



B.Sc. Under Graduate Semester wise Syllabus  
(w.e.f. session 2017-2018)

**Class: - B.Sc.**  
**Semester: - III Semester**  
**Subject: - Mathematics (BSM 301T)**

Name of the Paper	Theory (M.M.)	Minimum Passing Marks in Theory	C.C.E. (M.M.)	Minimum Passing Marks in C.C.E.	Practical MM	Minimum Passing Marks	Total
Real Analysis, Differential Equation, Abstract Algebra	125	42	25	8	---	---	150

**Note:** There will be three sections in the question paper. All questions from each section will be compulsory.

Section –A (20 marks.) will contain 10 objective type questions, two from each unit, with the weightage of 2 marks.

Section –B (35 marks.) will contain 5 short answer type questions (each having internal choice), one from each unit having 7 marks.

Section –C (70 marks.) will contain 5 long answer type questions (each having internal choice), one from each unit, having 14 marks.

There should be 12 teaching periods per week for Mathematics like other Science Subject  
(6 Period Theory + 6 Period Practical)



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**Paper: - Real Analysis, Differential Equation Abstract Algebra**

**Marks 85+15 CCE**

**UNIT-I**

Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences, Cauchy's convergence criterion, Series of non-negative terms, Comparison test, Cauchy's integral test, Ratio test, Raabe's test, logarithmic test, Leibnitz's theorem, Absolute and conditional convergence.

अनुक्रम की परिभाषा, अनुक्रमों की सीमाओं पर प्रमेय, परिबद्ध एवं एकदिष्ट अनुक्रम, कॉशी के अभिसरण का मापदंड, अत्र्यणात्मक पदों की श्रेणी, तुलना परीक्षण, कॉशी का समाकल परीक्षण, अनुपात परीक्षण, रॉबी का परीक्षण, लघुगणकीय परीक्षण, लिबनीज का प्रमेय, निरपेक्ष एवं सापेक्ष अभिसरण ।

**UNIT-II**

Series Solution of Differential Equations-Power series Method, Bessel' Equation ,Bessel's function and its properties, recurrence and generating relations, Legendre's Equation, Legendre's function and its properties, recurrence generating relations

अवकल समीकरणों की श्रेणी हल, घात-श्रेणी विधि, बेसल का समीकरण, बेसल का फलन एवं उसके गुणधर्म, पुनरागमन एवं जनक संबंध, लीजेन्डर का समीकरण, लीजेन्डर का फलन एवं उसके गुणधर्म, पुनरागमन एवं जनक संबंध

**UNIT-III**

Laplace transformations, Linearity of the Laplace transformation, Existence theorem of Laplace transforms, Laplace transforms of derivatives and integrals, Shifting theorem, Differentiation and integration of transforms, Inverse Laplace transforms, Convolution theorem, Applications of Laplace transformation in solving linear differential equations with constant coefficients. Properties of Laplace Transform i.e I & II shifting Theorem, Change of Change , Modulation.

लाप्लास रूपांतरण, लाप्लास रूपांतरणों की लांबिकता, लाप्लास रूपांतरणों का अस्तित्व प्रमेय, अवकलों एवं समाकलों के लाप्लास रूपांतरण, स्थानांतरण प्रमेय, रूपांतरणों का अवकलन एवं समाकलन, प्रतिलोम लाप्लास रूपांतरण, सवलन प्रमेय, अचर गुणांकों वाले रैखिक अवकल समीकरणों को हल करने में लाप्लास रूपांतरणों के अनुप्रयोग ।



#### UNIT-IV

Definition and basic properties of group, Order of an element of a group, Subgroups, Algebra of subgroups, Cyclic groups and their simple properties, Coset decomposition and related theorems, Lagrange's theorem and its consequences.

समूह की परिभाषा एवं मूलभूत गुणधर्म, समूह के अवयव की कोटि, उपसमूह, उपसमूहों का बीजगणित। चक्रीय समूह एवं उनके साधारण गुणधर्म, सह समुच्चय विभाजन एवं संबंधित प्रमेय, लेग्रांजे प्रमेय एवं उसके निगमन

#### UNIT-V

Normal sub group, Quotient groups, homomorphism and isomorphism of groups, Kernel of homomorphism of groups, fundamental theorem of homomorphism of groups, Permutation groups ( even and odd permutations), Alternating groups  $A_n$ , Cayley's theorem.

प्रसामान्य उपसमूह, विभाग समूह, समूहों की समकारिता एवं तुल्यकारिता, समकारिता की अष्टि, समूहों की समकारिता का मूलभूत प्रमेय, क्रमचय समूह (सम एवं विषम क्रमचय) एकांतर समूह  $A_n$  कैली का प्रमेय ।

#### Text Books :

1. R.R. Goldberg, Real Analysis, I.B.H. Publishing Co. New Delhi, 1970.
  2. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd. Allahabad.
  3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & sons, 1999.
  4. I. N. Herstein – Topics in Algebra, Wiley Eastern Ltd. New Delhi 1977.
  5. Sharma and Gupta-Integral Transform, Pragati Prakashan Meerut
- म.प्र हिन्दी ग्रंथ अकादमी की पुस्तकें

#### Reference Books:

1. T.M. Apostol Mathematical Analysis Narosa Publishing House New Delhi 1985.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co. New York.
3. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
4. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd. New Delhi.
5. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
6. I. S. Luther and I.B. S. Passi, Algebra Vol- I , II, Narosa Publishing House.



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**Class: - B.Sc.**  
**Semester: - IV Semester**  
**Subject: - Mathematics (BSM 401T)**

Name of the Paper	Theory (M.M.)	Minimum Passing Marks in Theory	C.C.E. (M.M.)	Minimum Passing Marks in C.C.E.	Practical MM	Minimum Passing Marks	Total
Abstract Algebra, Advanced Calculus, Partial Differential Equations, Complex Analysis	125	42	25	8	---	---	150

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**Subject: - Mathematics (BSM 401T)**

**Paper: - Abstract Algebra, Advanced Calculus Partial Differential Equations, Complex Analysis**

### UNIT-I

Group automorphisms, inner automorphism, Group of automorphisms, Conjugacy relation and centraliser, Normaliser, Counting principle and the class equation of a finite group, Cauchy's theorem for finite abelian groups and non-abelian groups.

समूह स्वकारिता (स्वसमरूपता), आंतर स्वकारिता, स्वकारिताओं का समूह, संयुग्मता संबंध एवं केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित समूह का वर्ग समीकरण। परिमित आबेली एवं अन-आबेली समूहों के लिये कौशी प्रमेय

### UNIT-II

Introduction to rings, subrings, integral domains and fields, simple properties and examples, ring homomorphism, ideals and quotient rings.

वलय, उपवलय, पूर्णांकिय प्रांत एवं क्षेत्र का परिचय सरल गुणधर्म एवं उदाहरण, वलय समाकारिता, गुणजावली एवं विभाग वलय ।

### UNIT-III

Maxima, Minima and saddle points of functions of two variables, Improper integrals and their convergence, Comparison test, Abel's and Dirichlet's tests, Beta and Gamma, Relation between  $\beta$  and  $\gamma$  function

दो चरों के फलनों का उच्चिष्ठ, निम्निष्ठ एवं सेडल बिन्दु, विषम समाकल एवं उनका अभिसरण तुलना परीक्षण, आबेल एवं डिरिकले का परीक्षण, बीटा एवं गामा फलन।

### UNIT-IV

Partial Differential equations of the first order, Lagrange's solution, Some special types of equations which can be solved easily by methods other than general methods, Charpit's general method of solution, Partial differential equations of second and higher orders, Homogeneous and non-Homogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficients.

प्रथम कोटि के आंशिक अवकल समीकरण, लेग्रांजे का हल, कुछ विशिष्ट प्रकार के समीकरण जिन्हें व्यापक विधि के अलावा सरल विधि से हल किया जा सके, हल के लिए चारपिट की यापक विधि, द्वितीय एवं उच्चतर कोटि के आंशिक अवकल समीकरण, अचर गुणांकों के समघातीय एवं असमघातीय समीकरण, आंशिक अवकल समीकरण जो अचर गुणांकों वाले समीकरणों में परिवर्तनीय है।



**UNIT-V**

Continuity and differentiability of Complex functions, Analytical function, Cauchy Riemann equation, Harmonic function, Mobius transformations, fixed points, cross Ratio, Harmonic Conjugate function, Cauchy Integral formula.

सम्मिश्र फलनों का सांतत्य एवं अवकलनीयता। वैश्लेषिक फलन, कौशी रीमान समीकरण, प्रसंवादी फलन, मोबियस रूपांतरण, स्थिर बिन्दु, तिर्यक अनुपात।

**Text Books:**

1. I.N. Sneddon, Elements of partial Differential equations Mc graw Hill, Co. 1988
2. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.
3. I.N. Herstein Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1977.
4. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co., New York
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3. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd., New Delhi.
4. N. Jacobson, Basis Algebra, Vols, I & II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company.)
5. Shanti Narayan, A Text Book of Modern Abstract Algebra, S. Chand & Co. New Delhi
6. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
7. I. S. Luther and I.B. S. Passi, Algebra Vol- I , II, Narosa Publishing House.
8. R. V. Churchill & J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hill New. York. 1990
9. Mark; J. Ablowitz & A. S. Fokas. Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998
10. Ponnuswamy : Complex Analysis, Narosa Publishing Co.