaces.</p> <p><b>Practical-3:</b> Practical based on limit and sequences in metric spaces, equivalent metrics.</p> <p><b>Practical-4:</b> Practical based on open sets in metric spaces.</p> <p><b>Practical-5:</b> Practical based on closed sets in metric spaces.</p> <p><b>Practical-6:</b> Practical based on connectedness and bounded sets in metric spaces.</p> <p><b>Practical-7:</b> Practical based on complete metric spaces.</p> <p><b>Practical-8:</b> Practical based on compact metric spaces.</p>								

<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. R. R. Goldberg : Method of Real Analysis, Oxford &amp; IBH Pub. Co. Ltd., New Delhi.</li> <li>2. T. M. Apostol : Mathematical Analysis, Narosa Publishing House, New Delhi,1985.</li> <li>3. S. Lang : Undergraduate Analysis, Springer-Verlag, New York,1983.</li> <li>4. S. C. Malik : Real Analysis, Wiley-Eastern Pub. Co., New Delhi.</li> <li>5. S. Kumaresan: Topology of Metric Spaces, Narosa Publishing House, New Delhi, 2014</li> <li>6. W. Rudin Principles of mathematical Analysis, McGraw Hill</li> </ol>
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Practical): 25 Marks External Assessment (Practical): 25 Marks

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>																																																													
<b>Semester</b>	7																																																													
<b>NCrF Credit Level</b>	6.0																																																													
<b>Course Type</b>	Major																																																													
<b>Course Subtype</b>	Nil																																																													
<b>Subject Type</b>	Discipline Specific																																																													
<b>Course Code</b>	MH-MJ-704																																																													
<b>Course Level</b>	400-499																																																													
<b>Course Title</b>	Number Theory-II																																																													
<b>Credit</b>	<b>Theory:</b>	4	<b>Practical:</b>	-	<b>Total:</b>	4																																																								
<b>Effective From</b>	<b>Academic Year: 2026-27</b>																																																													
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p><b>CO1</b> – Compute solutions for individual linear congruences and systems of simultaneous congruences using the Chinese Remainder Theorem.</p> <p><b>CO2</b> –Analyze the properties of prime numbers and congruences by applying Fermat’s Little Theorem and Wilson’s Theorem.</p> <p><b>CO3</b> –Identify and explain the characteristics of pseudo-primes, distinguishing them from true prime numbers within modular arithmetic.</p> <p><b>CO4</b> –Compute and evaluate arithmetic properties involving the number of positive divisors, the sum of positive divisors, and the greatest integer function of an integer.</p> <p><b>CO5</b> –Demonstrate the multiplicative nature of number-theoretic functions and utilize the Möbius Inversion formula to manipulate and solve arithmetic relations.</p> <p><b>CO6</b> –Establish the properties and multiplicative behavior of Euler’s Phi-function, and apply Euler’s Theorem to evaluate complex modular exponentiations.</p>																																																													
<b>Mapping between COs and PSOs</b>	<table border="1"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> <th>PSO6</th> <th>PSO7</th> <th>PSO8</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <td>CO2</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <td>CO3</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <td>CO4</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <td>CO5</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> </tr> </tbody> </table>									PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	CO1									CO2									CO3									CO4									CO5								
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CO3																																																														
CO4																																																														
CO5																																																														

	CO6
<b>Course Content</b>	<p><b>Unit - 1</b> Computation of the solutions of linear congruence, Chinese Remainder Theorem.</p> <p><b>Unit – 2</b> Fermat’s little theorem, Pseudo-primes, Wilson’s theorem.</p> <p><b>Unit – 3</b> The number of positive divisors and sum of all positive divisors of an integer, Basic properties and Multiplicative nature of these functions, The Möbius Inversion formula, Greatest integer function</p> <p><b>Unit – 4</b> Introduction of Euler’s Phi-function, Multiplicative nature, Euler’s Theorem.</p>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. David M. Burton : Elementary Number Theory, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 6th Ed., 2006.</li> <li>2. S. G. Telang : Number Theory, The Tata McGraw Hill Co. Ltd., New Delhi.</li> <li>3. I. Niven, S. Zuckerman &amp; L. Montgomery: An Introduction to Theory of Numbers, John Wiley, 1991.</li> <li>4. George Andrews : Number Theory, The Hindustan Pub. Corporation, New Delhi.</li> </ol>
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment: 50 Marks External Assessment: 50 Marks

## Structure of Program (Semester – 8<sup>th</sup>) – HONS.

Course Category	Course Code	Course Title	Mark sheet Title in English	Level of Course	Teaching Hours/Week		Exam Duration		Credit		Internal Marks		External Marks		Total Marks	
					TH	PR	TH	PR	TH	PR	TH	PR	TH	PR	TH	PR
					MAJOR	MH-MJ-801	Advanced Topics in Algebra	Advanced Topics in Algebra	400-499	2	-	1	-	2	-	25
MHP-MJ-801	Practical based on Advanced Topics in Algebra	Practical based on Advanced Topics in Algebra	400-499	-		4	-	2	-	2	-	25	-	25	-	50
MH-MJ-802	Introductory Complex Analysis	Introductory Complex Analysis	400-499	2		-	1	-	2	-	25	-	25	-	50	-
MHP-MJ-802	Practical based on Introductory Complex Analysis	Practical based on Introductory Complex Analysis	400-499	-		4	-	2	-	2	-	25	-	25	-	50
MH-MJ-803	Real Analysis-III	Real Analysis-III	400-499	2		-	1	-	2	-	25	-	25	-	50	-
MHP-MJ-803	Practical based on Real Analysis-III	Practical based on Real Analysis-III	400-499	-		4	-	2	-	2	-	25	-	25	-	50
MH-MJ-804	Discrete Mathematics	Discrete Mathematics	400-499	4		-	2	-	4	-	50	-	50	-	100	-

**VEER NARMAD SOUTH GUJARAT UNIVERSITY,  
SURAT**



**Undergraduate Programme  
In  
Mathematics**

[3 Years (Degree) & 4 Years (Honours)]

# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## PROGRAM TITLE

<b>Name of Program</b>	<b>B. Sc. Mathematics</b>
<b>Program Abbreviation</b>	MH: Mathematics, MJ: Major, MHP: Mathematics Practical, ME: Minor Elective.
<b>Duration</b>	Four Year
<b>Eligibility Criteria</b>	As per university norms
<b>Pre-requisite</b>	B.Sc in Mathematics
<b>Medium of Instruction</b>	English / Gujarati
<b>Objective of Program</b>	The B.Sc. Mathematics program aims to provide students with a strong foundation in mathematical concepts, principles, and methods while developing analytical, logical, and problem solving skills. The program prepares students for higher education .research, and diverse professional careers by fostering critical thinking, computational competence, effective communication, ethical values, and a commitment to lifelong learning. It also enables students to apply mathematical knowledge to address real world problems in science, technology, Industry and society.
<b>Program Outcome (PO)</b>	<p><b><u>PO-01-Scientific Knowledge &amp; Conceptual Understanding:</u></b> Develop a strong foundation in scientific principles, theories and concepts across disciplines, fostering interdisciplinary learning, advance knowledge and problem-solving abilities.</p> <p><b><u>PO-02-Analytical &amp; Critical Thinking:</u></b> Apply critical thinking and analytical reasoning to evaluate scientific data, hypothesis and real-world problems, leading to evidence –based conclusions.</p> <p><b><u>PO-03-Research &amp; Inquiry-based Learning:</u></b> Develop investigative skills through experimentation, data analysis and scientific inquiry to contribute to research and innovation.</p> <p><b><u>PO-04-Laboratory &amp; Technical skills:</u></b> Gain hands –on experience with laboratory techniques, instrumentation and computational tools relevant to scientific research and industry applications.</p> <p><b><u>PO-05-Digital &amp; Computational Literacy:</u></b> Utilize digital tools, computational techniques and emerging technologies such as AI, bioinformatics and statistical modeling to enhance scientific learning and problem solving.</p> <p><b><u>PO-06-Environmental &amp; Societal Responsibility:</u></b> Understanding the role of science in addressing environmental, health and social challenges, promoting sustainability and ethical responsibility.</p> <p><b><u>PO-07-Effective Communication &amp; Collaboration:</u></b></p>

	<p>Develop proficiency in scientific communication, both written and oral, for effective dissemination of knowledge while collaborating in multidisciplinary teams.</p> <p><b>PO-08-Innovation &amp; Entrepreneurship:</b> Foster an entrepreneurial mind-set by applying scientific knowledge for innovation, technology development, and industry –oriented applications. Develop sustainable solutions to address real – world challenges in research and environmental management.</p> <p><b>PO-09-Lifelong Learning &amp; Professional Growth:</b> Cultivate curiosity and adaptability for continuous learning, equipping students for higher education, research and professional careers.</p> <p><b>PO-10-Ethical Leadership &amp; Value-based education:</b> Develop leadership qualities, ethical values, and a sense of responsibility in applying science for societal progress, aligning with Indian knowledge system and global perspective.</p>								
<p><b>Program Specific Outcomes (PSO)</b></p>	<p><b>PSO1:</b> Develop and strengthen the fundamental core concepts that are required to solve complex problems</p> <p><b>PSO2:</b> Develop the skills that needs independent logical and analytical thinking, teamwork and leadership</p> <p><b>PSO3:</b> Nurture the students to investigate and development of a workable solution for a real world problem</p> <p><b>PSO4:</b> Develop students for self-learning and practicing challenging problem solution</p> <p><b>PSO5:</b> Train students to apply mathematical skills for new investigation.</p> <p><b>PSO6:</b> Train students to expand their knowledge of fields related to their current areas of professional specialization.</p> <p><b>PSO7:</b> Train students to take-up the real world challenges to develop workable solution to a domain specific problem.</p> <p><b>PSO8:</b> Inculcate the passion for continuous learning and doing research for making a successful professional career.</p>								
<p><b>Mapping between POs and PSOs</b></p> <p><b>Convention used:</b>  ✓✓✓ Strong correlation  ✓✓ Moderate correlation  ✓ Slight correlation</p>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
PO1	✓✓ ✓	✓	✓	✓	✓	✓✓	✓✓ ✓	✓	✓
PO2	✓✓ ✓	✓✓ ✓	✓✓	✓✓	✓✓	✓✓ ✓	✓	✓✓	✓
PO3	✓✓	✓✓	✓✓ ✓	✓✓	✓✓	✓✓ ✓	✓✓	✓✓	✓✓✓
PO4	✓✓	✓	✓✓ ✓	✓✓	✓✓	✓✓	✓✓	✓	✓
PO5	✓	✓	✓✓	✓✓	✓✓	✓✓ ✓	✓✓	✓	✓
PO6	✓	✓	✓✓	✓	✓	✓	✓	✓✓	✓✓
PO7	✓	✓✓	✓✓ ✓	✓✓	✓✓	✓✓	✓	✓✓	✓✓
PO8	✓✓ ✓	✓✓ ✓	✓✓ ✓	✓✓ ✓	✓✓ ✓	✓✓ ✓	✓✓ ✓	✓✓ ✓	✓✓✓

	PO9	✓	✓✓	✓✓	✓✓ ✓	✓	✓✓	✓✓	✓✓✓
	PO10	✓	✓✓ ✓	✓	✓	✓	✓	✓✓	✓✓

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	<b>8</b>								
<b>NCrF Credit Level</b>	<b>6.0</b>								
<b>Course Type</b>	<b>Major</b>								
<b>Course Subtype</b>	<b>Nil</b>								
<b>Subject Type</b>	<b>Discipline Specific</b>								
<b>Course Code</b>	<b>MH-MJ-801</b>								
<b>Course Level</b>	<b>400-499</b>								
<b>Course Title</b>	<b>Advanced Topics in Algebra</b>								
<b>Credit</b>	<b>Theory:</b>	<b>2</b>	<b>Practical:</b>	<b>0</b>	<b>Total:</b>	<b>2</b>			
<b>Effective From</b>	<b>Academic Year: 2026-27</b>								
<b>Course Outcomes</b>	<p>The course will enable students to understand:</p> <p><b>CO1</b> – Class equation and Cauchy theorem  <b>CO2</b> – Sylow theorems  <b>CO3</b> – Structure of finite abelian groups  <b>CO4</b> – Polynomial rings and Eisenstein criterion  <b>CO5</b> – Field extensions and degree of extensions  <b>CO6</b> – Splitting fields and Galois groups</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Unit - 1</b> Class equations, Cauchy theorem, Sylow's theorem, Fundamental theorem of abelian groups, Polynomial rings, Eisenstein Criterion for irreducibility of polynomials</p> <p><b>Unit – 2</b> Field extensions, degree of extension field, Splitting field, Galois group.</p>								
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. I. N. Herstein: Topics in Algebra 4thEd., John Wiley Sons.</li> <li>2. P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul: Basic Abstract Algebra, 2<sup>nd</sup> Ed., Cambridge University Press.</li> <li>3. M. Artin: Algebra, Prentice Hall, Englewood, Cliffs NJ.</li> <li>4. J. A. Gallian: Contemporary Abstract Algebra, Narosa Publishing House.</li> </ol>								
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.								

**Evaluation Method**

Internal Assessment (Theory): 25 Marks  
External Assessment (Theory): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	<b>8</b>								
<b>NCrF Credit Level</b>	<b>6.0</b>								
<b>Course Type</b>	<b>Major</b>								
<b>Course Subtype</b>	<b>Nil</b>								
<b>Subject Type</b>	<b>Discipline Specific</b>								
<b>Course Code</b>	<b>MHP-MJ-8001</b>								
<b>Course Level</b>	<b>400-499</b>								
<b>Course Title</b>	<b>Practical Based on Advanced Topics in Algebra</b>								
<b>Credit</b>	<b>Theory:</b>	<b>0</b>	<b>Practical:</b>	<b>2</b>	<b>Total:</b>	<b>2</b>			
<b>Effective From</b>	<b>Academic Year: 2026-27</b>								
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p>CO1 – Apply class equation and Cauchy theorem in problems</p> <p>CO2 – Solve problems based on Sylow theorems</p> <p>CO3 – Determine structure of finite abelian groups</p> <p>CO4 – Apply Eisenstein criterion to check irreducibility of polynomials</p> <p>CO5 – Work with field extensions and compute their degrees</p> <p>CO6 – Determine splitting fields and construct Galois groups</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Practical-1:</b> Practical based on Conjugate classes and Class equation</p> <p><b>Practical-2:</b> Practical based on Sylow's theorem</p> <p><b>Practical-3:</b> Practical based on finite abelian groups and irreducibility of polynomials</p> <p><b>Practical-4:</b> Practical based on extension field - 1</p> <p><b>Practical-5:</b> Practical based on extension field - 2</p> <p><b>Practical-6:</b> Practical based on splitting field</p> <p><b>Practical-7:</b> Practical based on normal extension of a field</p> <p><b>Practical-8:</b> Construction of Galois Group</p>								
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>I. N. Herstein: Topics in Algebra 4thEd., John Wiley Sons.</li> <li>P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul: Basic Abstract Algebra, 2<sup>nd</sup> Ed., Cambridge University Press.</li> </ol>								

	3. M. Artin: Algebra, Prentice Hall, Englewood, Cliffs NJ. 4. J. A. Gallian: Contemporary Abstract Algebra, Narosa Publishing House.
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Practical): 25 Marks External Assessment (Practical): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	<b>8</b>								
<b>NCrF Credit Level</b>	<b>6.0</b>								
<b>Course Type</b>	<b>Major</b>								
<b>Course Subtype</b>	<b>Nil</b>								
<b>Subject Type</b>	<b>Discipline Specific</b>								
<b>Course Code</b>	<b>MH-MJ-802</b>								
<b>Course Level</b>	<b>400-499</b>								
<b>Course Title</b>	<b>Introductory Complex Analysis</b>								
<b>Credit</b>	<b>Theory:</b>	<b>2</b>	<b>Practical:</b>	<b>0</b>	<b>Total:</b>	<b>2</b>			
<b>Effective From</b>	<b>Academic Year: 2026-27</b>								
<b>Course Outcomes</b>	<p>The course will enable students to understand:</p> <p><b>CO1</b> – Complex numbers in polar and exponential forms, powers and roots  <b>CO2</b> – Limits, continuity and differentiability of complex functions  <b>CO3</b> – Cauchy-Riemann equations and analytic functions  <b>CO4</b> – Harmonic and elementary functions  <b>CO5</b> – Contour integrals and ML-inequality  <b>CO6</b> – Cauchy-Goursat theorem and Cauchy integral formula</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Unit - 1</b> Complex Numbers, Polar and Exponential forms, Powers and Roots, Functions of a Complex variable, Limits, Continuity, Differentiability, Cauchy-Riemann Equations, Analytic functions, Harmonic functions.</p> <p><b>Unit – 2</b> Elementary functions: Exponential, Trigonometric, Hyperbolic, Complex Integration, Contour Integral, ML-inequality, Cauchy-Goursat theorem, Extension of Cauchy-Goursat Theorem, Winding Number, Cauchy Integral formula.</p>								
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>H. S. Kasana: Complex Variables – Theory and Applications, 2<sup>nd</sup> Edition (2006), PHI, N. Delhi.</li> <li>Brown and Churchill: Complex Variables and Applications, McGraw Hill, 2009.</li> <li>S. Ponnuswamy: Foundation of Complex Analysis, Narosa Publishing House, 1997.</li> <li>S. Lang: Complex Analysis, Addison Wesley, 1997.</li> <li>J. B. Conway: Functions of one Complex Variable, Springer-Verlag, 1980</li> </ol>								

<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Theory): 25 Marks External Assessment (Theory): 25 Marks

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	<b>8</b>								
<b>NCrF Credit Level</b>	<b>6.0</b>								
<b>Course Type</b>	<b>Major</b>								
<b>Course Subtype</b>	<b>Nil</b>								
<b>Subject Type</b>	<b>Discipline Specific</b>								
<b>Course Code</b>	<b>MHP-MJ-8002</b>								
<b>Course Level</b>	<b>400-499</b>								
<b>Course Title</b>	<b>Practical Based on Introductory Complex Analysis</b>								
<b>Credit</b>	<b>Theory:</b>	<b>0</b>	<b>Practical:</b>	<b>2</b>	<b>Total:</b>	<b>2</b>			
<b>Effective From</b>	<b>Academic Year: 2026-27</b>								
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p>CO1 – Compute properties of complex numbers in polar and exponential forms</p> <p>CO2 – Compute powers and roots of complex numbers</p> <p>CO3 – Solve problems on limits, continuity and differentiability of complex functions</p> <p>CO4 – Verify Cauchy-Riemann equations and identify analytic functions</p> <p>CO5 – Solve problems on harmonic and elementary functions</p> <p>CO6 – Evaluate complex integrals and contour integrals</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								
<b>Course Content</b>	<p><b>Practical-1:</b> Practical based on properties of complex numbers, polar and exponential forms.</p> <p><b>Practical-2:</b> Practical based on powers and roots of complex numbers.</p> <p><b>Practical-3:</b> Practical based on limits, continuity, differentiability of functions of complex variable.</p> <p><b>Practical-4:</b> Practical based on Cauchy-Riemann Equations, Analytic functions.</p> <p><b>Practical-5:</b> Practical based on Harmonic functions.</p> <p><b>Practical-6:</b> Practical based on Elementary functions.</p> <p><b>Practical-7:</b> Practical based on Complex Integration-I.</p> <p><b>Practical-8:</b> Practical based on Complex Integration-II.</p>								
<b>Reference Books</b>	1. H. S. Kasana: Complex Variables – Theory and Applications, 2 <sup>nd</sup> Edition (2006),								

	<p>PHI, N. Delhi.</p> <ol style="list-style-type: none"> <li>2. Brown and Churchill: Complex Variables and Applications, McGraw Hill, 2009.</li> <li>3. S. Ponnuswamy: Foundation of Complex Analysis, Narosa Publishing House, 1997.</li> <li>4. S. Lang: Complex Analysis, Addison Wesley, 1997.</li> <li>5. J. B. Conway: Functions of one Complex Variable, Springer-Verlag, 1980</li> </ol>
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	<p>Internal Assessment (Practical): 25 Marks</p> <p>External Assessment (Practical): 25 Marks</p>

## VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## SYLLABUS

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<b>Course Type</b>	<b>Major</b>																																																																					
<b>Course Subtype</b>	<b>Nil</b>																																																																					
<b>Subject Type</b>	<b>Discipline Specific</b>																																																																					
<b>Course Code</b>	<b>MH-MJ-803</b>																																																																					
<b>Course Level</b>	<b>400-499</b>																																																																					
<b>Course Title</b>	<b>Real Analysis-III</b>																																																																					
<b>Credit</b>	<b>Theory:</b>	<b>2</b>	<b>Practical:</b>	<b>0</b>	<b>Total:</b>	<b>2</b>																																																																
<b>Effective From</b>	<b>Academic Year: 2026-27</b>																																																																					
<b>Course Outcomes</b>	<p>The course will enable students to understand:</p> <p><b>CO1</b> – Summability of sequences and series</p> <p><b>CO2</b> – Pointwise convergence of sequences of functions</p> <p><b>CO3</b> – Uniform convergence of sequences of functions</p> <p><b>CO4</b> – Sets of measure zero</p> <p><b>CO5</b> – Properties of Riemann integral</p> <p><b>CO6</b> – Fundamental and mean value theorems of integral calculus</p>																																																																					
<b>Mapping between COs and PSOs</b>	<table border="1"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> <th>PSO6</th> <th>PSO7</th> <th>PSO8</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO2</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO3</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO4</td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> </tr> <tr> <td>CO5</td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> </tr> <tr> <td>CO6</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> </tr> </tbody> </table>								PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	CO1									CO2									CO3									CO4									CO5									CO6								
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<b>Course Content</b>	<p><b>Unit - 1</b> Summability of sequences, Addition and subtraction of <math>(C, 1)</math> summable sequences, <math>(C, 2)</math> summable sequences, <math>(C, 1)</math> Summability of series. Sequences of functions, Pointwise convergence of Sequences of functions, Uniform convergence of Sequences of functions.</p> <p><b>Unit - 2</b> Sets of measure zero, Definition of the Riemann Integral, Algebraic properties of Riemann Integral, Non-Algebraic properties of Riemann Integral, Fundamental theorems of Integral Calculus, Mean-value Theorems of Integral Calculus.</p>																																																																					
<b>Reference Books</b>	1. R. R. Goldberg: Method of Real Analysis, Oxford & IBH Pub. Co. Ltd., New Delhi.																																																																					

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<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Theory): 25 Marks External Assessment (Theory): 25 Marks

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>																																																																						
<b>Semester</b>	<b>8</b>																																																																						
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<b>Subject Type</b>	<b>Discipline Specific</b>																																																																						
<b>Course Code</b>	<b>MHP-MJ-8003</b>																																																																						
<b>Course Level</b>	<b>400-499</b>																																																																						
<b>Course Title</b>	<b>Practical Based on Real Analysis-III</b>																																																																						
<b>Credit</b>	<b>Theory:</b>	<b>0</b>	<b>Practical:</b>	<b>2</b>	<b>Total:</b>	<b>2</b>																																																																	
<b>Effective From</b>	<b>Academic Year: 2026-27</b>																																																																						
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p>CO1 – Solve problems on summability of sequences and series</p> <p>CO2 – Analyze pointwise convergence of sequences of functions</p> <p>CO3 – Analyze uniform convergence of sequences of functions</p> <p>CO4 – Identify sets of measure zero through examples</p> <p>CO5 – Solve problems on Riemann integrable functions</p> <p>CO6 – Apply fundamental and mean value theorems of integral calculus</p>																																																																						
<b>Mapping between COs and PSOs</b>	<table border="1"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> <th>PSO6</th> <th>PSO7</th> <th>PSO8</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO2</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO3</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO4</td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO5</td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> </tr> <tr> <td>CO6</td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> </tbody> </table>									PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	CO1									CO2									CO3									CO4									CO5									CO6								
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CO6																																																																							
<b>Course Content</b>	<p><b>Practical-1:</b> Practical based on (C,1) summability of sequences</p> <p><b>Practical-2:</b> Practical based on (C,2) summability of sequences</p> <p><b>Practical-3:</b> Practical based on (C,1) summability of series</p> <p><b>Practical-4:</b> Practical based on pointwise convergence of sequences of functions</p> <p><b>Practical-5:</b> Practical based on uniform convergence of sequences of functions</p> <p><b>Practical-6:</b> Practical based on sets of measure zero</p> <p><b>Practical-7:</b> Practical based on Riemann integrable functions</p> <p><b>Practical-8:</b> Practical based on fundamental and mean value theorems of integral calculus</p>																																																																						

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<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment (Practical): 25 Marks External Assessment (Practical): 25 Marks

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SYLLABUS

<b>Program Name</b>	<b>Bachelor of Science (Mathematics)</b>								
<b>Semester</b>	<b>8</b>								
<b>NCrF Credit Level</b>	<b>6.0</b>								
<b>Course Type</b>	<b>Major</b>								
<b>Course Subtype</b>	<b>Nil</b>								
<b>Subject Type</b>	<b>Discipline Specific</b>								
<b>Course Code</b>	<b>MH-MJ-804</b>								
<b>Course Level</b>	<b>400-499</b>								
<b>Course Title</b>	<b>Discrete Mathematics</b>								
<b>Credit</b>	<b>Theory:</b>	<b>4</b>	<b>Practical:</b>	<b>0</b>	<b>Total:</b>			<b>4</b>	
<b>Effective From</b>	<b>Academic Year: 2026-27</b>								
<b>Course Outcomes</b>	<p>The course will enable students to:</p> <p><b>CO1</b> – Analyse binary relations to identify their fundamental properties and categorize them into equivalence relations or partial orders.</p> <p><b>CO2</b> – Determine bounds (bounds, GLB, LUB) of partially ordered sets and construct visual representations using Hasse diagrams.</p> <p><b>CO3</b> – Explain the structural properties of lattices as algebraic systems and differentiate between various types of lattices and lattice homomorphisms.</p> <p><b>CO4</b> – Formulate and manipulate Boolean expressions by treating Boolean algebra as a formal algebraic system.</p> <p><b>CO5</b> – Construct and convert Boolean expressions into their standard Sum of Products (SOP) and Product of Sums (POS) canonical forms.</p> <p><b>CO6</b> – Minimize complex Boolean functions using the Karnaugh Map method and the Quine-McCluskey algorithm to design optimized switching circuit diagrams using logic gates (AND, OR, NOT).</p>								
<b>Mapping between COs and PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								

<b>Course Content</b>	<p><b>Unit - 1</b> Binary relations, Properties of binary relations, Equivalence relation, Partial ordered relation, Partially ordered sets, Upper bounds, Lower bounds, GLB &amp; LUB of sets, Totally ordered sets, Well ordered sets, Hasse Diagram, Lattices and its properties.</p> <p><b>Unit – 2</b> Lattices as Algebraic Systems, Lattice Homomorphism, Different types of lattices.</p> <p><b>Unit – 3</b> Boolean Algebra as an algebraic system, Boolean expressions (forms), Sum of Products Canonical form and Product of Sums Canonical forms of Boolean expressions.</p> <p><b>Unit – 4</b> Representation and Minimization of Boolean functions by Karnaugh Map method and Quine- McCluskey Algorithm, AND, OR &amp; NOT gates, Reduction of switching circuit diagram.</p>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. J. P. Tremblay &amp; R. Manohar: Discrete mathematical Structures with Applications to Computer Science., McGraw Hill Book Co., 1999.</li> <li>2. B. Kolman, R. C. Busby &amp; S. Ross: Discrete Mathematical Structures, Prentice Hall of India Pvt. Ltd., 3rd ed., 2001.</li> <li>3. C. L. Liu &amp; D. P. Mohapatra: Elements of Discrete Mathematics, Tata McGraw Hill, 2008.</li> <li>1. T. Koshy: Discrete Mathematics with Applications, Academic Press, 2004.</li> </ol>
<b>Teaching Methodology</b>	Classwork, Discussions, Seminars and Assignment.
<b>Evaluation Method</b>	Internal Assessment: 50 Marks External Assessment: 50 Marks