Program: **Bachelor's Degree with Honours/Hons. with Research** Class: **UG**	Year: **Fourth**	Semester: **VIII**
Subject: **Mathematics**		
Course Code: **MJ-20**	Course Title: **Linear Algebra & Linear Difference equation**	

Course Learning Outcomes: This course will enable the students to:

a) understand concept of basis of vector spaces and construct orthonormal basis.
b) understand the concept of rank & nullity.
c) construct difference equations and find its general solutions.
d) find solution of linear difference equations and homogeneous difference equations.

Credit: **4 (Theory)**	**Compulsory**
Full Marks: **75**	Time: **3 Hours**

Unit	**Content**	**Hours**
I	Vector Space: Def. & properties, subspaces, linear dependence, dimension and basis of a finite dimensional vector space, Quotient space, Direct sums and complements matrices and change of basis. Inner product & norm in a I. S., properties of inner product, Schwartz inequality, orthogonal set, orthogonal basis and Gram-schmidt construction for finite dimensional inner product space.	15 h
II	Linear transformation: Def, Sylvester Law of nullity, algebra of linear transformations, Dual spaces, principal of duality. Matrices and linear transformation, similar matrices, even matrices, diagonalisation Eigen root (Algebraic geometric and multiplicity).	15 h
III	Difference Equation Order, Solution of Difference Equation, Existence & Uniquencess theorem, solution of the form. $y_{n+1} = Ay_n + C$	15 h
IV	Linear Difference Equation with constant coefficient: Basic Definition. Combination of solution, Fundamental set of solution, Homogeneous Difference Equation & their solution (General & Particular), Special operator, variation of parameters.	15 h

Sessional Internal Assessment (SIA) Full Marks 25 Marks

A Internal written Examination 20 Marks (1 Hr.)

B Over All Performance including Regularity 05 Marks

Books Recommended:

1. Modern Algebra: Surjeet Singh & Quazi Zameeruddin
2. Linear Difference Equation: R.K. Gupta & D.C. Agarwal.

Program: **Bachelor's Degree with Honours/Hons. with Research** Class: **UG**	Year: **Fourth**	Semester: **VIII**
Subject: **Mathematics**		
Course Code: **AMJ-1**	Course Title: **Topology**	

Course Learning Outcomes: This course will enable the students to:

a) learn about the concept of compactness in metric space.

b) define topological space its bases and different types spaces.

c) learn different types of compactness in topological spaces.

d) learn different types separation axioms in topological spaces and also the connectedness of topological spaces

Credit: **4 (Theory)**	**Compulsory**
Full Marks: **75**	Time: **3 Hours**

Unit	**Content**	**Hours**
I	Compactness in metric space, Ascoli's theorem. Topological spaces:	**15 h**
II	Definition, examples, base, sub-base, first axiom space, second axiom space, comparison of topologies.	**15 h**
III	Compactness: Compact space, Lindeloff space, product space, Tychonoff's theorem, locally compactness.	**15 h**
IV	Separation: T_1 – space, T_2 – space, normal & completely regular space, Uryshon's lemma, Tietze extension theorem, Uryshon's metrization theorem. Connectedness: connectedness & its properties.	**15 h**

Sessional Internal Assessment (SIA) Full Marks 25 Marks

A Internal written Examination 20 Marks (1 Hr.)

B Over All Performance including Regularity 05 Marks

Books Recommended:

1. Real Analysis: H. L. Royden, P. M. Fitzpatrick
2. Topology: J. N. Sharma, J. P. Chauhan
3. Advanced General Topology: K. K. Jha

Program: **Bachelor's Degree with Honours/Hons. with Research** Class: **UG**	Year: **Fourth**	Semester: **VIII**
Subject: **Mathematics**		
Course Code: **AMJ-2**	Course Title: **Complex Analysis II**	

Course Learning Outcomes: This course will enable the students to:

a) apply complex integration in solving problems.
b) learn about power series expansion and their convergence.
c) apply method of contour integration.
d) learn about conformal mapping.

Credit: **4 (Theory)**	**Compulsory**
Full Marks: **75**	Time: **3 Hours**

Unit	Content	Hours
I	Integral: Cauchy's integral theorem, Cauchy's integral formula, Morera's theorem, Liouvillies theorem, Taylor's theorem, Laurent's theorem, Rouche's theorem, fundamental theorem of algebra.	15 h
II	Power series: formula for radius of convergence of power series, absolute & uniform convergence theorem of power series, uniqueness theorem of power series, term by term integration and differentiation theorem.	15 h
III	Residue & poles, contour integration and problems	15 h
IV	Conformal mapping: Conformal and bilinear mapping, necessary & sufficient condition for conformal mapping, mapping from half plane to circle, mapping from unit circle to unit circle and related problems.	15 h

Sessional Internal Assessment (SIA) Full Marks . 25 Marks

A . Internal written Examination . 20 Marks (1 Hr.)
B . Over All Performance including Regularity . 05 Marks

Books Recommended:

1. Complex Variable: Churchill
2. Theory of Functions: Titch Marsh
3. Complex Analysis: J. B. Conway
4. Function of a Complex Variable: Goyal & Gupta

Program: **Bachelor's Degree with Honours/Hons. with Research** Class: **UG**	Year: **Fourth**	Semester: **VIII**
Subject: **Mathematics**		
Course Code: **AMJ-3**	Course Title: **Real Analysis & Measure Theory**	

Course Learning Outcomes: This course will enable the students to:

a) learn the concept of uniform convergence in sequence & series of functions.

b) learn about Fourier series and its applications.

c) learn the concept of measure theory and its properties.

d) know about the measurable functions & its properties.

Credit: **4 (Theory)**	**Compulsory**
Full Marks: **75**	Time: **3 Hours**

Unit	Content	Hours
I	Sequence and series of function: Uniform convergence of sequence and series of real function. Cauchy's general principle of uniform convergence, continuity of the sum of a series of function. Weiestrass's M-test for uniform convergence. Term by term integration and differentiation.	**15 h**
II	Fourier series: Fourier series expansion of a function relative to an orthonormal system. Bessel's inequality, pointwise convergence of trigonometric Fourier series, Dirichlet's integral, Perseval's theorem, Riemann-Lebesgue theorem, Problems on finding trigonometric Fourier series representation of periodic functions.	**15 h**
III	Measure theory: Outer measure, measurable sets through Caratheodory approach, arithmetical properties of measurable sets, two fundamental theorems and examples of uncountable sets of zero measure.	**15 h**
IV	Measurable Functions: Closure of class of measurable function under all algebraic and limit operations, Littlewood's third principle trigonometric Fourier series representation of periodic functions. Function bounded over a set of finite measure, condition of measurability, Lebesgue integral and its arithmetical properties, comparison with R-integral, bounded convergence theorem.	**15 h**

Sessional Internal Assessment (SIA) Full Marks 25 Marks

A Internal written Examination 20 Marks (1 Hr.)

B Over All Performance including Regularity 05 Marks

Books Recommended:

1. Principle of Mathematical Analysis: Walter Rudin
2. Mathematical Analysis: Shanti Narayan
3. Real Analysis: H. L. Royden
4. Advanced Real Analysis: K. K. Jha
5. Measure theory: Gupta & Gupta