C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: II**

SUBJECT NAME: Mathematics-II **SUBJECT CODE: BSCMTC201**

Teaching & Evaluation Scheme:-

Teaching Scheme(hrs)			Evaluation Scheme								
			Theory					Practical (Marks)			
Th	Pr	Total	Sessional Exam		University Exam		Total	External	Internal	Total	Total
			Marks	Hrs	Marks	Hrs					
4	0	4	30	1.5	70	3	100	--	--	--	100

Objectives: -The objective of this course is

- To learn Cones, Cylinders.
- To learn Conicoids and Cartesian co-ordinate.
- To learn Higher order linear differential equations.
- To learn Sequence and reduction formula.
- To learn algebra of a complex number.
- To Calculate the roots of any complex number.
- To learn Complex functions.

Prerequisites:-

Students must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. Students should have basic knowledge differential equations. Also they should have basic knowledge of complex numbers of at least 10+2 level.

Course outline:-

Sr. No.	Course Contents	Hours
1	Definition of a cone, vertex, guiding curve and generators; equations Cones, enveloping cone of a sphere; conditions for a cone to have three mutually perpendicular generators; tangent lines and plane at point. Condition for tangency (statement only), reciprocal cones, intersection of two cones with a common vertex.	07
2	Definition of a cylinder, its equations; enveloping cylinder of a sphere; the right circular cylinder and its equation.	05
3	Conicoids, ellipsoid, hyperboloids of one and two sheets types. Types of Conicoids and their properties.	05
4	Linear differential equations of higher order with constant coefficients, Operator D, auxiliary equation, roots of auxiliary equations, Methods to obtain Complementary Function (C.F.), solutions of Homogeneous differential equations $f(D)y = 0$ for real and complex roots.	04
5	Operator $\frac{1}{D}$, Solutions of differential equations of the types $f(D)y = X$. Methods to obtain Particular Integral (P.I.) when $X = e^{ax}$, $X = \sin(ax + b)$, $X = \cos(ax + b)$, $X = x^m$, $X = e^{ax}V$.	05
6	Equation reducible to linear differential equations with constant equations, Cauchy's linear differential equations, Legendre's linear differential equations, Simultaneous liner differential equations.	04
7	Complex numbers, Polar form of complex number. De'Moivre's theorem, nth roots of a complex number, Fundamental theorem of algebra (statement only), Multiple roots and test for multiplicity.	06
8	Expansions of $\cos n\theta$, $\sin n\theta$, $\tan n\theta$ in terms of $\cos\theta$, $\sin\theta$, $\tan\theta$ respectively ($n \in N$). Expansion of $cos^n\,\theta$, $sin^n\,\theta$ in a series of $cosines$ or $sines$ of multiple angles of θ ($n \in N$). Expansion of $\cos\theta$, $\sin\theta$, $\tan\theta$ in terms of θ.	04
9	Exponential, circular and hyperbolic functions.	04
10	Logarithm functions for complex and real numbers, Inverse circular and hyperbolic functions for complex and real numbers.	06
11	Definition of a sequence, bounded sequences, convergence of a sequence, subsequences, monotonic sequences, Cauchy's sequence, General principle of convergence of sequence (without proof), Some important sequences $\{\sqrt[n]{n}\}, \left\{\frac{a_1+a_2+\cdots+a_n}{n}\right\}$.	06
12	Reduction Formula of $\int sin^n\,x\,dx, \int cos^n\,x\;dx, \int sin^m\,x\,cos^n\,x\;dx, \int tan^n\,x\,dx, \int cot^n\,x\,dx$ where $m, n \in N; m, n \geq 2$.	04

	$\int_0^{\frac{\pi}{2}} sin^n\, x\, dx$, $\int_0^{\frac{\pi}{2}} cos^n\, x\, dx$, $\int_0^{\frac{\pi}{2}} sin^m\, x\, cos^n\, x\, dx$ where $m, n \in N$; $m, n \geq 2$.	

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Analyze differential equations.
- Solve Higher order ODES.
- Imagine three dimensional objects virtually.
- Understand the concepts of complex numbers and some complex functions.
- Use the sequences and reduction formulas.
- Demonstrate this knowledge by working suitable problems and developing their own proofs, and by presenting and writing work inside and outside of class.

Books Recommended:-

1. 'Analytical solid Geometry', **Shanti Narayan and Mittal P.K.**,*S. Chand And Co.* New Delhi.
2. 'Higher Engineering Mathematics, Thirty-fifth edition.', **B.S. Grewal**, *Khanna Publication*
3. 'The calculus with analytic geometry', **Louis Leithod**, *Harper- Collins Pub.*
4. 'The Elements of Co-ordinate Geometry', **S. L. Loney**, *Mac Milan & Co.*
5. 'A Textbook of Analytical Geometry of three dimensions', **P. K. Jain and Khalid Ahmad**.
6. 'Elementary Treatise on Co-ordinate Geometry of three dimensions', **R. J. T. Bell**, *Mac Milan Co.*
7. 'Advanced Engineering Mathematics', **Kreyszig E.**,*New Age International Publishing Co.*
8. 'Complex Variables and Applications',**R.V.Churchill, J.W.Brown**, *McGraw-Hill Book Co.*
9. 'Principles of Real Analysis', **S.C.Malik**, *New Age International, New Delhi.*
10. 'Integral Calculus', **Shanti Narayan and Mittal P.K.**,*S. Chand And Co.* New Delhi.

E-Resources:-

1. en.wikipedia.org/wiki/Analytic_geometry
2. www.britannica.com/EBchecked/topic/22548/analytic-geometry
3. www.jimloy.com/geometry/analytic.htm
4. http://mathworld.wolfram.com/AnalyticGeometry.html
5. ualr.edu/lasmoller/descartes.html
6. en.wikipedia.org/wiki/Linear_differential_equation
7. www.ufgop.org/pdf/calcululs-review-of-analytic-geomtry/
8. tutorial.math.lamar.edu/Classes/DE/Linear.aspx
9. www.khanacademy.org/math/differential-equations
10. en.wikibooks.org/wiki/Real_Analysis/Sequences
11. www.proofwiki.org/wiki/Definition:Real_Sequence

12. www.mathcs.org/analysis/reals/numseq/
13. en.wikipedia.org/wiki/Integration_by_reduction_formulae
14. archives.math.utk.edu/visual.calculus/4/recursion.2/
15. en.wikipedia.org/wiki/Complex_number
16. www.purplemath.com/modules/complex.htm
17. www.mathsisfun.com/numbers/complex-numbers.html
18. http://mathworld.wolfram.com/ComplexNumber.html
19. http://mathworld.wolfram.com/ComplexFunction.html
20. en.wikipedia.org/wiki/Complex_analysis

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FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: II**

SUBJECT NAME: Mathematics Practical-II **SUBJECT CODE: BSCMTP201**

Teaching & Evaluation Scheme:-

Teaching Scheme(hrs)			Evaluation Scheme								
			Theory					Practical (Marks)			
Th	Pr	Total	Sessional Exam		University Exam		Total	External	Internal	Total	Total
			Marks	Hrs	Marks	Hrs					
0	6	6	--	--	--	--	--	30	20	50	50

Objectives: -The objective of this course is

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Prerequisites:-

Students must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. Students should have basic knowledge differential equations. Also they should have basic knowledge of complex numbers of at least 10+2 level.

Course outline:-

Sr. No.	Course Contents
1	Integration of rational function of x and a linear surd $(Ax+B)(ax^2+bx+c)^{-1/2}$ and $(Ax+B)(ax^2+bx+c)^{1/2}$
2	Reduction formulae for integration of $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$
3	Sketching of Quadric surfaces, Cone, Cylinder
4	General solution of Linear differential equations $F(D)y = X$, where $X = e^{ax}, \sin(ax+b), \cos(ax+b)$, $x^m, e^{ax}V, xV$(where V is a function of x Only), Reducible equation to LDE with constant coefficient
5	Descarte's rule of sign.
6	Solution of cubic equations (Cardan's method), Solution of biquadratic equations (Ferarri's method)
7	Algebra of Complex numbes, Complex functions
8	Angles between two curves, Radius of curvature for Cartesian, Parametric and polar equations
9	Arc length of the curves given in Cartesian, parametric and polar forms
10	Intrinsic equation for Cartesian and polar equations

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8. 'Complex Variables and Applications',**R.V.Churchill, J.W.Brown**, *McGraw-Hill Book Co.*
9. 'Principles of Real Analysis', **S.C.Malik**, *New Age International, New Delhi.*
10. 'Integral Calculus', **Shanti Narayan and Mittal P.K.**,*S. Chand And Co.* New Delhi.

Notes:-

1. Problem solving skill in mathematics is an important aspect in the teachingof mathematics.
2. There would be problem solving session of SIX hours perweek and they will be conducted in batches.