

Koneru Lakshmaiah Education Foundation

(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

Accredited by NAAC as 'A' Grade University ♦ Approved by AICTE ♦ ISO 9001-2015 Certified

Campus: Green Fields, Vaddeswaram - 522 502, Guntur District, Andhra Pradesh, INDIA.

Phone No. 0863 - 2399999; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in

Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002. Ph. +91 - 866 - 2577715, Fax: +91-866-2577717.

To
The Dean –Academics
K L Deemed University
Vaddeswaram.

BOS No. 07/2018-19

Dear Sir,

**Sub: Minutes of the BOS Meeting, Department of Mathematics held on 04-08-2018
at 10.00 A.M.-Reg.,**

Greetings to you.

Department of Mathematics, held a BOS meeting on 04-08-2018 from 10.00 A.M. Here I am submitting Minutes of meeting for your kind Perusal.

Venue: FED Conference Hall, K.L.E.F.

Thanking You,

Yours sincerely

Dr V. Vasanta Kumar,

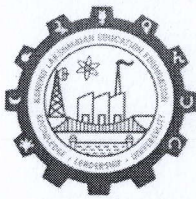
Chairman BOS

Department of Mathematics.

Prof. & Head Dept. of Mathematics

KL UNIVERSITY

VADDESWARAM - 522 302.



Koneru Lakshmaiah Education Foundation

(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

Accredited by NAAC as 'A' Grade University ♦ Approved by AICTE ♦ ISO 9001-2015 Certified

Campus: Green Fields, Vaddeswaram - 522 502, Guntur District, Andhra Pradesh, INDIA.

Phone No. 0863 - 2399999; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in

Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002 Ph: +91 - 866 -2577715, Fax: +91-866-2577717.

Department of Mathematics

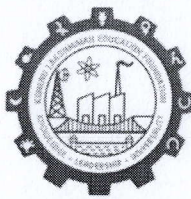
BOS No. 07/2018-19

Minutes of the BOS meeting held on 04-08-2018 at 10.00 A.M in FED-Conference Hall.

The following members present in the meeting:

1. Dr.Pranvir S.Satvat, Dean (Academics), Internal Member.
2. Dr.V.Vasanta Kumar, Chairman, BOS, Professor & H.O.D., Department of Mathematics, K.L.E.F.
3. Dr.B.V.Appa Rao, Internal Member, Professor & I/C H.O.D., Department of Mathematics, K.L.E.F.
4. Dr.K.Jayarami Reddy, Internal Member, Professor, Department of Mathematics, K.L.E.F.
5. Dr.Y.V.S.S.Sanyasi Raju, Academic Expert, Professor, Department of Mathematics, IIT, Madras.
6. Dr.Debashish Dutta, Academic Expert, Professor & H.O.D., Department of Mathematics, NIT, Warangal.
7. Dr.M.Mutyala Rao, Industry Expert, Scientist/Engineer, Applied Mathematics Division, ISRO, Trivandrum.
8. Dr.B.Nageswara Rao, Subject Expert, Professor, Department of Mathematics, K.L.E.F.
9. Mr.Hari Kiran, V, Subject Expert, Professor & H.O.D., Department of C.S.E., K.L.E.F.
10. Dr.V.S.Bhagavan, Internal Member, Professor, Department of Mathematics, K.L.E.F.
11. Dr.G.V.Ramana Reddy, Internal Member, Professor, Department of Mathematics, K.L.E.F.
12. Dr.N.Srimannarayana, Internal Member, Professor, Department of Mathematics, K.L.E.F.
13. Dr.K.Prasad, Internal Member, Professor, Department of Mathematics, K.L.E.F.
14. Dr.V.B.V.N.Prasad, Internal Member, Professor, Department of Mathematics, K.L.E.F.
15. Dr.G.Suresh Kumar, Internal Member, Associate Professor, Department of Mathematics, K.L.E.F.
16. Dr.T.Srinivasa Rao, Internal Member, Associate Professor, Department of Mathematics, K.L.E.F.
17. Dr.K.Rajya Lakshmi, Internal Member, Assistant Professor, Department of Mathematics, K.L.E.F.
18. Dr.S.V.Subrahmanyam, Internal Member, Assistant Professor, Department of Mathematics, K.L.E.F.


Dr. B.V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWAREM - 522 302.



Koneru Lakshmaiah Education Foundation

(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

Accredited by NAAC as 'A' Grade University ♦ Approved by AICTE ♦ ISO 9001-2015 Certified

Campus: Green Fields, Vaddeswaram - 522 502, Guntur District, Andhra Pradesh, INDIA.

Phone No. 0863 - 2399999; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in

Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002, Ph: +91 - 866 - 2577715, Fax: +91-866-2577717

Dr.V.Vasanta Kumar, Chairman of BOS gave the opening remarks and introduce the external members, to the internal and co-opted members. Thanked them for accepting the invitation to be a part of the Board of Studies.

After due deliberations, the following resolutions have been adopted:

AGENDA ITEMS

1. To approve M.Sc.(Applied Mathematics) program curriculum.
2. To approve the intake of M.Sc.(Applied Mathematics).
3. To approve the list of scholars admitted into Ph.D. program in Mathematics during July, 2018, their research guides, doctoral committees.
4. To revise the syllabus of Mathematics Electives for engineering students. a) Probability and Statistics, b) Theory of Differential Equations in Engineering and Mechanics.

AGENDA and RESOLUTIONS

BOS Chairman presented the detailed M.Sc (Applied Mathematics) curriculum for 2018 admitted batch to the all members. Way far deliberations, the external members suggested the following courses in curriculum.

AGENDA ITEM-1

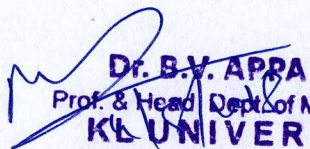
To **approve** M.Sc.(Applied Mathematics) program curriculum.

Recommended to
Academic Council for
Approval

- Dr.B.V.Appa Rao, Professor, Dr.V.Vasanta Kumar, Professor, Dr.N.Srimannarayana, Professor, Dr.V.B.V.N.Prasad, Professor, Dr.K.Prasad, Professor, Dr.G.V.Ramana Reddy, Professor and Dr.V.Hari Kiran, Professor suggested to introduce new program M.Sc.(Applied Mathematics) from 2018-19, as per the market needs and contemporary industry requirements. Hence it is resolved to introduce the same and forwarded to the Academic Council for approval.
- Dr.Debaish Datta, Professor & HOD, Dept. of Mathematics, NIT, Warangal, recommended to initiate the M.Sc.(Applied Mathematics) program from the academic year 2018-19.
- Mr.M.Mutyala Rao, CoScientist/Engineer, Applied Mathematics Division, ISRO, Trivandrum, recommended Y18 Course Structure and to introduce Software Testing courses as they are competent and need for the current industry.

Hence, to resolve and approve the course structure and syllabi of M.Sc Applied

Mathematics program (I, II, III and IV semesters) along with labs as given in Annexure-I


DR. B.V. APPA RAO
Prof. & Head, Dept. of Mathematics
KL UNIVERSITY
VADDESWAREM - 522 302.

and Annexure-2 as suggested by BoS members recommendations are sent for the academic council's final approval.

(Annexure:1: Detailed Course Structure)

(Annexure:2 : Syllabus of Courses)

AGENDA ITEM-2

To approve the intake of M.Sc.(Applied Mathematics).

Recommended to
Academic Council for
Approval

It was resolved to approve for intake of 40 for M.Sc.(Applied Mathematics) program for the A.Y.: 2018-19 and forwarded it to Academic Council for the necessary approval.

AGENDA ITEM-3

To approve the list of scholars admitted into Ph.D. program in Mathematics during July, 2018, their research guides, doctoral committees.

Recommended to
Academic Council for
Approval

It was resolved to approve the scholars admitted into Ph.D. program, Doctoral Committees, Pre-Ph.D. syllabus and forwarded the same to Academic Council for Approval.

AGENDA ITEM-4

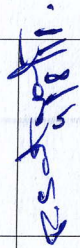
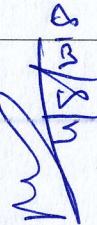
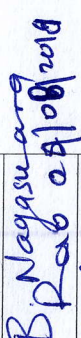
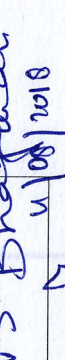
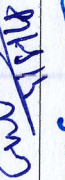
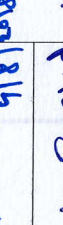
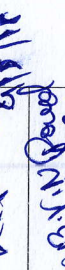
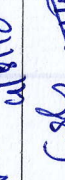
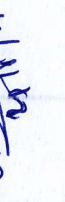
To revise the syllabus of Mathematics Electives for UG Engineering students.

a) Probability and Statistics b) Theory of Differential Equations in Engineering and Mechanics.

Recommended for
Academic Council
Approval

It was resolved to revise the syllabus of Probability and Statistics, Theory of Differential Equations in Engineering and Mechanics for UG Engineering students and forwarded it to Academic Council for approval.


DR. B.V. APPA RAO
Prof. & Head, Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

S.NO	NAME OF THE PERSON	DESIGNATION	Position in Meeting	Signature
1	Dr. Pranvir S Satvat	Dean(Academics)	Internal Member	
2	Dr V Vasanta Kumar	Professor & H.O.D., Department of Mathematics, K.L.E.F.	Chairman	
3	Dr B V Appa Rao	Professor & I/C HOD, Department of Mathematics, KLEF	Internal Member	
4	Dr.K.Jayarami Reddy	Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	
5	Dr.Y.V.S.S. Sanyasi Raju	Professor, Dept. of Mathematics, IIT, Madras	Academic Expert	
6	Dr.Debasisish Dutta	Professor & H.O.D., Dept. of Mathematics, NIT, Warangal	Academic Expert	
7	Dr.M.Mutyala Rao	Scientist/Engineer, Applied Mathematics Division, ISRO, Trivandrum	Industry Expert	
8	Dr.B.Nageswara Rao	Professor, Dept. of M.E.(Retd. Scientist, ISRO)	Subject Expert	
9	Mr.Hari Kiran, V	H.O.D., Dept. of C.S.E.	Subject Expert	
10	Dr V S Bhagavan	Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	
11	Dr G V Ramana Reddy	Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	
12	Dr N Srimannarayana	Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	
13	Dr.K.Prasad	Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	
14	Dr V B V N Prasad	Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	
15	Dr G Suresh Kumar	Associate Professor, Dept. of	Internal	


Dr. B.V. APPA RAO
 Head, Dept. of Mathematics
KLE UNIVERSITY
 VADDESWARAM - 522 302.

		Mathematics, K.L.E.F.	Member	
16	Dr T.Srinivasa Rao	Associate Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	T.S. Rao 18/11/18
17	Dr K Rajya Lakshmi	Assistant Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	K. Rajya Lakshmi 18/11/18
18	Dr.S.V.Subrahmanyam	Assistant Professor, Dept. of Mathematics, K.L.E.F.	Internal Member	S.V. Subrahmanyam 18/11/18

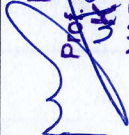

Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWARAH - 522 302.

Annexure:1:(Curriculum)

SN O	COURSE CODE	COURSE NAME	Type	L	T	P	S	Cr	New Course/ Revised Course/ Retained Course requisites	Changes Proposed By	Employability / Entrepreneurship / Skill Development
1	18AM1101	REAL ANALYSIS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
2	18AM1102	ORDINARY DIFFERENTIAL EQUATIONS	PC	3	0	2	0	4	New Course	Academic Peers, Faculty	Employability
3	18AM1103	NUMERICAL METHODS	PC	3	0	2	0	4	New Course	Academic Peers, Faculty	Employability
4	18AM1104	COMPLEX ANALYSIS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
5	18AM1105	MATHEMATICAL STATISTICS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
6	18AM1106	SEMINAR-1	PC	0	0	2	0	1	New Course	Academic Peers, Faculty	Employability
7	18AM1206	TOPOLOGY	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
8	18AM1207	ABSTRACT ALGEBRA	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability

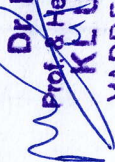
Dr. B.V. APPA RAO
Prof. & Head, Dept. of Mathematics
KLU UNIVERSITY
VADDESINARAM - 522 302.

9	18AM1208	TRANSFORM TECHNIQUES	PC	3	0	2	0	4	New Course	Academic Peers, Faculty	Employability
10	18AM1209	DISCRETE MATHEMATICS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
11	18AM1210	INTRODUCTION TO COMPUTER PROGRAMMING	PC	3	0	2	0	4	New Course	Industry Person	Employability
12	18AM1211	SEMINAR-2	PC	0	0	2	0	1	New Course	Academic Peers, Faculty	Employability
13	18AM2111	PARTIAL DIFFERENTIAL EQUATIONS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
14	18AM2112	CONTINUUM MECHANICS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
15	18AM2113	DATA STRUCTURES	PC	3	0	2	0	4	New Course	Industry Person	Employability
16	18AM2114	FUNCTIONAL ANALYSIS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
17	18AM2105	SEMINAR-3	PC	0	0	2	0	1	New Course	Academic Peers, Faculty	Employability
18	18AM2215	FLUID DYNAMICS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
19	18AM2216	OPERATION RESEARCH	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
20	18AM2226	DISSERTATION WITH RESEARCH PUBLICATION	PC	0	0	2	0	12	New Course	Academic Peers, Faculty	Employability
21	18AM2011	MATHEMATICAL CONTROL THEORY	PE	4	0	0	0	4	New	Academic	Employability


DR. B.V. APPA RAO
 Prof. & Head, Dept. of Mathematics
KJ Somaiya UNIVERSITY
 VADDESWARAM - 522 302.

Program Structure :

SNO	COURSE CODE	COURSE NAME	Type	L	T	P	S	Cr	New Course/Revised Course/Retained Course requisites	Changes Proposed By	Employability / Entrepreneurship / Skill Development
1	18AM1101	REAL ANALYSIS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
2	18AM1102	ORDINARY DIFFERENTIAL EQUATIONS	PC	3	0	2	0	4	New Course	Academic Peers, Faculty	Employability
3	18AM1103	NUMERICAL METHODS	PC	3	0	2	0	4	New Course	Academic Peers, Faculty	Employability
4	18AM1104	COMPLEX ANALYSIS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
5	18AM1105	MATHEMATICAL STATISTICS	PC	4	0	0	0	4	New Course	Academic Peers, Faculty	Employability
6	18AM1106	SEMINAR-1	PC	0	0	2	0	1	New Course	Academic Peers, Faculty	Employability
7	18AM1206	TOPOLOGY	PC	4	0	0	0	4	New Course	Academic	Employability


DR. B.V. APPA RAO
 Prof. & Head, Dept. of Mathematics
 KLE UNIVERSITY
 VADDESWARAM - 522 302.

8	18AM1207	ABSTRACT ALGEBRA	PC	4	0	0	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
9	18AM1208	TRANSFORM TECHNIQUES	PC	3	0	2	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
10	18AM1209	DISCRETE MATHEMATICS	PC	4	0	0	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
11	18AM1210	INTRODUCTION TO COMPUTER PROGRAMMING	PC	3	0	2	0	4										Industry Personnel	New Course	Industry Personnel	Employability
12	18AM1211	SEMINAR-2	PC	0	0	2	0	1										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
13	18AM2111	PARTIAL DIFFERENTIAL EQUATIONS	PC	4	0	0	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
14	18AM2112	CONTINUUM MECHANICS	PC	4	0	0	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
15	18AM2113	DATA STRUCTURES	PC	3	0	2	0	4										5	New Course	5	Employability
16	18AM2114	FUNCTIONAL ANALYSIS	PC	4	0	0	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
17	18AM2105	SEMINAR-3	PC	0	0	2	0	1										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
18	18AM2215	FLUID DYNAMICS	PC	4	0	0	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability
19	18AM2216	OPERATION RESEARCH	PC	4	0	0	0	4										Academic Peers, Faculty	New Course	Academic Peers, Faculty	Employability

Percentage of Syllabus Revision = $29/29 = 100\%$

Percentage of Courses focusing on Employability = $29/29 = 100\%$

Percentage of Courses focusing on Entrepreneurship = $01/29 = 0\%$

Percentage of Courses focusing on Skill Development = $0/29 = 0\%$


Dr. B.V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWARAM - 522 302.

Annexure-2(Syllabus) :**Course Code- 18AM1101****Course Name- Real Analysis****L-T-P-S: 4-0-0-0****Credits: 4****Prerequisite: Real number system, Cauchy sequences, Darboux's theorem, Weierstrass approximation, Reimann integrals**

CO. No.	Course Outcome (CO)	PO	PSO	Blooms Taxonomy Level (BTL)
CO1	Describe the fundamental properties of the real numbers that lead to the formal development of real analysis.	PO2, PO5, PO6, PO7	Nil	3
CO2	Demonstrate an perceptive of limits and how they are used in sequences, series, differentiation and integration	PO2, PO5, PO6, PO7	Nil	3
CO3	Describe and apply the important properties of the limit and continuity and the differentiation and integration of the sequences and series of functions. Explain the basic properties of the Riemann integration	PO2, PO5, PO6, PO7	Nil	3
CO4	Determine the Riemann integrability of a bounded or unbounded function and prove a selection of theorems concerning integrations.	PO2, PO5, PO6, PO7	Nil	3

Syllabus:

Real number system, ordering, bounded sets, order completeness axiom, mathematical induction, well ordering principle; Archimedian property, Dedekind's theorem, complete ordered field, limit point of a set, Bolzano Weierstrass theorem, open and closed sets, compact sets and Heine-Borel theorem. Sequences, Cauchy's first and second limit theorems, Cauchy sequences, Cauchy criterion for convergent sequences, bounded and monotonic sequences, Euler's constant, subsequences, limit superior and limit inferior. Series of real valued functions and their Tests for convergence. Limit and continuity, uniform continuity, monotonic functions, functions of bounded variation, absolutely continuous functions, Taylor's theorem (finite form), Lagrange's form of remainder. Sequences and series of real valued functions, their point-wise, absolute and uniform convergence, Cauchy's general principle of uniform convergence, continuity of the limit (sum) function, differentiation and integration of the sequences and series of functions, Weierstrass approximation theorem. Riemann integration, Darboux's theorem, necessary and sufficient conditions for integrability. Functions defined by Integrals, fundamental theorem of calculus, first and second mean value theorems of integral calculus. Improper Integrals: Introduction, Integration of unbounded functions with finite limit of Integration, comparison tests for convergence at a point infinity, Infinite range Integration. Integral as a product of functions.


Dr. B.V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

Textbooks::

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Royden. H.L. and Fitzpatrick. P.M., Real Analysis, Prentice Hall India Pvt. Ltd.	2010
2.	Apostol, T. M., Mathematical Analysis, Narosa PublishingHouse.	2002
3.	Lang. S., Real and Functional Analysis, Springer - Verlag.	1993

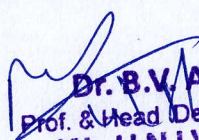
Reference Books:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Rudin. W., Principles of Mathematical Analysis, McGraw-Hill Book Company.	1976
2.	Goldberg, R.R., Methods of Real Analysis, Oxford and IBH Publishing company Pvt. Ltd.	1970

Course Code- 18AM1102**Course Name-Ordinary Differential Equations****L-T-P-S: 3-0-2-0****Credits: 4**

Prerequisite: Existence, uniqueness of solutions of first order ODE, Power series, Boundary value problems, Oscillation theory, Eigen values and Eigen functions.

CO No:	Course Outcomes	PO's	PSO's	BTL
CO 1	Apply the existence and uniqueness conditions of solution of the homogeneous/non-homogeneous differential equation and the system of differential equations.	PO2, PO3,	PS01	3
CO 2	Apply the power series method of solution to second order ODE arising in mathematical physics- Gauss hypergeometric, Hermit and Chebyshev polynomials.	PO1, PO2	PS04	3
CO 3	Apply Green's function method to study behavior of the Boundary value Problems (BVP) for second order ODE.	PO2	PS01	3
CO 4	Determine the oscillatory solutions of BVP and illustrate their qualitative properties.	PO2,	PS04	3
CO 5	Verify the solution of the ODE through MATLAB.	PO2	PS03	3


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESWARAM - 522 302.

Syllabus:

Existence, uniqueness and continuation of solutions of a differential equation and system of differential equations; Applications. Differential and integral inequalities. Fixed point methods. Linear systems, properties of homogeneous and non-homogeneous systems, behavior of solutions of n^{th} order linear homogeneous equations. Review of power series, Power series solution of second order homogeneous equations, ordinary points, regular singular points, solution of Gauss hypergeometric equations, Hermite and Chebyshev polynomials. Boundary value problems for second order differential equations, Green's function and its applications. Eigen value problems, self adjoint form, Sturm –Liouville problem and its applications. Oscillation Theory and boundary value problems: Qualitative properties of solutions –The Sturm comparison theorem-Eigen values, Eigen functions and the vibrating string.

List of lab Experiments:

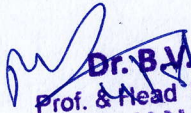
Lab session No	Experiment	CO-Mapping
1	Introduction to MATLAB.	CO1
2	Solving first and second order ODE.	CO1
3	Determine solutions of homogeneous system of ODE.	CO1
4	Determine solutions of non-homogeneous system of ODE.	CO2
5	Determine the singular and regular points of second order ODE.	CO2
6	Determine Hermite and Chebyshev polynomials.	CO2
7	Solutions of BVP for second order ODE.	CO3
8	Solutions of Sturm-Liouville problem.	CO3
9	Solution of BVP using Green's function.	CO3
10	Oscillatory solutions of BVP.	CO4
11	Determine the Eigen values and Eigen functions.	CO4
12	Determine the solution of vibrating string.	CO4

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Braun, M. "Differential Equations and Their Applications", 4 th Ed., Springer	2011
2.	Brauer, F. and Nohel, J.A., "The Qualitative Theory of Ordinary Differential Equations", Dover Publications	1989
3.	Coddington F.A., "Ordinary Differential Equations", Tata McGraw Hill	2002

ReferenceBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
--------	---	---------------------


DR. B.V. ARORA RAO
 Prof. & Head, Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

1.	Deo, S.G., Lakshmikantham, V., and Raghvendra, V., "Text Book of Ordinary Differential Equations", 2 nd Ed., Tata McGraw Hill	2010
2.	Simmons G.F., "Ordinary Differential Equations with Applications", Tata McGraw Hill	2003

Course Code-18AM1103

Course Name—Numerical Methods

L-T-P-S: 3-0-2-0

Credits: 4

Prerequisite: System of linear equations, Roots of non-linear equations, Eigen values and Eigen vectors, Interpolation Numerical differentiation, Numerical integration, Numerical solution of first and second order ordinary differential equations.

CO No:	Course Outcomes	PO's/	PSO's	BTL
CO 1	Identify the difference between solutions of system linear and roots of non-linear equations by direct, bisection methods.	PO2, PO3,	PS01	3
CO 2	Construct the interpolation forward and backward tables and find the Eigen values and vectors by using mat lab also.	PO1, PO2,	PS04	3
CO 3	Apply Numerical differentiation and integration problems for different methods and find the values and compare the values by using mat lab also.	PO2,	PS01	3
CO 4	Construct numerical solutions of first and second order ordinary differential equations and compare the numerical values with mat lab also.	PO2,	PS04	3
CO 5	Verify the solution of the N.M. through MATLAB.	PO2	PSO3	3

Syllabus:

Solution of system of linear equations: (i) Direct methods: Gauss elimination method without pivoting and with pivoting, LU-decomposition method. (ii) Iterative methods: Jacobi and Gauss-Seidel methods. Roots of non-linear equations: Bisection method, Regula-Falsi method, Newton-Raphson method, direct iterative method with convergence criteria, Newton-Raphson method for solution of a pair of non-linear equations. Eigen values and Eigen vectors: Dominant and smallest Eigen values/Eigen vectors by power method. Interpolation: Finite difference operator and their relationships, difference tables, Newton, Bessel and Stirling's interpolation formulae, Divided differences, Lagrange interpolation and Newton's divided difference interpolation. Numerical differentiation: First and second order derivatives by various interpolation formulae. Numerical integration: Trapezoidal, Simpsons 1/3rd and 3/8th rules with errors and their combinations, Gauss Legendre 2-points and 3-points formulae. Numerical solution of first and second order ordinary differential equations: Picard's method, Taylor's series method, Euler, Modified Euler, Runge-Kutta methods, Predictor-Corrector Method's- Milne's method.

TextBooks:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1	Gerald, C. F. and Wheatly, P. O., " Applied Numerical Analysis", 6 th Ed., Wesley.	2002

Dr. B.V. APPA RAO
 Prof. & Head, Dept. of Mathematics
KLU UNIVERSITY
 VADDESWAREM - 522 302.

2	Jain, M. K., Iyengar, S. R. K. and Jain, R. K., "Numerical Methods for Scientific and Engineering Computation", New Age Pvt. Pub, New Delhi.	2000
---	--	------

Reference Books:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Conte, S. D. and DeBoor, C., "Elementary Numerical Analysis", McGraw- Hill Publisher	1982
2.	Krishnamurthy, E. V. & Sen, S. K., "Applied Numerical Analysis", East West Publication.	1998

Course Code-18AM1104

Course Name-Complex Analysis

L-T-P-S: 4-0-0-0

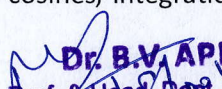
Credits: 4

Prerequisite: Analytic Functions, Cauchy-Reimann equations, Complex integration, Residue Calculus, Conformal Mapping, Evaluation of real integrals.

CO No:	Course out come	P O	PSO	BTL
CO1	Explain the definition of continuity, differentiability, apply the concepts of analytic function and harmonic function to explain Cauchy-Riemann equations; Understanding Power Series.	PO1,	PSO1	3
CO2	Apply the concept of conformal mapping, and describe the mapping properties of Möbius transformations and how to apply them for conformal mappings in Fluid Dynamistic etc..	PO2, PO7,	PSO4	3
CO3	Explain complex contour integrals; Understand simple sequences and series apply the convergence properties of a power series, and to determine the Taylor series or the Laurent series of an analytic function.	PO1, PO7	PSO1, PSO4	3
CO4	Explain properties of singularities and poles of analytic functions and apply to compute residues integrals by applying residue techniques.	PO1	PSO1, PSO4	3

Syllabus:

Analytic Functions: Functions of a complex variable. Limits, continuity, uniform continuity, differentiability and analyticity of functions, C-R equations, necessary and sufficient conditions, applications to the problems of potential flow, Harmonic functions, Harmonic conjugates, Milne's method. Sequences, Series, Uniform convergence, power series. Complex integration: Rectifiable arcs, contours, complex line integration, Cauchy's theorem for simply and multiply connected domains, Cauchy's integral formula for the derivatives of an analytic function, Winding Numbers, Cauchy's estimate, Morera's theorem, Liouville's theorem, Fundamental theorem of Algebra. Maximum modulus principle, Schwarz Lemma, Taylor series, Laurent series, Zeros and poles of a function, Meromorphic function. Residue Calculus: The residue at a singularity, Residue theorem, the argument principle, Rouché's theorem, contour integration and its applications to improper integrals, evaluation of a real integrals, improper integrals involving sines and cosines, definite integrals involving sines and cosines, integration through branch cut. Conformal Mapping:


Dr. B.V. APPA RAO
 Prof. & Head, Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

Definition of Conformal and Bilinear transformations, Cross ratio, the mappings from disc to disc, disc to half plane and half plane to half plane. Mapping of elementary transformations. Space of continuous functions, the space of analytic functions, the space of meromorphic functions, Riemann-mapping theorem. Applications: Applications of conformal mapping to steady temperature, electrostatic potential, two-dimensional fluid flow, stream function.

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Churchill, J. W. and Brown, R. V., "Complex Analysis", McGraw- Hill.	2009
2.	Gamelin, T. W., "Complex Analysis", Springer-Verlag	2001
3.	Greene R., and Krantz, S. G., "Function Theory of One Complex Variable", 3 rd Ed., GSM, Vol. 40, American Mathematical Society.	2006

Reference Books:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Kreyszig, E., "Advanced Engineering Mathematics", Wiley, New York	2009
2.	Lang, S., "Complex Analysis", Springer –Verlag.	2003
3.	Mathews, J. H. and Howell, R. W., "Complex Analysis for Mathematics and Engineering", Narosa.	2009

Course Code-18AM1105

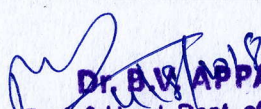
Course Name – Mathematical Statistics

L-T-P-S: 4-0-0-0

Credits: 4

Prerequisite: Conditional Probability, discrete distributions, Random variables, Simple random sampling with replacement and without replacement, Fundamental sampling distributions.

CO No:	Course Outcomes	PO	PSO	BTL
CO 1	Explain the concepts of random variable, probability distribution, distribution function, expected value, variance and higher moments, and calculate expected values and probabilities associated with the distributions of random variables	PO3	PS02	3
CO 2	Explain the concepts of independence, jointly distributed random variables and conditional distributions, and use generating functions to establish the distribution of linear combinations of independent random variables.	PO2	PS01	3
CO 3	Explain the concepts of random sampling, statistical inference and sampling distribution, and state and use basic sampling distributions. State the central limit theorem, and apply it.	PO1	PS02	3


DR. B. V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

CO 4	Construct the sampling distribution of mean and variance and calculation of mean and variance of sampling distribution of mean and variance..	PO3	PS02	3
-------------	---	-----	------	---

Syllabus:

Concept of probability, Axioms of Probability, Conditional Probability, Addition, Multiplication and Baye's Theorems, Random variable and Distribution function of discrete and continuous distributions, Mathematical expectation, Moments and Moment generating function. Some discrete distributions: Binomial, Poisson, Geometric and Hypergeometric; Some continuous distributions: Uniform, Exponential, Weibull, Gamma and Normal. Bivariate Random variables: Joint, Marginal, Conditional distribution, Statistical independence, product moments, correlation, regression, transformation of random variables, Law of large numbers and Central limit theorem. Simple random sampling with replacement and without replacement, Parameter and statistic, Mean and variance of sampling distributions, order statistics and distribution of order statistics, Fundamental sampling distributions from normal population viz. χ^2 , t, f and Z (central).

TextBooks:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1	Miller, I. and Miller, M., "Freund's Mathematical Statistics with Applications", 7 th Ed., Prentice Hall PTR .	2006
2	Hogg, R. V. and Craig, A., "Introduction to Mathematical Statistics", 6 th Ed., Pearson Education,	2006

Reference Books:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Rohatgi, V. K. and Md. Ehsanes Saleh, A. K., "An Introduction to Probability and Statistics", 2 nd Ed., John Wiley and Sons.	2000
2.	Papoulis, A., Pillai, S.U., Probability, "Random Variables and Stochastic Processes", 4 th Ed., Tata McGraw-Hill.	2002

Course Code-18AM1206

L-T-P-S: 4-0-0-0

Course Name-Topology

Credit: 4

Prerequisite: Countable, uncountable sets, functions, relations, Topological Spaces and Continuous functions Connectedness and Compactness, Countability and Separation axiom.

CO No:	Course Outcome	PO	PSO	BTL
CO1	Explain the definition of Finite, countable, uncountable sets and apply the concepts of composite function and Axiom of choice to explain Zorn's Lemma.	PO1	PSO1, PSO2	3

Dr. B.V. APPA RAO
 Prof. & Head, Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

CO2	Explain the concept of open sets, closed sets and basis for a topology describe the properties of product space and apply the concept of topological space and continuous function.	PO1	PSO1, PSO2	3
CO3	Explain the definition of compact space and connected space and apply the concept of finite intersection property and Bolzano weierstrass property.	PO1	PSO1, PSO2	3
CO4	Explain the properties of Hausdorff's space and normal space and apply the Urysohn's lemma to determine the Urysohn's metrization theorem, Tietze extension theorem, and Tychonoff theorem.	PO1	PSO1, PSO2	3

Syllabus:

Introduction: Finite, countable, uncountable sets, functions, relations, Axiom of choice, Zorn's Lemma

Topological Spaces and Continuous functions: Open sets, closed sets, basis for a topology, Sub basis, T_1 and T_2 Spaces, Order topology, product topology, subspace topology, limit point, continuous function, general product topology, metric space and its Topology, quotient topology. **Connectedness and**

Compactness Connected spaces, connected subspaces, Local connectedness, compact subspace, limit point compactness, Local compactness. **Countability and Separation axiom:** Countability axioms, separation axioms. Regular and Normal Spaces, Urysohn's Lemma, Urysohn metrization Theorem. Tietze Extension Theorem, Tychonoff Theorem.

TextBooks:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Munkres, J.R., "Topology", 2 nd Ed., PHI	2010
2.	Mansfield, M.J., "Introduction to Topology", East-West student Edition	1973
3.	Simmons, G.F., "Introduction to Topology & Modern Analysis", Krieger Publishing Company.	2003

ReferencesBooks:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Mendelson, B., "Introduction to Topology," 3 rd Ed., Dover Publications	1988
2.	Gamelin, T.W. and Greene, R.E., "Introduction to Topology", 2 nd Ed., Dover Publications	1999
3.	Min, Y., "Introduction to Topology: Theory & Applications", Higher Education Press	2010

Course Code-18AM1207

Course Name – Abstract Algebra

L-T-P-S: 4-0-0-0

Credit: 4

Prerequisites: Group theory, Ring theory, Vector Spaces, Fields, Euclidean rings, polynomial rings.

CO No.	Course out come	PO	PSO	BTL
CO1	Define group, subgroup and quotient group with examples, and proving some preliminary lemmas.	PO3,	PSO2	2
CO2	Define homomorphism and automorphism of groups .Explain Cayley's and Sylow's theorems of finite groups and demonstrate the problems.	PO1,	PSO1	2

Dr. B.V. APPA RAO
Prof. & Head, Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

CO3	Define a ring, homomorphism of rings, ideal, quotient rings with examples. Explain principal ideal domain, unique factorization domain, modules over PID theorems and demonstrate the problems.	PO2,	PSO1	2
CO4	Define field and Polynomial ring with examples. Explain the field of Quotients of an integral domain and Euclidean and polynomial rings with problems.	PO4,	PSO2	2

Syllabus:

Group theory: Definition and some examples of groups, some preliminary lemmas, subgroups. Homeomorphisms, auto morphisms, Canley's theorem, permutation groups, Solow's theorems. Ring theory: Definition and examples of Rings, some special classes of Rings, homomorphisms Ideal and Quotient rings. Maximal Ideal, Integral domain, Principal Ideal domain(PID), unique factorization. Vector Spaces, Sub Spaces, Dimension, Basis, Inner Product Space, Schewarz inequality, Grahm-Smith Orthogonalization process, Modules, Modules over PID, Modules with chain conditions. Definition of field and some examples, the field of Quotients of an Integral domain, Euclidean rings, polynomial rings.

TextBooks:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication/ Reprint
1.	Herstein, I. N., "Topics in Algebra", 2 nd Ed., John Wiley & Sons.	2004
2.	Fraleigh, J. B., "A First Course in Abstract Algebra", 7 th Ed., Pearson Education	2003
3.	Dummit, D. S. and Foote, R. M., "Abstract Algebra", 3 rd Ed., John Wiley & Sons.	2004

ReferenceBooks:

S.No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication/ Reprint
1.	Artin M., "Algebra", 2 nd Ed., Prentice Hall India	2011
2.	Gallian J. A., "Contemporary Abstract Algebra", 8 th Ed., Cengage Learning	2013

Course Code-18AM1208

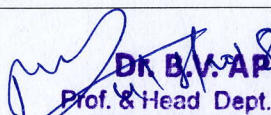
Course Name-Transform Techniques

L-T-P-S: 3-0-2-0

Credit: 4

Prerequisites: Laplace transforms, Inverse Laplace transforms, Applications, Mellin Transform, Fourier Series, Fourier Transforms

CO No:	Course Outcomes	PO	PSO	BTL
CO 1	Apply Laplace transform techniques to solve linear differential equations in system analysis where initial conditions can be easily included to give system response.	PO1 PO3 PO4	PSO3	3


DR. B. V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESWAREM - 522 302.

CO 2	Applying z- transform and Mellin transform to the analysis and characterization of Discrete Time systems.	PO1 PO3	PS03	3
CO 3	Apply Fourier series to analyze various signals.	PO4	PS03	3
CO 4	Apply Fourier transforms to analyze various signals.	PO6	PS03	3
CO 5	Verify the solution of the Transform techniques through MATLAB.	PO5	PSO3	3

Syllabus:

Laplace Transform: Laplace of some standard functions, Existence conditions for the Laplace Transform, Shifting theorems, Laplace transform of derivatives and integrals, Inverse Laplace transform and their properties, Convolution theorem, Initial and final value theorem, Laplace transform of periodic functions, Heaviside unit step function and Dirac delta function, Applications of Laplace transform to solve ODEs. **Finite Laplace Transform:** Definition and properties, Shifting and scaling theorem. **Z-Transform:** Z-transform and inverse Z-transform of elementary functions, Shifting theorems, Convolution theorem, Initial and final value theorem, Application of Z-transforms to solve difference equations. **Mellin Transform:** Definition and properties of Mellin transform, Shifting and scaling properties, Mellin transforms of derivatives and integrals, Applications of Mellin transform. **Fourier series:** Trigonometric Fourier series and its convergence. Fourier series of even and odd functions, Gibbs phenomenon, Fourier half-range series, Parseval's identity, Complex form of Fourier series. Solving ODE using Fourier series. **Fourier Transforms:** Fourier integrals, Fourier sine and cosine integrals, Complex form of Fourier integral representation, Fourier transform, Fourier transform of derivatives and integrals, Fourier sine and cosine transforms and their properties, Convolution theorem, Application of Fourier transforms to Boundary Value Problems.

List of Lab Experiments:

Lab session No	List of Experiments	CO-Mapping
1	Introduction and Review of MATLAB.	CO1
2	Determine the Laplace transforms of the function using derivatives and integrals property.	CO1
3	Calculate the Inverse Laplace transforms of the given function.	CO1
4	Solving ODE by Laplace transforms.	CO2
5	Using the Shifting, Convolution, Initial and final value theorems of Z-transforms to the function.	CO2
6	Using Z-transforms to solve the difference equations.	CO2
7	Determine the Mellin transforms of derivatives and integrals.	CO3
8	Obtain the Complex form of Fourier series of the function.	CO3
9	Determine the Fourier series of even and odd functions.	CO3
10	Solving ODE using Fourier series.	CO4
11	Expressing the Fourier sine and cosine integrals and Complex form of Fourier integral representation of the function.	CO4
12	Application of Fourier transforms to Boundary Value Problems (BVP).	CO4



Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESWARAM - 522 302.

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Kreyszig, E., "Advanced Engineering Mathematics", John Wiley & Sons	2011
2.	Jain, R. K. and Iyenger, S. R. K., "Advanced Engineering Mathematics", Narosa Publishing House	2009

ReferenceBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Hildebrand F. B., "Methods of Applied Mathematics", Courier Dover Publications	1992
2.	Debanth L. and Bhatta D., Integral Transforms and Their Applications, 2 nd Ed., Taylor and Francis Group	2007

Course Code-18AM1209
L-T-P-S: 4-0-0-0

Course Name- Discrete Mathematics
Credit: 4

Prerequisites: Fundamentals of logic, Partially ordered sets, Lattices, Recurrence Relation, Graphs, colouring theorems, isomorphism of graphs.

CO No:	Course out come	PO	PSO	BTL
CO1	Apply the rules of Propositional logic to establish valid results and apply rules of valid inference and hence understand how to construct correct mathematical arguments, Mathematical Induction	PO3, PO6, PO7	PSO2	2
CO2	Understand the concept of relations, functions and discrete structures , Count discrete event occurrences , lattices, to represent the Boolean functions by an expression	PO2, PO3, PO6, PO7	PSO3	3
CO3	Formulate and solve recurrence relations of homogeneous and non homogeneous relations, understand some recursive algorithms.	PO2, PO3, PO6, PO7	PSO3	3
CO4	Use graph theory for various techniques to study and analyze different problems associated with computer design, logic design, Formal languages, Artificial Intelligence etc, Analysis of different traversal methods for trees and graphs.	PO2, PO3, PO5, PO6, PO7	PSO3	3

Syllabus:

Proposition, predicate logic, logic connectives, methods of proofs. Mathematical induction. Relation and Function: Definitions and properties, pigeonhole principle, extended pigeonhole principle, equivalence relations and equivalence classes. representation of relations by binary matrices and digraphs; operations on


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

relations. closure, Warshall's algorithm, discrete numeric functions, growth of functions, big O, big hash function. Partial Order. Partially ordered sets, lattices, isomorphism of lattices - Boolean algebra and Boolean functions, different representations of Boolean functions, application of Boolean functions to synthesis of circuits, circuit minimization and simplification, Karnaugh map. Recurrence Relation: Linear recurrence relations with constant coefficients, homogeneous and non-homogeneous relations, discussion of several special cases to obtain particular solutions. Generating functions, solution of linear recurrence relations using generating functions. Some recursive algorithms. Definition of Graphs, Finite & infinite graphs, Incidence & degree, Walks, paths and circuits, trees, their properties and fundamental circuits, cut-sets and cut-vertices, Euler, Hamiltonian path & circuit, planar graphs, colouring theorems, isomorphism of graphs.

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Kenneth, H. R., Discrete Mathematics and its Applications, 7 th Ed., Tata McGraw Hill,	2012
2.	Liu, C. L., Elements of Discrete Mathematics, Tata McGraw Hill	2007
3.	Johnsonbaugh, R., Discrete Mathematics, 6 th Ed., Maxwell Macmillan International	2006

ReferenceBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Mott, J.L., Kandel, A. and Baker, T.P., Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall India Pvt Ltd	2001
2.	Kolman, B., Busby, R. and Ross, S.C., Discrete Mathematical Structure, 6 th Ed., Pearson	2008

Course Code-18AM1210

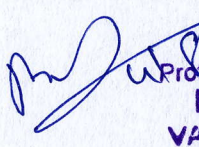
Course Name- Introduction to Computer Programming

L-T-P-S: 3-0-2-0

Credit: 4

Prerequisites: Computer Fundamentals, Computer Fundamentals, Programming through functional decomposition and Data hiding, Data structures. Dynamic binding and virtual functions, Polymorphism, Dynamic data in classes.

CO No:	Course outcomes	PO/PSO	PSO	BTL
CO 1	Introduction to basic computer organization and computer fundamentals. Introduction to Programming language fundamentals. Illustrate and use Control Flow Statements in C++.	PO1	PSO2	1
CO 2	Introduction to functions in C++ and Decomposition of programs through function.	PO1	PSO2	2
CO 3	Interpret & Illustrate user defined C++ functions and different operations on list of data.	PO1	PSO2,3	3
CO 4	Illustrate Object Oriented Concepts and implement linear data structures	PO1	PSO2	3
CO 5	Develop the code for the algorithms in C++	PO8	PSO3	

 **Dr. B.V. APPA RAO**
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

Syllabus:

Basic Computer Fundamentals: Introduction to computer systems; number system, integer, signed integer, fixed and floating point representations; IEEE standards, integer and floating point arithmetic; CPU organization, ALU, registers, memory, the idea of program execution at micro level. Basic Programming in C++: Input/output; Constants, variables, expressions and operators; Naming conventions and styles; C; Looping and control structures (while, for, do-while, break and continue); Arrays; File I/O, header files, string processing; Pre-processor directives such as #include, #define, #ifdef, #ifndef; Compiling and linking. Programming through functional decomposition: Design of functions, void and value returning functions, parameters, scope and lifetime of variables, passing by value, passing by reference, passing arguments by constant reference, recursive functions; Function overloading and default arguments; Library functions. Object Oriented Programming Concepts: Data hiding, abstract data types, classes, access control; Class implementation-default constructor, constructors, copy constructor, destructor, operator overloading, friend functions. Introduction to data structures, use of pointers in linked structures. Pointers: Pointers; Dynamic data and pointers, dynamic arrays. Object oriented design (an alternative to functional decomposition) inheritance and composition; Dynamic binding and virtual functions; Polymorphism; Dynamic data in classes.

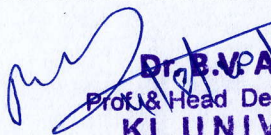
List of Lab Experiments:

Lab session No	List of Experiments	CO-Mapping
1	Write a program that enters a 10- digit telephone number (the first three digits refer to the area code, the next three digits refer to the exchange code, and the remaining four digits refer to number), prints the parts of the number and complete telephone number and addition of area code and exchange code in the following format.	CO1
2	The government of India passed a GO regarding tax payment and you have to develop a C program based on some conditions. If the income is less than 1,50,000 then no tax. If taxable income is in the range 1,50,001-3,00,000 then charge 10% of tax. If taxable income is in the range 3,00,001-5,00,000 then charge 20% of tax. If taxable income is in the range 5,00,001 above then charge 30% of tax. Calculate the amount of tax he/she has to pay.	CO1
3	https://www.hackerrank.com/challenges/staircase Consider value of $n = 5$: 1 2 3 4 5 2 3 4 5 6 3 4 5 6 7 4 5 6 7 8 5 6 7 8 9 Write a program that prints the above pattern for given n.	CO1
4	a) Write a C++ program to solve the second degree equation $aX^2 + bX + c = 0$ for any real a, b and c. b) Find the greatest and smallest of given 3 numbers	CO2
5	a) A company is having N no of employees. Calculate their net salary the with the following details of HRA,DA and TAX on basic salary. If basic salary is in between 80000 to 60000 then HRA = 30% DA = 20% Tax= 10% If the basic is in between 59000 to 40000 HRA = 25% (on basic) DA = 12% Tax= 8% If basic is below 39000 DA = 12% Tax= 8% For basic more than 80000 HRA = 30% (on basic) DA = 30% Tax= 20% b) Create a file named "inventory.dat" that stores item name,	CO2

	quantity and price for a single item. Write a program to read the values from the file and calculate bill amount and re write the same into the same file.	
6	a) Write a C++ program to read N values and get their mean and the standard deviation. b) Write a C++ program to perform binary search.	CO2
7	a). Write a C++ program to convert a given decimal number to binary using recursion b) Write an efficient function to return maximum occurring character in the input string e.g., if input string is "test" then function should return 't'.	CO3
8	a) Write a function <i>reverse(int n)</i> which reverses the digits of given number and returns the result. For Example, if n is 927 , it would return 729 b) Write a C++ program to perform different arithmetic operation such as addition, subtraction, and multiplication using inline function	CO3
9	a) Write a C++ program to swap two number by both call by value and call by reference mechanism, using two functions <i>swap_value()</i> and <i>swap_reference</i> respectively , by getting the choice from the user and executing the user's choice by switch-case. b). Create a class Student which has data members as name, branch, roll no, age ,sex ,marks in five subjects and display them.	CO3
10	a) Write a program to print the names of students by creating a Student class. If no name is passed while creating an object of Student class, then the name should be "Unknown", otherwise the name should be equal to the String value passed while creating object of Student class. b) Write a Program to design a class complex to represent complex numbers. The complex class should use an external function (use it as a friend function) to add two complex numbers. The function should return an object of type complex representing the sum of two complex numbers.	CO4
11	Write a program to overload unary operator ++ and – (prefix)	CO4
12	Create a base class <i>basic_info</i> with data members name ,roll no, sex and two member functions <i>getdata</i> and <i>display</i> . Derive a class <i>physical_fit</i> from <i>basic_info</i> which has data members height and weight and member functions <i>getdata</i> and <i>display</i> . Display all the information using object of derived class.	CO4

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	H.M. Deitel and P.J. Deitel. C++ How to Program. 8 th Ed., Prentice Hall.	2011
2.	B. Eckel. Thinking in C++ Volume 1 & 2. 2 nd Ed., Prentice Hall.	2003


DR. B. V. APPA RAO
 Prof & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWAREM - 522 302.

3.	I. Koren. Computer Arithmetic Algorithms. 2 nd Ed., A.K. Peters Ltd.	2001
4.	S.B. Lippman, J. Lajoie, and B.E. Moo. The C++ Primer. Addison-5 th Ed., Wesley Professional.	2012
5.	S. Oualline. Practical C++ Programming. 2 nd Ed., O'ReillyMedia.	2003

Reference Books:

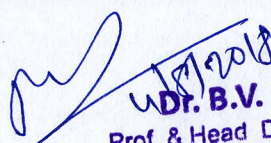
S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	S. Prata. C++ Primer Plus. 5 th Ed., Sams.	2004
2.	W. Stallings. Computer Organisation and Architecture: Designing for Performance. 7 th Ed., Prentice-Hall.	2005
3.	B. Stroustrup. The C++ Programming Language. Addison-3 rd Ed., Wesley.	1997
4.	R. Lafore. Object-Oriented Programming in C++.4 th Ed., Sams Publishing.	2001

Course Code-218AM2111
L-T-P-S: 4-0-0-0

Course Name- Partial Differential Equations
Credit: 4

Prerequisites: Formation of PDE, Classification of second order equation, Hyperbolic, Parabolic and Elliptic equations of separation of variables, Solutions in cylindrical and spherical equation, The maximum principle for the heat equation.

CO No.	Course Outcome (CO)	PO	PSO	Blooms Taxonomy Level (BTL)
CO1	Model the relevant phenomena as a Partial differential equations and obtain the solutions	PO2	PSO1	3
CO2	Understand the Nature of the higher order Partial differential equation and obtain the solutions	PO3,	PSO4	3
CO3	Express the Laplace equation in Various coordinate systems and solve by Fourier series method	PO1, PO5	PSO1	3
CO4	Solve the Hyperbolic and Parabolic differential equations by Separation of variable method	PO1, PO5	PSO1	3


Dr. B.V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

Syllabus:

Modelling with partial differential equations, Partial differential equations of first order, Cauchy problem, Linear first order P.D.E., Method of characteristics, Lagrange, Charpit's and Jacobi's method. Partial differential equation of second order, Classification of second order equation, Hyperbolic, Parabolic and Elliptic equations, Linear second order partial differential equations with constant coefficients. Elliptic Equations: Laplace equation in Cartesian, polar, spherical and cylindrical coordinates and its solution by Fourier series method, Poisson equation in 2D. Hyperbolic differential equations, One dimensional wave equation, Solution of the wave equation by separation of variables, d'Alembert's solution, Boundary and initial value problem of two dimensional wave equation. Parabolic differential equations, One dimensional diffusion equation, Boundary conditions; Dirichlet, Neumann and Robin type boundary conditions, Method of separation of variables, Solutions in cylindrical and spherical equation, The maximum principle for the heat equation.

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Zachmanoglou, E.C., Thoe, D.W., "Introduction to Partial Differential Equations with Applications", Dover Publications.	1986
2.	Sneddon, I. N., "Elements of Partial Differential Equations", McGraw-Hill Book Company.	1988
3.	Amarnath, T., "An Elementary Course in Partial Differential Equations", 2 nd Ed., Narosa Publishing House.	2012

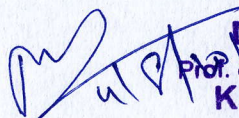
ReferenceBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Rao, K. S., "Introduction to Partial Differential Equations", 2 nd Ed., PHI Learning Pvt. Ltd.	2012
2.	Lawrence C. Evans, "Partial Differential Equations", American Mathematical Society	2010

Course Code-18AM2112**Course Name– Continuum Mechanics****L-T-P-S: 4-0-0-0****Credit: 4**

Prerequisites: Physical Properties of Fluids, Introduction to thermodynamics, Kinematics of Fluids, Stress in Fluids and Constitutive Equations and Conservation Laws, Incompressible Viscous Fluid Flows.

CO No	Course Outcome (CO)	PO	PSO	Blooms Taxonomy Level (BTL)
CO1	Concept of fluids, Continuum Hypothesis, Density, Specific etc Equation of State, First and Second Law of Thermodynamics and Clausius Inequality	PO2,	PSO1	3
CO2	Eulerian and Lagranges methods of Description of Fluids, Newtonian Fluids, Non	PO3,	PSO4	3


DR. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

	Newtonian Fluids, Visco elastic fluids			
CO3	Equation of conservation of Mass, Equation for the conservation of momentum, Equation for energy, Basic equations in different coordinate systems, Boundary conditions Vortex motion, velocity potential due to a vortex, velocity potential due to a vortex	PO1, PO5	PSO1	3
CO4	Flow between two parallel plates, Plane Couette flow, Plane Poiseuille flow, Flow over an inclined plane, Flow through circular pipe, Flow through an annulus, Flow between two porous plates, Unsteady flows, Unsteady flow over a flat plate, Unsteady flow between two parallel plates.	PO1, PO5	PSO1	3

Syllabus:

Physical Properties of Fluids: Concept of fluids, Continuum Hypothesis, Density, Specific Weight and Specific Volume, Pressure, Viscosity and Surface tension. Thermodynamics of Fluids: Introduction to thermodynamics, Equation of State, First Law of thermodynamics, Second Law of Thermodynamics and Clausius Inequality Kinematics of Fluids: Eulerian and Lagranges methods of Description of Fluids, Equivalence of Lagrangian and Eulerian Methods, Translation, Rotation and Deformation of Fluid Elements, Analytical Approach to Deformation, Stress - strain relations, Steady and unsteady flows, Stream Lines, Path Lines and Streak Lines. Stress in Fluids and Constitutive Equations: Stress tensor, Normal Stresses, Shear Stresses, Symmetry of Shear of Stress tensor, Newtonian Fluids, Non Newtonian Fluids, Purely viscous fluids, Reiner Rivlin Fluids, Power Law Fluids, Visco elastic fluids. Conservation Laws: Equation of conservation of Mass, Equation for the conservation of momentum, Equation for energy, Basic equations in different coordinate systems, Boundary conditions. Irrotational and Rotational Flows: Kelvin's minimum energy theorem, Gauss theorem, Bernoulli's equation and its application, 2D irrotational incompressible flows, D'Alembert's paradox, Flow due to a moving cylinder with circulation, Flow over an aerofoil, Vortex motion, velocity potential due to a vortex, velocity potential due to a vortex Incompressible Viscous Fluid Flows: Flow between two parallel plates, Plane Couette flow, Plane Poiseuille flow, Flow over an inclined plane, Flow of two immiscible fluids, Flow through circular pipe, Flow through an annulus, Flow between two porous plates, Plane Couette flow, Flow through convergent and divergent channels, Stagnant point, Unsteady flows, Unsteady flow over a flat plate, Unsteady flow between two parallel plates.

TextBooks:

1. S. Valsalan: Continuum Mechanics, Oxford & IBH Publishing Company
2. Goldstein : Classical Mechanics, Narosa Publications
3. R. K. Rath, An Introduction to Fluid Mechanics, Oxford & IBH Publishing Company
4. Fluid Mechanics : Frank M. White, Fluid Mechanics, McGraw Hill Publications

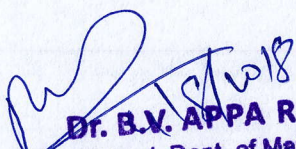
Course Code:18AM2113

Course Name-Data Structures

L-T-P-S: 3-0-2-0

Credit: 4

Prerequisites: Data structures, Arrays, Binary trees, General lists: Representations, operations, dynamic storage management, garbage collection, compaction. Minimum spanning tree, shortest path algorithm


DR. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESWARAM - 522 302.

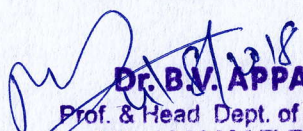
CO#	Course Outcome	PO/	PSO	BTL
CO1	Analyze and compare stack ADT and queue ADT implementations using linked list and applications.	PO1, PO4	PSO1, PSO2	4
CO2	Analyze the linked lists and types of Binary trees and their representations.	PO1, PO4	PSO1, PSO2	4
CO3	Apply measures of efficiency on algorithms and Analyze different Sorting Algorithms, Analyze the linked implementation of Binary, Balanced Trees and different Hashing techniques.	PO1, PO2	PSO1, PSO2	4
CO4	Analyze different representations, traversals, applications of Graphs and Heap organization.	PO2, PO4	PSO1, PSO2	4
CO5	Develop and Evaluate common practical applications for linear and non-linear data structures.	PO1, PO2	PSO1, PSO2	5

Syllabus:

Introduction to data structures. Arrays: One and two dimensional arrays, storage allocations. String representation. Implementation of abstract data types (ADT). Stacks: LIFO structure, push, pop, create, delete and empty stack. Queues: FIFO structure, operations on queues, priority queues, circular queues. Linear lists, list v/s array, internal pointer & external pointer, head, tail of a list, null list, length of a list. Linked Lists: nodes, linked list data structure, algorithms: insert, delete and retrieve node, create, search, print, append linked list, array of linked lists, header nodes, circularly-linked list, doubly linked list: insertion, deletion. Binary trees: definition, array, linked and threaded representations, traversal, (Pre, Post and Symmetric order), expression trees (Infix, Prefix and Postfix). Sorting: Selection sort, bubble sort, exchange sort, quick sort, heap sort and merge sort. Analysis of sorting techniques. Searching: sequential search, binary search, search trees AVL trees, M-way search trees, B trees, hash tables, hashing functions, collision resolution techniques. General lists: Representations, operations, dynamic storage management, garbage collection, compaction. Graphs: array and linked representation, operations: add, delete and find vertex, add, delete edge, traverse graph (depth-first, breadth-first). Networks: minimum spanning tree, shortest path algorithm (Dijkstra's algorithm and Kruskal's algorithm).

List of Lab Experiments:

Lab session No	Experiment	CO-Mapping
1	Traversal, Insertion, deletion in a linear array.	CU1
2	Stacks using arrays.	CO1
3	Linear Queue using arrays.	CO1
4	Circular Queue using arrays	CO1
5	Stacks and Queues using linked list.	CO1


DR. B.V. APPA RAO
 Prof. & Head, Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

6	Singly Linked circular List.	CO1
7	Doubly Linked List.	CO1
8	Polynomial Arithmetic using linked list.	CO1
9	Insertion sort, Exchange sort, Selection sort	CO2
10	Quick sort	CO2
11	Heap Sort.	CO2
12	Binary Tree Traversal (pre, post and symmetric order)	CO4
13	Sequential Search and Binary Search.	CO4
14	Binary Search Tree	CO4

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication/ Reprint
1	Langman, Y., Augenstein, M.; Tennenbaum A.M. Data Structure Using C and C++. Prentice Hall of India.	1998
2	Sahni S., Data Structures Algorithms and Applications in C++, McGraw Hill	2005
3	Dale N., C++ Plus Data Structures. Narosa Publications.	2000

ReferenceBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication/ Reprint
1.	Tenenbaum A. M., Data Structures Using C, Pearson Edn, India.	1990
2.	Kruse Robert L., Ryba Alexander J., Data Structures and Program Design in C++	1998

Course Code-18AM2114

Course Name- Functional Analysis

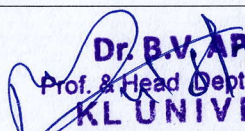
L-T-P-S: 4-0-0-0

Credit:4

Prerequisites: Fundamentals of metric spaces, Normed linear spaces, Banach spaces, Hilbert spaces

Contraction Mappings with examples, Banach–fixed point theorems and applications and Open mapping Theorem and applications.

CO Nu	Course Outcome (CO)	PO/PSO	PSO	Blooms Taxonomy Level (BTL)
CO1	Understand the concepts of Banach and Hilbert spaces and to learn to classify the standard examples. In particular, spaces of sequences and functions	PO2,	PSO1	3
CO2	learn to use properly the specific techniques for bounded operators over normed and Hilbert spaces	PO3,	PSO4	3


Dr. B.V. APPARAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

CO3	Explain the fundamental results in the theory with accuracy and proper formalism.	PO1, PO5	PSO1	3
CO4	Apply the spectral analysis of compact self-adjoint operators to the resolution of integral equations	PO1, PO5	PSO1	3

Syllabus:

Fundamentals of metric spaces, Completion metric spaces, normed spaces, Hölder inequality, Minkowski inequality and vector spaces with examples of ℓ_p and L_p spaces. Normed linear spaces, Banach spaces with examples, Convergence and absolute convergence of series in a normed linear space. Inner product spaces, Hilbert spaces, Relation between Banach and Hilbert spaces. Schwarz inequality. Convex sets, Existence and uniqueness of a vector of minimum length, Projection theorem. Orthogonal and orthonormal systems in Hilbert space with examples, Bessel's inequality, Parseval's identity, Characterization of complete orthonormal systems. Continuity of linear maps on normed linear spaces, Four equivalent norms on $B(N, N')$, Conjugate and Dual spaces, The Riesz Representation Theorem. Adjoint operators, self adjoint operators, normal operators, Unitary operators on Hilbert spaces (H) and their properties. Isometric isomorphism of H onto itself under Unitary operators and their importance. Projection operators on Banach spaces and Hilbert spaces. Orthogonal Projections. Contraction Mappings with examples, Banach-fixed point theorems and applications. The Closed Graph Theorem, The Uniform Boundedness Principle and its applications, The Hahn – Banach Extension and Separation Theorems, Open mapping Theorem and applications

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1	Simons, G. F., "Introduction to Topology and Modern Analysis", McGraw Hill.	2004
2	Debnath L. K. and Mikusinski P., "Introduction to Hilbert Spaces with Applications", Academic Press.	2005

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Bachman G. and Narici L., "Functional Analysis", Academic Press.	1972
2.	Ponnusamy S., "Foundation of Functional Analysis", Narosa Publication.	2002
3.	Jain P. K. and Ahuja O. P., "Functional Analysis", New Age International Publishers.	2010
4.	Nair, M. T., "Functional Analysis: A First Course", PHI Pvt. Ltd.	2004

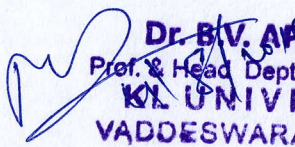
Course Code-18AM2101

Course Name- Technical Skill

L-T-P-S: 0-0-0-4

Credit: 1

Prerequisites: Calculus, Probability Distribution, Functions for fitting curves and surfaces to data, Linear programming (LP), mixed-integer linear programming (MILP), quadratic programming (QP), nonlinear programming.


Dr. B.V. ARPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VAODESWARAM - 522 302.

CO No	Course Outcome (CO)	PO/PSO	PSO	Blooms Taxonomy Level (BTL)
CO1	Apply MATLAB operators and functions for symbolic processing and solving equations	PO1,2	PSO1	3
CO2	Apply MATLAB functions and codes to fit discrete and continuous probability distributions and use statistical plots to evaluate goodness of fit.	PO1,2	PSO1	3
CO3	Apply MATLAB tools and codes for regression analysis and interpolation.	PO1,2	PSO1	3
CO4	Apply MATLAB tools and codes for solving linear and nonlinear programming problems.	PO1,2	PSO1	3

Syllabus:

Calculus, linear algebra, algebraic and ordinary differential equations, equation simplification, and equation manipulation using symbolic computation. Probability Distribution: Fit continuous and discrete distributions, use statistical plots to evaluate goodness-of-fit, compute probability density functions and cumulative distribution functions, and generate random and quasi-random numbers from probability distributions. Functions for fitting curves and surfaces to data. Exploratory data analysis, preprocess and post-process data, compare candidate models, and remove outliers. Regression analysis using the linear and nonlinear models. Non parametric modeling techniques, such as splines, interpolation, and smoothing. Functions for finding parameters that minimize or maximize objectives while satisfying constraints. Linear programming (LP), mixed-integer linear programming (MILP), quadratic programming (QP), nonlinear programming (NLP), constrained linear least squares, nonlinear least squares, and nonlinear equations.

Text books:

1. P. Mohana Shankar, Differential Equations: A Problem Solving Approach Based on MATLAB, CRC Press; 1 edition (23 May 2018).
2. Cesar Perez Lopez, MATLAB Optimization Techniques, Apress Academic, Springer, 2014.

Reference Books:

1. Xue, Dingyu and YangQuan Chen, Solving Applied Mathematical Problems with MATLAB, , CRC Press, Taylor & Frances, Boca Raton, 2009.
2. Nikolaos Ploskas and Nikolaos Samaras, Linear Programming Using MATLAB, 1 edition 2017, Springer.
3. Braselton J. Curve Fitting with MATLAB, LINEAR and NON LINEAR REGRESSION, INTERPOLATION, CreateSpace Independent Publishing Platform, 2016, USA.

Course Code-18AM2215

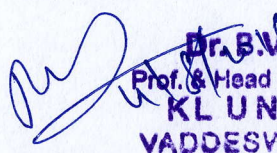
Course Name- Fluid Dynamics

L T P S: 1-0-0-0

Credit: 4

Prerequisites: Continuum hypothesis, forces acting on a fluid, Lagrangian and Eulerian descriptions, General equations of motion, Navier-Stokes equations and Dimensional analysis.

CO No	Course Outcome (CO)	PO	PSO	Blooms Taxonomy Level (BTL)
-------	---------------------	----	-----	-----------------------------


DR. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESARAM - 522 302.

CO1	Under stand irrotational flows, boundary surface, streamlines, path lines, streak lines, vorticity.	PO1,2	PSO1	2
CO2	Explain General equations of motion, in viscid case, Bernoulli's theorem,	PO1,2	PSO1	3
CO3	Develop energy equation, Dynamical similarity.	PO1,2	PSO1	3
CO4	Solve Momentum integral equations by Karman- Pohlhausen	PO1,2	PSO1	3

Syllabus:

Continuum hypothesis, forces acting on a fluid, stress tensor, analysis of relative motion in the neighborhood of a point. Euler's theorem, equation of continuity. Lagrangian and Eulerian descriptions, Continuity of mass flow, circulation, rotational and irrotational flows, boundary surface, streamlines, path lines, streak lines, vorticity. General equations of motion: inviscid case, Bernoulli's theorem, compressible and incompressible flows, Kelvin's theorem, constancy of circulation Stream function, Complex-potential, source, sink and doublets, circle theorem, method of images, Theorem of Blasius, Stokes, stream function, Motion of a sphere. Helmholtz's vorticity equation, vortex filaments, vortex pair. Navier-Stokes equations, dissipation of energy, diffusion of vorticity, Steady flow between two infinite parallel plates through a circular pipe (Hagen-Poiseuille flow), Flow between two co-axial cylinders, Energy equation, Dynamical similarity Dimensional analysis, large Reynold's numbers; Laminar boundary layer equations, Similar solutions; Flow past a flat plate, Momentum integral equations, Solution by Karman- Pohlhausen methods, impulsive flow Reyleigh problem, dynamical similarity Thermal boundary layer equation for incompressible flow; Temperature distribution in Couette flow and in flow past a flat plate. Introduction to Complex fluids.

TextBooks:

S. No.	Title/Authors/Publishers	Year of Publication/ Reprint
1.	Batchelor, G.K., "An Introduction to Fluid Dynamics", Cambridge Press.	2002
2.	Schlichting, H., Gersten K., "Boundary Layer Theory", Springer, 8 th edition.	2004

ReferenceBooks:

S. No.	Title/Authors/Publishers	Year of Publication/ Reprint
1.	Rosenhead, "Laminar Boundary Layers", Dover Publications	1963
2.	Drazin, P.G., Reid W. H., "Hydrodynamic Stability", Cambridge Press	2004

Course Code-18AM2216

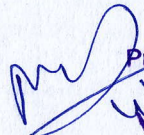
Course Name- Operations Research

L-T-P-S: 4-0-0-0

Credit: 4

Prerequisites: Introduction to linear programming, Simplex Method, Big – M Method, Two Phase Method, Revised Simplex Method, Duality Theory, Transportation Problems and Assignment Problems and Non-linear optimization.

CO No	Course Outcome	PO/PSO		Blooms
-------	----------------	--------	--	--------

 **Dr. B.V. APPA RAO**
Prof. & Head, Dept. of Mathematics
KJ Somaiya UNIVERSITY
VADDESWAREM - 522 302.

	(CO)		PSO	Taxonomy Level (BTL)
CO1	Solving LPP by Simplex Method, Big – M Method, Two Phase Method, Revised Simplex Method.	PO1,2	PSO1	3
CO2	Solve parametric LPP	PO1,2	PSO1	3
CO3	Solve Transportation and Assignment Problems	PO1,2	PSO1	3
CO4	Find the solution of non linear LPP	PO1,2	PSO1	3

Syllabus:

Introduction to linear programming: Convex Sets, Graphical Method, Simplex Method, Big – M Method, Two Phase Method, Revised Simplex Method Duality Theory, Dual Simplex Method, Sensitivity Analysis, Parametric Linear Programming Transportation Problems and Assignment Problems Non-linear optimization: Unconstrained and constrained optimization of several variables, Lagranges multipliers, Khun-Tucker theory, numerical methods for optimization.

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Taha, H.A., "Operations Research: An Introduction", MacMillan Pub Co., NY, 9 th Ed. (Reprint).	2013
2.	Mohan, C. and Deep, K., "Optimization Techniques", New Age India Pvt. Ltd, New Delhi.	2009
3.	Mittal, K.V. and Mohan, C., "Optimization Methods in System Analysis and Operations Research", New Age India Pvt. Ltd, New Delhi.	1996

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Ravindran, A., Phillips, D.T. and Solberg, J.J., "Operations Research: Principles and Practice", John Wiley and Sons, NY, 2 nd Ed. (Reprint).	2012
2.	Pant, J.C., "Introduction to Optimization/Operations Research", Jain Brothers, New Delhi, 2 nd Ed.	2012

ELECTIVE-I

Course Code - 18AM2011

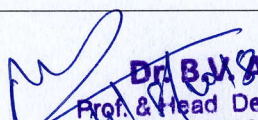
Course Name - Mathematical control theory

L-T-P-S: 4-0-0-0

Credit: 4

Prerequisites: Mathematical control theory, Controllability and observability for Linear and non linear systems, Stability of non-Linear systems and Optimal controllability.

CO No:	Course out come	PO/PSO	PSO	BTL
--------	-----------------	--------	-----	-----


DR. B. J. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

1	Develop conditions for the controllability and observability of the linear control systems and validate with suitable example.	PO1, PO2	PSO1	3
2	Obtain conditions for the controllability and observability for the nonlinear control systems and illustrate with suitable example.	PO1,	PSO1	3
3	Determine the stability for the linear and nonlinear control systems.	PO1,	PSO1	3
4	Solve the optimal control problems for linear and nonlinear control systems.	PO1,	PSO1	3

Syllabus:

Introduction Problems of mathematical control theory, Specific models. Controllability and observability for Linear systems Linear differential equations, The controllability matrix, Rank condition, Kalman decomposition and Observability. Controllability and observability for non-Linear systems Nonlinear differential equations, Controllability and linearization, Lie brackets, The openness of attainable sets and Observability. Stability of Linear systems Stable linear systems, Stable polynomials. The Routh theorem, Stability, observability, and Liapunov equation, Stabilizability and controllability. Stability of non-Linear systems The main stability test, Linearization, The Liapunov function method, La Salle's theorem Necessary conditions for stabilizability. Optimal controllability Bellman's equation and the value function. The linear regulator and stabilization, Impulse control problems, An optimal stopping problem. Iterations of convex mappings.

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Jerzy Zabczyk, Mathematical Control Theory: An Introduction, Birkhauser, Boston, Springer.	2008
2.	S.Barnett, R.G. Cameron, Introduction to mathematical control theory, Clarendon Press.	1985

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
3.	E.D.Sontag, Mathematical control theory: Deterministic finite dimensional systems, Springer.	1998
4.	John B. Baillieul, J.C. Willems, Mathematical control theory, Springer.	1999

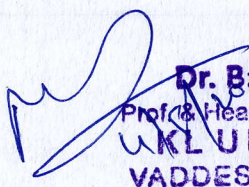
Course Code-18AM2012

Course Name- Statistical Inference

L-T-P-S: 4-0-0-0

Credit: 4

Prerequisites: Theory of Estimation, Principle of Data Reduction, Testing of Hypothesis and Analysis of Variance


Dr. B. V. APPA RAO
 Professor & Head, Dept. of Mathematics
UKL UNIVERSITY
 VADDESWAREM - 522 302.

CO No	Course Outcome (CO)	POS/PSOs	PSO	Blooms Taxonomy Level (BTL)
CO1	Obtain estimates of parameters and identify the various methods to estimate it.	PO1	PS02	3
CO2	Apply various principles for the data reduction and draw conclusion about the population based upon samples drawn from it	PO2	PS02	3
CO3	Describe the tests of significance and draw conclusion about the population and sample using various tests.	PO3	PS02	3
CO4	Testing the hypothesis to analyze the variance and also predict the linear relationship between the two variables	PO3	PS02	3

Syllabus:

Theory of Estimation: Basic concepts of estimation, Point estimation, , methods of estimation; method of moments, method of maximum likelihood; Unbiasedness, Minimum variance estimation, Cramer – Rao bound and its generalization, Rao Blackwell theorem, Existence of UMVU Estimators. Interval Estimation, Some results for normal population case. Principle of Data Reduction: Sufficiency principle, Factorization criterion, minimal sufficiency, Completeness and bounded completeness, Likelihood principle, Equivariance principle. Testing of Hypothesis: Null and alternative hypothesis, Type I and II errors error probability and power function, Method of finding tests, Neyman – Pearson lemma, Uniformly most powerful tests, Likelihood ratio principle, Likelihood ratio test, Sequential probability ratio test, Some results based on normal population. Analysis of Variance: one way classification; simple linear regression analysis with normal distribution.

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication/ Reprint
1	Miller, I. and Miller, M., "Freund's Mathematical Statistics with Applications", 7 th Ed., Prentice Hall PTR.	2006
2	Lehman, E.L., "Testing of Statistical Hypothesis", Wiley Eastern Ltd	1959
3	G. Casella, R. L. Berger, "Statistical Inference", Duxbury Press	2002

ReferenceBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication/ Reprint


Dr. B.V. APPA RAO
 Prof & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESWAREM - 522 302.

1.	Lehman, E.L., "Point Estimation", John Wiley & sons	1984
2.	Rohatgi, V.K., "Statistical Inference", Dover Publications	2011

Course Code-18AM2013

L-T-P-S: 3-0-2-0

Credit: 4

Course Name- Data Base Management systems

Prerequisites: Database Fundamentals, Relational Algebra & SQL, Database Design and Transaction Management & Recovery Techniques

CO#	Course Outcome	PO/PSO	PSO	BTL
CO1	Illustrate the functional components of DBMS, importance of data modelling in design of a database.	PO1, PO5,	PSO2	2
CO2	Build queries using SQL and concepts of PL/SQL	PO1,	PSO2	3
CO3	Apply normalization techniques and indexing to construct and access decent database.	PO5,	PSO1	3
CO4	Identify the importance of transaction processing, concurrency control and recovery techniques	PO1,	PSO4	3
CO5	Develop a good database and define SQL queries for data analysis	PO3,	PSO2	3

Syllabus:

Database Fundamentals: DBMS Characteristics & Advantages, Database Environment, Database Users, Database Architecture, Data Independence, Languages, Tools and Interface in DBMS, DBMS types. Data Modelling: ER Model, Notation used in ER Diagram, Constraint, Types, Relationships in ER Model and other considerations in designing ER diagram. Enhanced ER data Model, EER Diagram, Relational Model: concepts, constraints, schemas, ER to Relational Model. Relational Algebra & SQL: Relational Algebra :Operators in relational algebra, Data Definition and other languages in SQL, Creating tables and Data types, Constraints, DML statements, Functions and writing SQL statements using nested sub queries, complex queries, joining relations, views, compound statements, user defined functions, user defined procedures, cursors, Triggers. Database Design: Guidelines for good database design, Normalization- Normal Forms, First, Second, Third Normal Forms, BCNF, Multi value and join dependencies, 4th and 5th normal forms. File and storage structures: File storage, Index structures, Indexing and hashing, query processing and optimization. Transaction Management & Recovery Techniques: Transaction processing issues, Transaction states, problems during multiple transactions processing, ACID properties, system log and concurrency control techniques: Lock based techniques, and Timestamp based techniques, Multiversion based Techniques. Recovery concepts, shadow paging, ARIES.

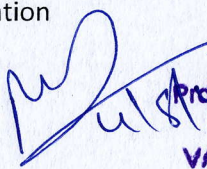
List of Lab Experiments:

Experiment - 1:

Introduction to DBS lab, Tools used in the lab (TerraER2.23 for ER diagrams, MYSQL5.7 server and client)

Experiment - 2:

Draw an ER diagram that captures this information about university database by considering the following information


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302.

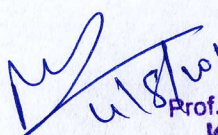
- Professors have an SSN, a name, an age, a rank, and a research specialty.
- Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
- Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
- Each project is managed by one professor (known as the project's principal investigator).
- Each project is worked on by one or more professors (known as the project's co-investigators).
- Professors can manage and/or work on multiple projects.
- Each project is worked on by one or more graduate students (known as the project's research assistants).
- When graduate students work on a project, a professor must supervise their work on the project.
- Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number, a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
- Graduate students have one major department in which they are working on their Degree.
- Each graduate student has another, more senior graduate student (known as a Student advisor) who advises him or her on what courses to take.
- Capture dependent details of the professor to offer medical insurance to their family.
- Capture information regarding the clients who sponsored projects to the professors.
- Capture information regarding the expenditure and income and details of the project along with PI details.

TextBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
1.	Ramez Elmasri and shamkant B Navathe, "Database Systems: Models, Languages, Design and Application Programming", 6 th Ed., Pearson Education.	2013
2.	CONNOLLY, Database Systems : A Practical Approach to Design, Implementation and Management, 6 th Ed., Pearson Education	Latest Edition
3.	A.Silberschatz Henry F Korth, S.Sudarsan, " Database System Concepts", 6 th Ed., Tata McGrawHill	2011

ReferenceBooks:

S. No.	Author(s) / Title/ Edition No./ Publisher	Year of Publication
--------	---	---------------------


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESWARAM - 522 302.

1.	Raghu RamaKrishnan , Johannes Gehrke, "Database Management Systems", 3 rd Ed., Tata McGraw Hill.	2014
2.	Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", 2 nd Ed., BPB Publications.	Latest Eddition
3.	C. J. Date, A. Kannan and S. Swamynathan, An Introduction to Database Systems, 8 th Ed., PearsonEducation.	2009

ELECTIVE-II

Course Code-18AM2021

Course Name- Fuzzy mathematics and applications

L-T-P-S: 4-0-0-0

Credit: 4

Prerequisites: Crisp set, Fuzzy set theory, Fuzzy relations, Fuzzy logic, switching functions and switching circuits, applications fuzzy methods in control theory.

CO No:	Course out come	PO	PSO	BTL
1	Understand cartesian Product of Crisp Sets Crisp Relations on Sets.	PO1, PO2	PSO1	2
2	Explain Concept on a Fuzzy Set.	PO1,	PSO1	2
3	Apply Projections of Fuzzy Relations and sets	PO1,	PSO1	3
4	Apply fuzzy methods in control theory	PO1,	PSO1	3

Syllabus:

CRISP SET THEORY: Introduction; Relations between Sets; Operations on Sets; Characteristic Functions; Cartesian Product of Crisp Sets; Crisp Relations on Sets. FUZZY SET THEORY: Introduction; Concept on a Fuzzy Set; Relations between Fuzzy Sets; Operations of Fuzzy Sets; Properties of the Standard Operations; Certain numbers Associated with a Fuzzy Set; Certain Crisp Sets Associated with a Fuzzy Set; Certain Fuzzy Sets Associated with a Given Fuzzy Set; Extension Principle. FUZZY RELATIONS: Introduction; Fuzzy Relations; Operations on Fuzzy Relations; α -Cuts of a Fuzzy Relation; Composition of Fuzzy Relations; Projections of Fuzzy Relations; Cylindrical Extensions; Cylindrical Closure; Fuzzy Relation on a Domain. FUZZY LOGIC: Introduction; Three-valued Logics; N -valued Logics $N \geq 4$; Infinite-valued Logics; Fuzzy Logics; Fuzzy Propositions and Their Interpretations in Terms of Fuzzy Sets; Fuzzy Rules and Their Interpretations in Terms of Fuzzy Relations. SWITCHING FUNCTIONS AND SWITCHING CIRCUITS: Introduction; Switching Functions; Disjunctive Normal Form; Relation between Switching Functions and Switching Circuits; Equivalence of Circuits; Simplification of Circuits. APPLICATIONS FUZZY METHODS IN CONTROL THEORY: Introduction to Fuzzy Logic Controller; Fuzzy Expert Systems; Classical Control Theory vs. Fuzzy Control; Illustrative Examples; Working of an FLC through Examples; Details of the Components of FLC; Mathematical Formulation of an FLC; Real-life Examples.


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADDESWAREM - 522 302.

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication
1.	M. Ganesh, Introduction to Fuzzy Sets and Fuzzy Logic, PHI.	2001
2.	G. J. Klir and B. Yuan , Fuzzy Sets and Fuzzy Logic theory and applications, PHI.	1997

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication
1.	T.J.Ross, Fuzzy Logic with engineering Applications, McGraw-Hill Inc.	1995
2.	H.J.Zimmerman, Fuzzy sets, Decision making and expert systems, Kluwer, Boston.	1987

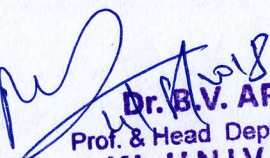
Course Code-18AM2022**Course Name- Advanced Numerical Analysis****L-T-P-S: 3-0-2-0****Credit: 4**

Prerequisites: Eigen values of a matrix, Initial value problems, inverse interpolation, Finite difference, Elliptic, Hyperbolic and parabolic PDE.

CO No:	Course out come	PO/PSO	PSO	BTL
1	Find of Eigen Values of a Matrix by using poer and Jacobi methods.	PO1, PO2	PSO1	3
2	Solve initial value problems.	PO1,	PSO1	3
3	Classify and solve PDE.	PO1,	PSO1	3
4	Apply Galerkins, Rayleigh-Ritz methods and their compatibility.	PO1,	PSO1	3

Syllabus

Computations of Eigen Values of a Matrix: Power method for dominant, sub-dominant and smallest eigen-values, Method of inflation, Jacobi, Givens and Householder methods for symmetric matrices, LR and QR methods. Initial Value Problems: Multistep methods, their error analysis and stability analysis. Inverse interpolation: Their developments and applications Finite Difference: Review of finite difference operators, finite difference methods. Elliptic PDE: Five point formulae for Laplacian, replacement for Dirichlet and Neumann's boundary conditions, curved boundaries, solution on a rectangular domain, block tri-diagonal form and its solution using method of Hockney, condition of convergence. Parabolic PDE: Concept of compatibility, convergence and stability, Explicit, full implicit, Crank Nicholson, du-Fort and Frankel scheme, ADI methods to solve two-dimensional equations with error analysis. Hyperbolic PDE: Solution of hyperbolic equations using FD, and Method of characteristics, Limitations and Error analysis. Weighted residual methods: Collocation, least squares, Galerkins, Rayleigh-Ritz methods and their compatibility.


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWARAM - 522 302.

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Gerald, C. F. and Wheatly P. O., "Applied Numerical Analysis", 6th Ed., Addison-Wesley Publishing	2002
2.	Smith, G. D., " Numerical Solution of Partial Differential Equations", Oxford University Press.	2001

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Jain, M. K., " Numerical Solution of Differential Equations", John Wiley.	1991
2.	Fausett, L. V., "Applied Numerical Analysis", Prentice Hall, 2nd Ed.	2007
3.	Froberg, C. E., "Introduction to Numerical Analysis", 2nd Ed., Addison Wesley.	2004

Course Code-18AM2023 Course Name- Design and Analysis of Algorithms

L-T-P-S: 3-0-2-0

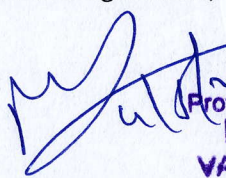
Credit: 4

Prerequisites: Pseudo code conventions, Performance analysis, Recurrence relations, Merger sort, Quick sort, Strassen's matrix multiplication method. Introduction to dynamic programming.

CO No:	Course out come	PO/PSO	PSO	BTL
1	Understand notions of algorithm, pseudo code conventions, Performance analysis, Time and space complexities, Asymptotic notation, Big oh notation, omega notation, theta notation,	PO1, PO2	PSO1	2
2	Solve the recurrence relations	PO1	PSO1	3
3	Develop the search algorithms.	PO1	PSO1	3
4	Apply naive string matching algorithm, The Rabin-Karp algorithm.	PO1	PSO1	3

Syllabus

Notion of algorithm, pseudo code conventions, Performance analysis, Time and space complexities, Asymptotic notation, Big oh notation, omega notation, theta notation, Average and worst case analysis, Probabilistic analysis, Amortized analysis. Recurrence relations, Divide and conquer relations, Solving of recurrences by iteration method and substitution method, Master theorem, Binary search algorithm, Merger sort, Quick sort, Strassen's matrix multiplication method. Greedy strategy, Huffman coding algorithm, Data structures of disjoint sets, Complexity analysis of Depth first search, Breadth first search, Prim's algorithm, Kruskal's algorithm, Dijkstra's and Bellman-Ford algorithms, Knapsack problem, Warshall's and Floyd's algorithms.


DR. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWAREM - 522 302.

Introduction to dynamic programming, Principle of optimality, Optimal binary search trees, Matrix-chain multiplication, Longest common subsequence. String matching, The naive string matching algorithm, The Rabin-Karp algorithm. Introduction to computability, Reducibility, Polynomial-time verification, NP-completeness, NP-complete problems.

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Cormen T. H., Leiserson C. E., Rivest R. L. and Stein C., "Introduction to Algorithms", Prentice Hall India, (3rd Edition)	2004
2.	Aho A. V., Hopcroft J. E. and Ullman J. D., "The Design and Analysis of Computer Algorithms", Pearson Education	2002

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Horowitz E., Sahni S. and Rajasekaran S., "Fundamentals of Computer Algorithms", Orient Longman	2006
2.	Kleinberg J. and Tardos E., "Algorithm Design", Pearson Education	2008
3.	Levitin A., "Introduction to the Design and Analysis of Algorithm", (2nd edition) Pearson Education	2003

ELECTIVE-III

Course Code-18AM2031

Course Name- Dynamical Systems

L-T-P-S: 4-0-0-0

Credit:4

Prerequisites: Periodic points, Itineraries, Invariant sets of one-dimensional maps and Periodic points of higher dimensional maps. Functions with several variables.

CO No:	Course out come	PO/PSO	PSO	BTL
1	Understand Periodic points, Itineraries , Invariant sets of one dimensional maps.	PO1, PO2	PSO1	2
2	Explain the functions with several variables	PO1,	PSO1	2
3	Apply limit sets, Chaotic Attractors, Lyapunov Exponents	PO1,	PSO1	3
4	Apply Periodic points of Higher Dimensional maps.	PO1,	PSO1	3

Syllabus:

Iteration of functions as dynamics: One dimensional maps. Functions with several variables Periodic points of one dimensional maps: Periodic points, Iteration using the graph, Stability of periodic points, Critical points and Basins, Bifurcation of periodic points. Itineraries for one-dimensional maps: Periodic points from transition


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

Graphs, Topological Transitivity, Cantor sets, Piecewise expanding maps and sub shifts, Applications
Invariant sets for one dimensional maps: Limit sets, Chaotic Attractors, Lyapunov Exponents Invariant measures, Applications.
Periodic points of Higher Dimensional maps: Dynamics of Linear maps, classification of periodic points, stable manifolds, Hyperbolic Toral automorphisms, Applications.

Textbook:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1	R. Clark Robinson, An Introduction to Dynamical Systems- continuous and discrete, Second Edition, AMS	2012

Referencebooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Anatole Katok, Introduction to Modern theory of Dynamical systems, Cambridge University press.	1997
2.	Boris Hasselblatt, Anatole Katok, First Course in Dynamics: with a Panorama of Recent Developments, Cambridge University press	2003

Course Code-18AM2032

Course Name- Number Theory

L-T-P-S: 4-0-0-0

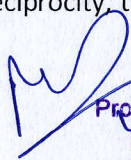
Credit: 4

Prerequisites: Divisibility, Euclidean algorithm, Linear Diophantine equations, solutions of linear congruences, Chinese Remainder Theorem, Euler's totient function, Euler-Fermat theorem, Wilson's theorem. Introduction to cryptography, public key cryptography, RSA.

CO No:	Course out come	PO/PSO	PSO	BTL
1	Under stand divisibility, Euclidean algorithm,, Fundamental theorem of arithmetic, Congruences, Chinese Remainder Theorem, Euler's totient function, Euler-Fermat theorem, Wilson's theorem.	PO1, PO2	PSO1	2
2	Identify the residue systems, Quadratic residues, quadratic reciprocity, the Jacobi symbols.	PO1,	PSO1	3
3	Develop the Mobius function and Mobius inversion formula, finite and infinite continued fractions.	PO1,	PSO1	3
4	Explain the concepts of cryptography, public key cryptography, RSA.	PO1,	PSO1	3

Syllabus:

Divisibility, Euclidean algorithm, Linear Diophantine equations, Prime numbers, Fundamental theorem of arithmetic, Prime number theorem (statement only). Congruences, solutions of linear congruences, Chinese Remainder Theorem, Euler's totient function, Euler-Fermat theorem, Wilson's theorem, non-linear congruences, Hensel's lemma, primitive roots and power residues. Polynomial congruences, Reduced residue systems. Quadratic residues, quadratic reciprocity, the Jacobi symbols. The greatest integer function, Arithmetic


DR. B. V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

functions, Mobius function and Mobius inversion formula. Finite continued fractions, infinite continued fractions, approximation to irrational numbers. Introduction to cryptography, public key cryptography, RSA.

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Niven I., Zuckerman H. S., and Montgomery H. L., "An Introduction to the Theory of Numbers", John Wiley & Sons (5th Ed.)	1991
2.	Hardy, G. H. and Wright, E. M., "An Introduction to the Theory of Numbers ", Oxford University Press (6th Ed.)	2008

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Burton D., M., "Elementary Number Theory", McGraw Hill (7th Ed.)	2010
2.	Andrews G. E., "Number Theory", Dover Publications	1994
3.	Koblitz N., A Course in Number Theory and Cryptography, Springer (2nd Ed.)	1994

Course Code-18AM2033

Course Name- Mathematical Modeling

L-T-P-S: 3-0-2-0

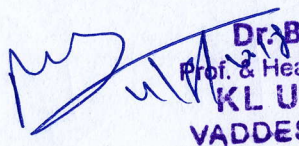
Credit: 4

Prerequisites: Merits and Demerits of Mathematical Modeling, Introduction to difference equations, Non-linear Difference equations, Introduction to Continuous Models, Carbon Dating, Fluid flow through a porous medium.

CO No:	Course out come	PO/PSO	PSO	BTL
1	Understand the Merits and Demerits of Mathematical Modeling.	PO1, PO2	PSO1	3
2	Solve linear , Non-linear Difference equations.	PO1	PSO1	3
3	Identify various mathematical models and solve them.	PO1	PSO1	3
4	Solve the wave equation, Vibrating string, Traffic flow problems	PO1	PSO1	3

Syllabus:

Mathematical Modeling, History of Mathematical Modeling, latest development in Mathematical Modeling, Merits and Demerits of Mathematical Modeling. Introduction to difference equations, Non-linear Difference


Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
 VADESWARAM - 522 302

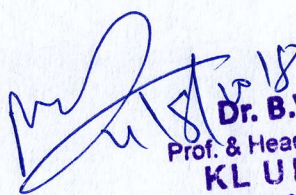
equations, Steady state solution and linear stability analysis. Introduction to Discrete Models, Linear Models, Growth models, Decay models, Newton's Law of Cooling, Bank Account Problem and mortgage problem, Drug Delivery Problem, Harrod Model of Economic growth, War Model, Lake pollution model, Alcohol in the bloodstream model, Arm Race models, Linear Prey-Predator models, Density dependent growth models with harvesting, Introduction to Continuous Models, Carbon Dating, Drug Distribution in the Body, Growth and decay of current in a L-R Circuit, Horizontal Oscillations, Vertical Oscillations, Damped Force Oscillation, Dynamics of Rowing, Combat Models, Mathematical Model of Influenza Infection (within host), Epidemic Models (SI, SIR, SIRS, SIC), Spreading of rumour model, Steady State solutions, Linearization and Local Stability Analysis, logistic and gomperzian growth, prey-predator model, Competition models. Fluid flow through a porous medium, heat flow through a small thin rod (one dimensional), Wave equation, Vibrating string, Traffic flow, Theory of Car-following, Crime Model, Linear stability Analysis: one and two species models with diffusion, Conditions for diffusive instability with examples.

TextBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1	Albright, B., "Mathematical Modeling with Excel", Jones and Bartlett Publishers.	2010
2	Marotto, F. R., "Introduction to Mathematical Modeling using Discrete Dynamical Systems", Thomson Brooks/Cole.	2006

ReferenceBooks:

S. No.	Name of Authors / Books / Publishers	Year of Publication/ Reprint
1.	Kapur, J. N., "Mathematical Modeling", New Age International	2005
2.	Barnes, B. and Fulford, G. R., "Mathematical Modelling with Case Studies", CRC Press, Taylor and Francis Group.	2009
3.	Edsberg, L., "Introduction to Computation and Modeling for Differential Equations", John Wiley and Sons.	2008

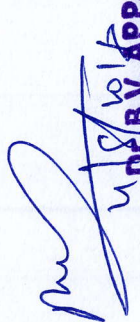

Dr. B.V. APPA RAO
 Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWAREM - 522 302.

S.No	Recommendations	Action taken	Name of the Programme	Department
1. Faculty				
1	Dr.B.V.Appa Rao, Professor, Dr.V.Vasanta Kumar, Professor, Dr.N.Srimanna ayana, Professor, Dr.V.B.V.N.Prasad, Professor, Dr.K.Prasad, Professor, Dr.G.V.Ramana Reddy, Professor and Dr.V.Hari Kiran, Professor suggested to introduce new program M.Sc.(Applied Mathematics) from 2018-19, as per the needs of market and contemporary industry requirements and hence it is resolved to introduce the same and forwarded to Academic Council for approval.	As per suggestions, in BOS also discussed and forwarded Academic Council for approval.	M.Sc.(Applied Mathematics)	Mathematics
2. Academic Peers				
1	Dr.Debaish Datta, Professor & HOD, Dept. of Mathematics, NIT, Warangal, recommend the M.Sc.(Applied Mathematics) program from the academic year 2018-19.	As per the suggestions, in BOS also discussed and forwarded to Academic Council for approval.	M.Sc.(Applied Mathematics)	Mathematics
3. Industry				
1	Mr.M.Mutyala Rao, Co-Scientist/ Engineer, Appl ed Mathematics Division, ISRo, Trivandrum, recommended Y18 Course Structure and to introduce Software Testing courses as they are good and need for current industry	As per suggestions, in BOS also discussed and forwarded to Academic Council for approval.	M.Sc.(Applied Mathematics)	Mathematics


Dr. B.V. APPA RAO
 Professor & Head, Dept. of Mathematics
KJ Somaiya UNIVERSITY
 VADDESWARAM - 522 302.

AAA:

Percentage Change in syllabus A.Y. : 2018-19								
S. No	Course Code	Course Title	Existing Syllabus	New Syllabus	Topics added/r emoved /replaced	Changes in Course Outcome(s)	Justification for no change in percentage of change in syllabus	Revision(%)
1				New Program				100%


DR. B.V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADDESWARAM - 522 302.

DAC MEETING AGENDA

DAC-2 meeting held on 3rd August, 2018 at 10.00 A.M.

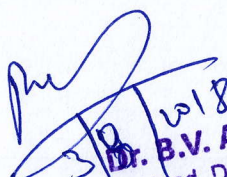
Venue: FED Conference Hall, K.L.E.F.

The following points were discussed in the Departmental Academic Committee meeting held on **03-08-2018** at 10.00 A.M.

AGENDA of the meeting: to discuss academic related issues & inclusion of new courses /disciplines in the department

As per the agenda, the following points were discussed. Based on the feedbacks taken from Stakeholders, it is reviewed and resolved the following items.

1. To **approve** M.Sc.(Applied Mathematics) program curriculum.
2. To approve the intake of M.Sc.(Applied Mathematics).
3. To approve the list of scholars admitted into Ph.D. program in Mathematics during July, 2018, their research guides, doctoral committees.
4. To revise the syllabus of Mathematics Electives.


3/8/2018
Dr. B.V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.

BOS Meeting (Preceding an Academic Year)

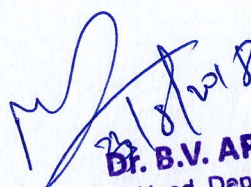
AGENDA and RESOLUTIONS

AGENDA ITEM-1

1. Confirmation of Minutes of the previous meeting of the Board of Studies	Approved
--	----------

AGENDA ITEM-2

Y18 regulation for M.Sc.(App.Maths)	Approved
-------------------------------------	----------


DR. B.V. APPA RAO
Prof. & Head Dept. of Mathematics
KL UNIVERSITY
VADESWARAM - 522 302.