ADIKAVI NANNAYA UNIVERSITY

ఆదికవి నన్నయ విశ్వవిద్యాలయం

RAJAMAHENDRAVARAM, ANDHRA PRADESH INDIA - 533296

ISO 9001:2015 Certified

UG PROGRAM (4 Years Honors)
CBCS-2020-21

UG Program (4 years Honors) Structure (CBCS)
2020-21 A. Y., onwards
BACHLOR OF SCIENCE

Subjects/ Semesters		I		II		III		IV		V		VI			
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/W	C		
Languages												THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester		FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).	
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Core Papers															
M-1	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-2	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-3	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-1	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-2	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-3	SEC (C6,C7)									4+2 4+2	4+1 4+1				
Hrs/ W (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	12	4	4
Project Work															
Extension Activities (Non Academic Credits)															
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30	0	12	4	4

M= Major; C= Core; SEC: Skill Enhancement Courses

1.DETAILS OF COURSE TITLES & CREDITS

Marks & Credits distribution: UG-Sciences

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	S.Lang	3	4	3	9	25	75	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -II	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -III	5+2	4+2	4+1	35	25	75+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship /Apprentice/ on the job training	1		12	12		200	2200 5	200
		38			**159**				**4550**
8	**Extension Activities (Non AcademicCredits)**							25	
	NCC/NSS/Sports/ Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits							2	
	Total	**40**			**142**			5	

Sem	Course No	Course Name	Course Type (T/L/P)	Hrs/Week (Arts/ Commerce &Science	Credits (Arts/Commerce &Science	Max. Marks Count/ Internal/Mid Assessment	Max. Marks (Sem-End)
I	1	Differential Equations	T	6	4	25	75
II	2	Three Dimensional Analytical Solid Geometry	T	6	4	25	75
III	3	Abstract Algebra	T	6	4	25	75
IV	4	Mathematics Real Analysis	T	6	4	25	75
	5	Linear Algebra	T	6	4	25	75
V	6A	Numerical Methods	T	6	4	25	75
	7A	Mathematical Special Functions	T	6	4	25	75
		OR					
	6B	Multiple integrals and Applications of Vector Calculus	T	6	4	25	75
	7B	Integral transforms withApplications	T	6	4	25	75
		OR					
	6C	Partial Differential Equationsand Fourier Series	T	6	4	25	75
	7C	Number theory	T	6	4	25	75

Note: *Course type code: T: Theory, L: Lab, P: Problem solving

Note 1: For Semester–V, for the domain subject **MATHEMATICS**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

- **First internship (After 1st Year Examinations):** Community Service Project. To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project (the detailed guidelines are enclosed).
- **Credit For Course: 04**
- **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).
- **Credit For Course: 04**
- **Third internship/Project work (6th Semester Period):**
  During the entire 6th Semester, the student shall undergo Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work (the detailed guidelines are enclosed).
- **Credit For Course:12**

a. Proposed combination subjects: NIL
b. Student eligibility for joining in the course: NIL
c. Faculty eligibility for teaching the course NIL
d. List of Proposed Skill enhancement courses with syllabus, if any NIL
e. Any newly proposed Skill development/Life skill courses with draft syllabus and required resources NIL

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DETAILS OF COURSE-WISE SYLLABUS

B.Sc.	Semester-I	Credits:4
Course:1	DIFFERENTIAL EQUATIONS	Hrs/Weak:6

UNIT I: (12 Hours)

Differential Equations of first order and first degree:

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors.

UNIT II: (12 Hours)

Differential Equations of first order but not of the first degree:

Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations homogeneous in x and y; Equations of the first degree in x and y – Clairaut's Equation.

UNIT III: (12 Hours)

Higher order linear differential equations-I:

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of f(D)y=0.

General Solution of f(D)y=Q when Q is a function 1/f(D) is expressed as partial fractions of x,

P.I. of f(D)y = Q when Q= be^{ax}

P.I. of f(D)y = Q when Q is bsin ax or b cos ax.

UNIT IV: (12 Hours)

Higher order linear differential equations-II:

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of f(D)y = Q when Q= bx^k

P.I. of f(D)y = Q when Q= e^{ax} V **,** where V is a function of x.

P.I. of f(D)y = Q when Q= xV **,** where V is a function of x.

of f(D)y = Q when Q= x^mV **,** where V is a function of x.

UNIT V: (12 Hours)

Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients(Solution when a part of CF is known method only); The Cauchy-Euler Equation, Legendre's linear equations.

Co-Curricular Activities (15 Hours)

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving.

B.Sc.	Semester-II	Credits:4
Course:2	THREE-DIMENSIONAL ANALYTICAL SOLID GEOMETRY	Hrs/Weak:6

UNIT I: (12hrs)

The Plane: Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT II: (12 hrs.)

The Line :Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line.

UNIT III: (12 hrs.)

The Sphere: Definition and equation of the sphere; Equation of the sphere through four given points; Planesections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of aPlane; Conjugate points; Conjugate planes;

UNIT IV: (12 hrs.)

The Sphere and Cones: Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres. Limiting Points.

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone;

UNIT V: **(**12 hrs.)

Cones: Enveloping cone of a sphere; right circular cone: equation of the right circular cone with a given vertex, axis and semi vertical angle: Condition that a cone may have three mutually perpendicular generators; intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex.

Co-Curricular Activities (15 Hours)

Seminar/ Quiz/ Assignments/Three dimensional analytical Solid geometry and its applications/ Problem Solving.

B.A/ B.Sc	Semester-III	Credits:4
Course:3	ABSTRACT ALGEBRA	Hrs/Weak:6

UNIT I: **(12 Hours)**

GROUPS: Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

UNIT II: **(12 Hours)**

SUBGROUP: Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition- examples-criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups. **Co-sets and Lagrange's Theorem:** Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

UNIT III: **(12 Hours)**

NORMAL SUBGROUPS: Definition of normal subgroup – proper and improper normal subgroup– Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

UNIT IV: **(12 Hours)**

HOMOMORPHISM: Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

PERMUTATIONS: Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

UNIT V: **(12 Hours)**

RINGS: Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.

B.A/ B.Sc	Semester-IV	Credits:4
Course:4	MATHEMATICS REAL ANALYSIS	Hrs/Weak:6

UNIT I:

(12 Hours)

Introduction of Real Numbers (No question is to be set from this portion)

Real Sequences: Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence. The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences , Cauchy Sequences – Cauchy's general principle of convergence theorem.

UNIT II:

(12 Hours)

Infinite Series: Introduction to series, convergence of series. Cauchy's general principle of convergence forseries tests for convergence of series, Series of Non-Negative Terms.

1. P-test
2. Cauchy's n^{th} root test or Root Test.
3. D'-Alembert's' Test or Ratio Test.
4. Alternating Series – Leibnitz Test.

UNIT III:

(12 Hours)

CONTINUITY:

Limits: Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. (No question is to be set from this portion).

Continuous functions: Continuous functions, Combinations of continuous functions, Continuous Functions on interval.

UNIT IV:

(12 Hours)

DIFFERENTIATION: The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Rolle's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem

UNIT V:

(12 Hours)

RIEMANN INTEGRATION: Riemann Integral, Riemann integral functions, Darboux's theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, First mean value Theorem.

Co-Curricular Activities(15 Hours)

eminar/ Quiz/ Assignments/ Real Analysis and its applications / Problem Solving.

B.Sc.	Semester-IV	Credits:4
Course:5	LINEAR ALGEBRA	Hrs/Weak:6

UNIT I: **(12 Hours)**

Vector Spaces-I: Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT II: **(12 Hours)**

Vector Spaces-II: Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

UNIT III: **(12 Hours)**

Linear Transformations: Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

UNIT IV: **(12 Hours)**

Matrix: Linear Equations, Characteristic equations, Characteristic Values & Vectors of square matrix, Cayley – Hamilton Theorem.

UNIT V: **(12 Hours)**

Inner product space: Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle Inequality, Parallelogram law, Orthogonality, Orthonormal set, Gram– Schmidt orthogonalization process. Bessel's inequality and Parseval's Identity.

Co-Curricular Activities **(15 Hours)**

Seminar/ Quiz/ Assignments/ Linear algebra and its applications / Problem Solving.

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III B.Sc. MATHEMATICS SYLLABUS 2022-23

Univ Code	Course Number	Name of Course	Hours/ Week	Credits	Marks	
					IA–20 Filed Work 05	Sem End
	6A	Numerical Methods	**6**	**5**	**25**	**75**
	7A	Mathematical Special Functions	**6**	**5**	**25**	**75**

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B.Sc.	Semester – V (Skill Enhancement Course- Elective)	Credits:
Course: 6A	Numerical Methods	Hrs/Wk:

Syllabus :(Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)

Unit – 1: Finite Differences and Interpolation with Equal intervals (15h)

1. Introduction, Forward differences, Backward differences, Central Differences, Symbolic relations, nth Differences of Some functions,
2. Advancing Difference formula, Differences of Factorial Polynomial.
3. Newton's formulae for interpolation. Central Difference Interpolation Formulae.

Unit – 2: Interpolation with Equal and Unequal intervals **(**15h)

1. Central Difference Interpolation Formulae.

   Gauss's Forward interpolation formula, Gauss's backward interpolation formula, Stirling's formula, Bessel's formula.
2. Interpolation with unevenly spaced points, divided differences and properties, Newton's divided differences formula.
3. Lagrange's interpolation formula, Lagrange's Inverse interpolation formula.

Unit – 3: Numerical Differentiation (15h)

1. Derivatives using Newton's forward difference formula, Newton's back ward difference formula,
2. Derivatives using central difference formula, Stirling's interpolation formula,
3. Newton's divided difference formula, Maximum and minimum values of a tabulated function.

Unit – 4: Numerical Integration (15h)

1. General quadrature formula one errors, Trapezoidal rule,
2. Simpson's1/3– rule, Simpson's 3/8 – rule, and Weddle's rules,
3. Euler – McLaurin Formula of summation and quadrature, The Euler transformation.

Unit – 5: Numerical solution of ordinary differential equations (15h)

1. Introduction, Solution by Taylor's Series,
2. Picard's method of successive approximations,
3. Euler's method, Modified Euler's method, Runge – Kutta methods.

B. A/B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:
Course: 7A	Mathematical Special Functions	Hrs /Wk:

Syllabus: (Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)

Unit – 1: Beta and Gamma functions. (15h)

1. Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions.
2. Transformation of Gamma Functions. Another form of Beta Function,
3. Relation between Beta and Gamma Functions.

Unit – 2: Power series and Power series solutions of ordinary differential equations (15h)

1. Introduction, summary of useful results, power series, radius of convergence, theorems on Power series
2. Introduction of power series solutions of ordinary differential equation
3. Ordinary and singular points, regular and irregular singular points, power series solution.

Unit – 3: Hermite polynomials (15h)

1. Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials, generating function for Hermite polynomials.
2. Other forms for Hermite Polynomials, Rodrigues formula for Hermite Polynomials, to find first few Hermite Polynomials.
3. Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

Unit – 4: Legendre polynomials (15h)

1.Definition, Solution of Legendre's equation, Legendre polynomial of degree n, generating function of Legendre polynomials.

2.Definition of $P_n(x) and Q_n(x)$ General solution of Legendre's Equation (derivations not required) to show that is the coefficient of, in the expansion of $(1 - 2xh + h^2)^{-1/2}$

3.Orthogonal properties of Legendre's polynomials, Recurrence formulas for Legendre's Polynomials.

Unit – 5: Bessel's equation (15h)

1. Definition, Solution of Bessel's equation, Bessel's function of the first kind of order n, Bessel's function of the second kind of order n.
2. Integration of Bessel's equation in series form=0, Definition of $J_n(x)$, recurrence formulae for $J_n(x)$.
3. Generating function for $J_n(x)$.