UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A$^+$ GRADE' UNIVERSITY)

Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

NOTIFICATION
(19/Aug./Adp/26)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the revised Syllabi and Courses of Study in the subject of **Applied Mathematics/Mathematics** for semesters I to III under the **Choice Based Credit System** at the Undergraduate level **(as given in the Annexure)** for the examinations to be held in the years indicated against each semester as under:-

Subject	Semester	For the examinations to be held in the year	%of Change
Applied Mathematics/Mathematics	Semester-I	Dec. 2019, 2020 and 2021	Less than 20%
	Semester-II	May 2020, 2021 and 2022	No Change
	Semester-III	Dec. 2020, 2021 and 2022	Less than 20%

The Syllabi of the courses is available on the University website: www.jammuuniversity.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F.Acd/II/19/5142~5191
Dated: 21-8-2019

Copy to:

1. Dean, Faculty of Mathematical Science
2. HOD/Convener, Board of Studies in Mathematics
3. All members of the Board of Studies
4. C.A. to the Controller of Examinations
5. Director, Computer Centre, University of Jammu
6. Asst. Registrar (Conf. /Exams. UG)
7. Incharge University Website for necessary action please

Assistant Registrar (Academic)

Semester-I

Title of the Course/ Course Number:- Differential Calculus/UMTTC101
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   **Credits: 06**
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2019, 2020 and 2021)

UNIT-I

Concept of Limit and Continuity of functions on **R** ($\in - \delta$ definition). Algebra of limits. Discontinuity and types of discontinuities. Successive differentiation ; Leibnitz Theorem. Indeterminate forms. Examples and exercises based on these topics.   (18 lectures)

UNIT-II

Functions of two and three variables . Continuity of functions in two real variables. Partial differentiation, Euler's theorem for homogeneous functions. Maxima and Minima of functions of two variables. Concavity of functions. Examples and exercises based on these topics.   (18 lectures)

UNIT-III

Asymptotes, Double points, Envelope, Curve Tracing in Cartesian Co-ordinates. Examples and exercises based on these topics. (18 lectures)

UNIT-IV

Polar Coordinates. Relation between Cartesian and Polar Coordinates. Angle between radius vector and tangent to the curve. Graphic Techniques in Polar forms such as $r = a \pm b \cos \theta$, $r = a \pm b \sin \theta$, $r = a \sin n\theta$, $r = a \cos n\theta$, n = 1, 2, 3 only). Examples and exercises based on these topics .   (18 lectures)

UNIT-V

Rolle's Theorem, The Mean Value Theorems, Taylor's Theorem with Lagrange's and Cauchy's form of remainder. Maclaurin's series of sin x, cos x, tan x, $\tan^{-1} x$, cot x, $\cot^{-1} x$, e^x, log(1+x), $(1+x)^m$. Examples and exercises based on these theorems.   (18 lectures)

Books Recommended:

- H. Anton, I. Birens and S. Davis, Calculus, 10th Ed., John Wiley and Sons, Inc.,2015.

- G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2018.

- Shanti Narayan, Dr. P.K. Mittal, Differential Calculus (Revised Edition),

S. Chand and Co. Pvt. Ltd New Delhi , 2010.

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Title of the Course/ Course Number:- Differential Calculus/UMTTC101
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   **Credits: 06**
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2019, 2020 and 2021)

Note:-

(1) The evaluation of a candidate shall be awarded and record thereof maintained in accordance with the regulations prescribed for the purpose under CBCS as per the following:

Theory	Syllabus to be covered in the examination	Time allotted	% Weightage(Marks)
Internal Assesment Test The question paper will consist of two parts: Part A: Total weightage of this part is 10 marks. It will contain 08 short answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any five and each question carries two marks. Part B: Total weightage of this part is 10 marks. It will contain 02 long answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any one question and it carries 10 marks.	Upto 50% (after 45 lectures)	1 hour	20%
External end semester university examination The question paper will contain 05 short answer type questions(without details explanation) of 03 marks each (No choice all compulsary), 05 short answer type questions (without details explanation) of 07 marks each (No choice all compulsary), 04 or 05 long answer type questions (with analysis/ explanation/ critical analysis/ evaluation) uniformly distributed in whole of the syllabus so as cover the maximum topics in the syllabus. A candidate has to attempt any two questions carrying 15 marks each.	Upto 100% (90 lectures)	2.5 hours	80%

(2) Each lecture will be of one hour duration.

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Semester -II

Title of the Course/ Course Number:- Differential Equations/UMTTC201
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   **Credits: 06**
External End Semester University Examination: 80 Marks
(For the Examinations to be held in May 2020, 2021 and 2022)

UNIT-I

Review of differential equations. Linear differental equations and Bernoulli equation. First order, higher degree differential equations solvable for x , y , p. Clairaut's equation. Exact and Non-Exact differential equations, Integrating factors and rules to find the integrating factor of a non-exact differential equation. Examples, problems and exercises based on these topics. (18 lectures)

UNIT-II

Basic Theory of linear differential equations. Wronskian and its properties. Solving a differential equation by reducing its order. Linear homogeneous differential equations with constant coefficients. Examples and exercises based on these topics. (18 lectures)

UNIT-III

Linear non-homogeneous differential equations . The method of variation of parameters and the Cauchy-Euler equation. Examples, problems and exercises based on these topics. (18 lectures)

UNIT-IV

Introduction to partial differential equations, order and degree of a partial differential equation. Formation of partial differential equations. Types of partial differential equations. Lagrange's method of solving linear partial differential equations of order one. Non-linear partial differential equations of degree one. Complete integral, Singular integral, General integral. Charpit's method and solutions of equations of the type $f(p, q) = 0$, $z = px+qy+f(p, q)$, $f(z, p, q) = 0$, $f(x, p) = g(y, q)$. Examples and exercises based on these topics. (18-Lectures)

UNIT-V

Homogeneous and Non-homogeneous linear partial differential equations of second and third order with constant coefficients of the type $F(D,D') = g(x, y)$, where $g(x, y) = 0$, e^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$, $f(ax+by)$, $x^m y^n$, $V e^{ax+by}$, when V is function of x and y and their sums. Homogeneous partial differential equations of the type $[(D + m_1D')(D + m_2D')(D + m_3D')]z = f(x, y)$. Examples and exercises based on these topics. (18-Lectures)

Title of the Course/ Course Number:- Differential Equations/UMTTC201
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   **Credits: 06**
External End Semester University Examination: 80 Marks
(For the Examinations to be held in May 2020, 2021 and 2022)

Books Recommended:

- Shepley L. Ross, Differential Equations, 3rd Edition, John Willy and Sons, 2007

- I. Sneddon, Elements of Partial Differential Equations, Dover Publications, 2006.

Reference Books:

- Dr. M. D. Raisinghania, Ordinary and Partial Differential Equations, S.

Chand and Co., New Delhi, 2017.

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Theory	Syllabus to be covered in the examination	Time allotted	% Weightage(Marks)
Internal Assesment Test The question paper will consist of two parts: Part A: Total weightage of this part is 10 marks. It will contain 08 short answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any five and each question carries two marks. Part B: Total weightage of this part is 10 marks. It will contain 02 long answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any one question and it carries 10 marks.	Upto 50% (after 45 lectures)	1 hour	20%
External end semester university examination The question paper will contain 05 short answer type questions(without details explanation) of 03 marks each (No choice all compulsary), 05 short answer type questions (without details explanation) of 07 marks each (No choice all compulsary), 04 or 05 long answer type questions (with analysis/ explanation/ critical analysis/ evaluation) uniformly distributed in whole of the syllabus so as cover the maximum topics in the syllabus. A candidate has to attempt any two questions carrying 15 marks each.	Upto 100% (90 lectures)	2.5 hours	80%

(2)Each lecture will be of one hour duration.

Semester III

Title of the Course/ Course Number:- Real Analysis/UMTTC301
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   Credits: 06
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

UNIT-I

Finite and infinite sets, countable and uncountable sets, their examples and results, absolute value, triangle inequality and its applications, bounded and unbounded sets, suprema and infima, axiomatic definition of real number system as a complete ordered field, least upper bound and greatest upper bound properties of reals, the field of rational numbers is not complete, characterization of suprema and infima of sets, Archimedean property, existence of rationals and irrationals between reals, concept of cluster points and statement of Bolzano-Weierstrass theorem.

UNIT-II

Real sequences and their boundedness, convergence and divergence, uniqueness of limit, algebra of limits, Cauchy convergence criterion, Cauchy's first and second theorem on limits, squeeze theorem, monotone convergence theorem, Nested-interval property of real numbers, exercises and problems based on these topics

UNIT-III

Infinite series and their convergence and divergence, Cauchy's general principle of convergence, criterion for convergence of a series of positive terms, geometric series, p-series, comparison tests, D'Alembert's ratio test, Cauchy's root test, Raabe's test Gauss's test (without proof), problems and exercises based on these topics.

UNIT-IV

Cauchy's condensation test and convergence of $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p}$, alternating series, absolute and conditional convergence Leibnitz's test, problems and exercises based on these topics. Some theorems on continuity and uniform continuity viz. every continuous function attains its bounds on closed and bounded interval, intermediate value theorem, continuity implies uniform continuity on closed intervals, relations between continuity and uniform continuity.

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Title of the Course/ Course Number:- Real Analysis/UMTTC301
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   Credits: 06
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

UNIT-V

Sequences and series of functions, pointwise and uniform convergence. Cauchy's criterion for uniform convergence of series of functions, Weierstrass's M-test, M_n-test, power series and radius of convergence. Problems and exercises based on these concepts.

Books Recommended:

- T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2007.

R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000.

- S. C. Malik and S. Arora, Mathematical Analysis, New Age international Publishers, 2010.

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Theory	Syllabus to be covered in the examination	Time allotted	% Weightage(Marks)
Internal Assesment Test The question paper will consist of two parts: Part A: Total weightage of this part is 10 marks. It will contain 08 short answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any five and each question carries two marks. Part B: Total weightage of this part is 10 marks. It will contain 02 long answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any one question and it carries 10 marks.	Upto 50% (after 45 lectures)	1 hour	20%
External end semester university examination The question paper will contain 05 short answer type questions(without details explanation) of 03 marks each (No choice all	Upto 100% (90 lectures)	2.5 hours	80%

Title of the Course/ Course Number:- Real Analysis/UMTTC301
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   Credits: 06
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

compulsary), 05 short answer type questions (without details explanation) of 07 marks each (No choice all compulsary), 04 long answer type questions (with analysis/ explanation/ critical analysis/ evaluation) uniformly distributed in whole of the syllabus so as cover the maximum topics in the syllabus. A candidate has to attempt any two questions carrying 15 marks each.			

(2) Each lecture will be of one hour duration.

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Semester-III

Title of the Course/ Course Number:- Logic and Sets/ UMTTS302
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   **Credits: 04**
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators. Propositional equivalence: Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

Sets, subsets, Set operations, the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.

Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections. Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation.

Books Recommended

- R.P. Grimaldi, Discrete Mathematics and Combinatorial Mathematics, Pearson Education, 5th Ed., 2006.
- P.R. Halmos, Naive Set Theory, Springer, 2019.
- E. Kamke, Theory of Sets, Dover Publishers, 2010

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Theory	Syllabus to be covered in the examination	Time allotted	% Weightage(Marks)
Internal Assesment Test The question paper will consist of two parts: Part A: Total weightage of this part is 10 marks. It will contain 08 short answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any	Upto 50% (after 45 lectures)	1 hour	20%

Title of the Course/ Course Number:- Logic and Sets/ UMTTS302
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   Credits: 04
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

five and each question carries two marks. Part B: Total weightage of this part is 10 marks. It will contain 02 long answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any one question and it carries 10 marks.			
External end semester university examination The question paper will contain 05 short answer type questions(without details explanation) of 03 marks each (No choice all compulsary), 05 short answer type questions (without details explanation) of 07 marks each (No choice all compulsary), 04 long answer type questions (with analysis/ explanation/ critical analysis/ evaluation) uniformly distributed in whole of the syllabus so as cover the maximum topics in the syllabus. A candidate has to attempt any two questions carrying 15 marks each.	Upto 100% (90 lectures)	2.5 hours	80%

(2) Each lecture will be of one hour duration.

Semester-III

Title of the Course/ Course Number:- Analytical Geometry / UMTTS303
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   Credits: 04
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola. Classification of quadratic equations representing lines, parabola, ellipse and hyperbola. Spheres, Cylindrical surfaces. Illustrations of graphing standard quadric surfaces like cone, ellipsoid.

Books Recommended

- G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2018.
- H. Anton, I. Bivens and S. Davis, Calculus, John Wiley and Sons (Asia) Pvt. Ltd., 2015.
- S.L. Loney, The Elements of Coordinate Geometry, McMillan and Company, London.
- R.J.T. Bill, Elementary Treatise on Coordinate Geometry of Three Dimensions, Wentworth Press, 2019.

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Title of the Course/ Course Number:- Analytical Geometry / UMTTS303
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   Credits: 04
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

External end semester university examination The question paper will contain 05 short answer type questions(without details explanation) of 03 marks each (No choice all compulsary), 05 short answer type questions (without details explanation) of 07 marks each (No choice all compulsary), 04 long answer type questions (with analysis/ explanation/ critical analysis/ evaluation) uniformly distributed in whole of the syllabus so as cover the maximum topics in the syllabus. A candidate has to attempt any two questions carrying 15 marks each.	Upto 100% (90 lectures)	2.5 hours	80%

(2) Each lecture will be of one hour duration.

Title of the Course/ Course Number:- Integral Calculus / UMTTS304
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   **Credits: 04**
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

Integration by Partial fractions, integration of rational and irrational functions. Properties of definite integrals. Reduction formulae for integrals of rational, trigonometric, exponential and logarithmic functions and of their combinations.

Areas and lengths of curves in the plane, volumes and surfaces of solids of revolution. Double and Triple integrals.

Books Recommended

- G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
- H. Anton, I. Bivens and S. Davis, Calculus, John Wiley and Sons (Asia) P. Ltd., 2002.

Note:-

(1) The evaluation of a candidate shall be awarded and record thereof maintained in accordance with the regulations prescribed for the purpose under CBCS as per the following:

Theory	Syllabus to be covered in the examination	Time allotted	% Weightage(Marks)
Internal Assesment Test The question paper will consist of two parts: Part A: Total weightage of this part is 10 marks. It will contain 08 short answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any five and each question carries two marks. Part B: Total weightage of	Upto 50% (after 45 lectures)	1 hour	20%

Title of the Course/ Course Number:- Integral Calculus / UMTTS304
Choice Based Credit System at Undergraduate level
Internal Assessment Test: 20 Marks   Credits: 04
External End Semester University Examination: 80 Marks
(For the Examinations to be held in Dec 2020, 2021 and 2022)

this part is 10 marks. It will contain 02 long answer type questions uniformly distributed in 50 % of the syllabus covered. A candidate has to attempt any one question and it carries 10 marks.			
External end semester university examination The question paper will contain 05 short answer type questions(without details explanation) of 03 marks each (No choice all compulsary), 05 short answer type questions (without details explanation) of 07 marks each (No choice all compulsary), 04 long answer type questions (with analysis/ explanation/ critical analysis/ evaluation) uniformly distributed in whole of the syllabus so as cover the maximum topics in the syllabus. A candidate has to attempt any two questions carrying 15 marks each.	Upto 100% (90 lectures)	2.5 hours	80%

(2) Each lecture will be of one hour duration.