Second Year
(3ʳᵈ & 4ᵗʰ Semester)

Curriculum Structure
For Lateral Entry

(Bridge Course)
(Common to All Branches)
2021-22

Semester III

(Common to All Branches)

Sl. No	Category Of Courses	Code No.	Course Title	Hours per week			Total contact hrs/week	Credits
				L	T	P		
1	Bridge Course-1	LBC 301	Mathematics- I	2	1	0	3	0
2	Bridge Course-2	LBC 302	Communication Skills in English	2	1	0	3	0
	Total Credits							0

Semester IV

(Common to All Branches)

Sl. No	Category Of Courses	Code No.	Course Title	Hours per week			Total contact hrs/week	Credits
				L	T	P		
1	Bridge Course-3	LBC 401	Mathematics- II	2	1	0	3	0
2	Bridge Course-4	LBC 402	Engineering Mechanics	2	1	0	3	0
	Total Credits							0

DETAILED SYLLABUS OF 3RD SEMESTER

Semester III

(Common to All Branches)

Sl. No	Category Of Courses	Code No.	Course Title	Hours per week			Total contact hrs/week	Credits
				L	T	P		
1	Bridge Course-1	LBC 301	Mathematics- I	2	1	0	3	0
2	Bridge Course-2	LBC 302	Communication Skills in English	2	1	0	3	0
	Total Credits							**0**

Mathematics I

Course Code	LBC – 301
Course Title	Mathematics – I
Number of Credits	0 (L:2, T: 1, P: 0)
Prerequisites	High School Level Mathematics
Course Category	Bridge Course

Course Outcomes: By the end of the course, the students are expected to

C.O.1: Categorize the necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis. (K4)
C.O.2: Identify the location of a complex number in Argand plane and carryout algebraic operations on complex numbers. (K4)
C.O.3: Determine values of large numbers having integral or non-integral powers. (K3)
C.O.4: Investigate the behavior of different types of functions. (K4)
C.O.5: Apply derivatives of different types of functions to solve problems. (K3)

Detailed Course Contents

Module – 1: Trigonometry

Number of Class hours: 10

Learning Outcomes:

1. Illustrate the concepts of Angle, distance, height with reference to different shapes, objects etc.(K3)
2. Uses of inverse trigonometric functions to calculate angles and inclinations under different situations. (K3)
3. Identify the relation between different trigonometric functions. (K4)

Detailed content of the unit:

1.1   Concept of angles, measurement of angles in degrees, grades and radians and their conversions.
1.2   Compound Angles and Associated Angles.
1.3   Transformation of sum or difference into products and products and products into sum or differences.
1.4   Multiple and Sub-multiple Angles.
1.5   Solution of Trigonometric equations (angles between 0 and 2π).
1.6   Inverse Circular Functions. Applications & simple problems.

Module – 2: Complex Number

Number of Class hours: 8

Learning Outcomes:

1. Recognize and define Cartesian and Polar form of complex number.(K4)
2. Identify the location of a complex number in Argand plane.(K4)
3. Use algebraic operations on complex numbers.(K3)

Detailed content of the unit:

2.1   Complex Numbers.
2.2   Conjugate complex number.
2.3   Geometric representation of a complex number.
2.4   Modulus and amplitude of a complex number – simple problems.
2.5   Polar form of a complex number – simple problems.
2.6   Rationalisation, addition and multiplication of complex numbers – simple problems.
2.7   Square root of a complex number – simple problems.
2.8   Cube root of unity – simple problems.
2.9   D'Moivre's Theorem – simple problems.

Module – 3: Binomial Theorem.

Number of Class hours: 8

Learning Outcomes:

1. Explain the Permutation and Combination of elements (similar and unique). (K4)
2. Identify and expand different types of binomial expressions.(k4)
3. Use Binomial Theorem to get values of large numbers having integral and rational powers.(K3)

Detailed content of the unit:

3.1   Permutations and Combinations: Factorial notation and basic principle of counting, definition and meaning of $^{n}P_r$ and $^{n}C_r$ – simple problems.
3.2   Binomial Theorem for positive integral index, general term, middle terms, co-efficient of x^n, terms independent of x^n , binomial theorem for any index (expansion without proof) first and second binomial approximation with application to engineering problems.

Module – 4: Function, Limit and Continuity.

Number of Class hours: 8

Learning Outcomes:

1. Identify different types of functions and their Domain and Range.(K4)

2. Solve limiting value of a function under different conditions.(K3)
3. Investigate the behavior of continuous and discontinuous functions.(K4)

Detailed content of the unit:

4.1 Function: Definition, types of functions, odd and even functions, periodic, composite, explicit, implicit and parametric functions. Increasing and Decreasing functions, Domain and Range of a function – simple problems.

4.2 Limit of a function: Definition, Standard limits, Left hand and Right hand limits, Evolution of limits – simple problems.

4.3 Continuity of a function: Definition, continuity of a real function at a point, testing of continuity – simple problems.

Module – 5: Differentiation

Number of Class hours: 12

Learning Outcomes:

1. Explain the meaning of differentiation.(K4)
2. Apply derivatives of different types of functions to solve problems.(K3)
3. Use 2nd order derivative to solve problems.(K3)

Detailed content of the unit:

5.1 Differential Coefficient.
5.2 Differentiation of some standard functions from first principles.

   $(x^n, \sin x, \cos x, \tan x, e^x \text{ and } \log_a x)$.
5.3 Differentiation of sum, product and quotient of function.
5.4 Differentiation of trigonometric and inverse trigonometric functions, Logarithmic functions, Exponential functions – simple problems.
5.5 Derivative of function of a function, implicit functions, parametric function. Logarithmic differentiation – simple problems.
5.6 Successive differentiation upto 2nd order – simple problems.
5.7 Physical meaning of derivative – Velocity and Acceleration – Maxima & Minima.

References:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. H.K.Dass, Advance Engineering Mathematics, S.Chand & Company Ltd, New Delhi.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018).
4. V.Sundaram, R.Balasubramanian, K.A.Lakshminarayanan, Engineering Mathematics, 6/e, Vikas Publishing House.

Communication Skills in English

Course Code	LBC – 302
Course Title	Communication Skills in English
Number of Credits	0 (L:2, T: 1, P: 0)
Prerequisites	Nil
Course Category	Bridge Course

Course outcomes:

At the end of this course, the participants will be able to

CO1: Develop conceptual knowledge of communication skill - K2

CO2: Demonstrate technical communication skills both in verbal and written format – K3

CO3: Apply the knowledge of soft skills for professional excellence – K3

CO4: Construct grammatically correct independent sentences and long texts – K3

CO5: Develop various life skills related to professional communication –K3

Unit-1 Communication: Theory and Practice (12 Marks)

Number of Class hours: 8

Learning Outcome:

i) Explain the basic concepts of communication skills –K1
ii) Analyse the factors of effective communication – K2
iii) Design the modes of technical communication – K3

Detailed Content

• **Basics of communication:**

Introduction, meaning and definition, process of communication etc

• **Types of communication:**

(Formal and informal, verbal, non-verbal and written Barriers to effective communication)

• **7 Cs for effective communication**

(Considerate, concrete, concise, clear, complete, correct, courteous)

• **Art of Effective communication** (Body Language)

(Choosing words, Voice Modulation, Clarity, posture and gestures)   C/H-2

• **Technical Communication.** (Types and examples)   C/H-6

Business Letters (written), telephonic conversations (oral)

Report Writing – Types, Structures, Data Collection, Content, Form

Writing a Proposal, Recommendation, Instruction

Unit-2 Soft Skills for Professional Excellence (12 Marks)

Number of Class hours: 8

Learning Outcome:

i)   Learn the importance of soft skills in one's personal and professional life –K2

ii)   Outline various life skills related to professional communication – K3

iii) Apply soft skills for professional excellence-K3

Detailed Content

• **Introduction:** Soft Skills and Hard Skills - Importance of soft skills   C/H-2

• **Life skills:** Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence, empathy etc

          C/H-2

• **Applying soft skills across cultures**

(Examples of beliefs and customs of community and ethnicity)   C/H-2

• **Case Studies**

(Examples of implementation of soft skill for professional success)   C/H-2

Unit-3: Reading Comprehension (12 Marks)

Number of Class hours: 8

Learning Outcome:

i) Comprehend a given text K2

ii) Analyse the content words- K2

iii) Restate the vocabulary to express in verbal and written communication.- K3

Detailed Content

Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:

Section-1 (Prose) C/H-4

Malgudi Days: R.K. Narayan

"Uncle Podger Hangs a Picture" Jerome K. Jerome

Section-2 (Poems) C/H-4

Night of the Scorpion by Nissim Ezekiel

Stopping by Woods on a Snowy Evening by Robert Frost

Where the Mind is Without Fear by Rabindranath Tagore

Ode to Tomatoes by Pablo Neruda

Unit-4: Professional Writing (12 Marks)

Number of Class hours: 10

Learning Outcome:

i) Write Business and personal letters –K3

ii)Develop précis out of a given text –K3

iii) Draft a written text meant for professional communication.-K3

Detailed Content

1. The art of précis writing

      C/H-2

2. Letters: personal and business

      C/H-2

3. Drafting e-mails, notices, minutes of a meeting, Memos

      C/H-2

4. Writing Proposals, Reports, Instruction.

      C/H-4

Unit-5: Vocabulary and Grammar (12 Marks)
Number of Class hours: 08

Learning Outcome:

    i)   Expand the vocabulary of commonly used words, Idioms and Phrases. – K1

    ii)Explain grammatical functions of words and punctuation marks – K2

    iii) Apply appropriate vocabulary and grammar in spoken and written language –K3

Detailed Content

1. **Vocabulary**:

Synonym and antonym of commonly used words (at least 20)

One-word substitution (at least 20)

Idioms and phrases (at least 20)

      C/H-2

2. **Remedial Grammar**

      C/H 4

Parts of speech, Determiners, Modals, degree of comparison, Subject-Verb Agreement

Voice (Active and Passive)

Sentence type and structure

(Types: declarative, interrogative, imperative, exclamatory, optative;

 Structure: simple, compound, complex)

Tenses (structure and example)

(Transformation of sentences without changing the meaning based on the grammatical functions)

3. **Punctuation** (functions and proper use of punctuation marks in written text)

  C/H-2

List of Recommended Study Materials:
Books
1. Wren and Martin, English Grammar and Composition,S Chand & Company Limited, New Delhi.

2. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Edition 2018)

3. M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.

4. Oxford Advanced Learner's Dictionary, OUP

5. Roget's Thesaurus of English Words and Phrases

6. English for Polytechnics by Dr Papori Rani Barooah (Eastern Book House Publishers)

7. Technical Communication, Meenakshi Raman & Sangeeta Sharma, Oxford University Press

8. Communication Skills, Pushplata, Sanjay Kumar, Oxford University Press

Web

1. Swayam MOOC. (English, communication skill and soft skill courses) www.swayam.gov.in

2. Malgudi Days (https://archive.org/details/NarayanRKMalgudiDays)
3. "Uncle Podger Hangs a Picture" Jerome K. Jerome

(https://docplayer.net/20977136-Uncle-podger-hangs-a-picture.html)

4. https://allpoetry.com

5. https://www.skillsconverged.com

6. https://learnenglishteens.britishcouncil.org

DETAILED SYLLABUS OF 4ᵗʰ SEMESTER

Semester IV

(Common to All Branches)

Sl. No	Category Of Courses	Code No.	Course Title	Hours per week			Total contact hrs/week	Credits
				L	T	P		
1	Bridge Course-3	LBC 401	Mathematics- II	2	1	0	3	0
2	Bridge Course-4	LBC 402	Engineering Mechanics	2	1	0	3	0
	Total Credits							0

Mathematics II

Course Code	LBC 401
Course Title	Mathematics – II
Number of Credits	0 (L:2, T: 1, P: 0)
Prerequisites	NIL
Course Category	Bridge Course

Course Outcomes:

On completion of the course, the students will be able to-

C.O.1: Solve different problems related to Matrices and Determinants for applications in various Engineering problems. (K3)

C.O.2: Evaluate integration of different functions for applications in the field of Engineering and their higher course of studies. (K5)

C.O.3: Identify the basic about geometry and realize that the coordinate geometry provides a connection between algebra and geometry through graphs of lines and curves. (K4)

C.O.4: Determine the amount of work done and the moment or torque on application of forces. (K5)

C.O.5: Solve differential equations and apply them in different Engineering problems. (K3)

Course Content:

Module - I: Determinants and Matrices

Number of Class hours: 10

Learning Outcomes:
1. Use Matrices for presentation of large data in an organised expression.(K3)
2. Applying algebraic operations on matrices under certain conditions.(K3)
3. Analysis and solution of system of linear equations.(K4)

Detailed content of the unit:
1) Definition & Expansion of determinants of order 2 & 3.
2) Elementary properties of determinants upto 3rd order.
3) Minors & Cofactors.
4) Consistency of equations, Crammer's rule.
5) Definition of a matrix of order m x n.
6) Types of matrices-null matrix, square matrix, diagonal matrix, identity matrix etc.
7) Symmetric and skew symmetric matrices.
8) Algebra of matrices-addition, subtraction, scalar multiplication, multiplication of matrices.
9) Inverse of a matrix
10) Matrix inverse method to solve a system of linear equations in 3 variables.

Module - II: Integral Calculus

Number of Class hours: 12
Learning Outcomes:
1) Explain the meaning of Integration.(K4)

2) Learn to use different methods of Integration.(K3)
3) Apply different properties of definite integral to solve problems.(K3)
4) Apply definite integral in calculation of area and volume.(K3)

Detailed content of the unit:

1) Concept of Integration: Integration as inverse operation of differentiation.
2) Fundamental Theorem of Integral calculus
3) Simple integration by substitution.
4) Integration by parts
5) Integration by partial fractions (for linear factors only).
6) Use of formulas $\int_0^{\frac{\pi}{2}} sin^n x\, dx$, $\int_0^{\frac{\pi}{2}} cos^n x\, dx$ and $\int_0^{\frac{\pi}{2}} sin^m x\, cos^n x\, dx$ for solving problems where m and n are positive integers.
7) Properties of definite Integral.
8) Applications of integration for - i). Simple problem on evaluation of area bounded by a curve and axes. ii). Calculation of Volume of a solid formed by revolution of an area about axes - Simple problems.

Module - III: Co-ordinate Geometry

Number of Class hours: 10
Learning Outcomes:
1) Identify and use of Cartesian and Polar co-ordinates. (K4)
2) Identify different forms of straight lines, there formation and some properties with respect to each other.(K4)
3) Analyzing different types of conic sections, their similarities and differences.(K4)

Detailed content of the unit:

1) Equation of straight line in various standard forms (without proof).
2) Intersection of two straight lines.
3) Angle between two lines.
4) Parallel and perpendicular lines.
5) Perpendicular distance formula.
6) General equation of a circle and its characteristics.
7) To find the equation of a circle, given: i) Centre and radius, ii) Three points lying on it and iii) Coordinates of end points of a diameter.
8) Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof.
9) Problems on conics when their foci, directories or vertices are given.

Module - IV: Vector Algebra

Number of Class hours: 8
Learning Outcomes:
1) Apply the concept of directed line segment or vector and various laws related to it.(K3)
2) Apply products of vectors and application of the product.(K3)

<u>Detailed content of the unit</u>:

1) Definition, different types of vectors, rectangular resolution of a vector.
2) Addition and subtraction of vectors.
3) Scalar and vector products of two vectors with properties.
4) Problems related to scalar & vector product.
5) Simple problems related to work, moment and angular velocity.

Module – V: Differential Equations

Number of Class hours: 10
 Learning Outcomes:
1) Identify different types of differential equation with respect to their order and degree.(K4)
2) Solve differential equations and apply them in different Engineering problems. (K3)

<u>Detailed content of the unit</u>:

1) Definition of ordinary differential equation, order & degree.
2) Solution of first order and first degree differential equation by i) variable separation method ii) homogeneous type, iii) exact type iv) Linear differential equation – simple problems.
3) Solution of 2nd order linear differential equation with constant coefficients - i) Evaluation of complementary functions, ii) Evaluation of Particular Integral(P.I) for exponential function, polynomial function, sine & cosine functions and functions of the form where V is any one of the above – simple examples.
4) MATLAB–Simple Introduction.

<u>References</u>:

1) B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, NewDelhi, 40 Edition, 2007.
2) G.B.Thomas, R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9 Edition, 1995. 3. S.S.Sabharwal, SunitaJain, Eagle Parkashan, Applied Mathematics, Vol.I&II, Jalandhar.
3) Comprehensive Mathematics, Vol.I & II by Laxmi Publications, Delhi.
4) Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi.

Engineering Mechanics

Course Code	LBC 402
Course Title	Engineering Mechanics
Number of Credits	0 (L:2, T: 1, P: 0)
Prerequisites	NIL
Course Category	Bridge Course

Course outcomes:

After completing this course, student will be able to:

C.O.1: Identify and determine the force systems for given conditions by applying the basics of mechanics (K2).

C.O.2: Determine unknown force(s) of different engineering systems (K3).

C.O.3: Apply the principles of friction in various conditions for useful purposes (K3).

C.O.4: Find the centroid and centre of gravity of various components in engineering systems (K2).

C.O.5: Analyze statically determinate Plane Trusses (K2).

Course Contents:

Unit – I Basics of mechanics and force system

No. of Lectures required: 5-8

Unit Learning Outcomes:

1. Identify flexible body and rigid body; Scalar and vector quantity (K1)
2. Recognize characteristics and effects of a force, Force system and its classification(K1)
3. Explain Orthogonal components and moment of a force(K2)
4. Determine resultant for concurrent, non-concurrent and parallel co-planar force systems(K2)

Contents:

Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.

Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.

Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem.

Composition of forces – Resultant, analytical method for determination of resultant for concur- rent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II Equilibrium

No. of Lectures required: 10-12

Unit Learning Outcomes:

1.   Express Conditions of Equilibrium (K2)

2.   Identify plane structures and support conditions (K1)

3.   Calculate Statically determinate Beam reaction subjected to combination of Point load and uniformly distributed load (K2)

4.   Apply graphical methods of analyzing Statically determinate Beam reaction(K3)

 Contents:

 Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium

 Lami's Theorem – statement and explanation, Application for various engineering

 problems. Types of beam, supports (simple, hinged, roller and fixed) and loads acting

 on beam (vertical
 and inclined point load, uniformly distributed load, couple),

 Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load.

 Beam reaction graphically for simply supported beam subjected to vertical point loads only.

Unit– III Friction

No. of Lectures required: 5-8

Unit Learning Outcomes:

1.   Relate laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction (K1)

2.   Apply conditions of Equilibrium of bodies on level surface subjected to force parallel and inclined to plane(K3)

3.   Apply conditions of Equilibrium of bodies on inclined plane subjected to force parallel to the plane only (K3)

 Contents:

Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, lim- iting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-effi- cient of friction and angle of friction.

Equilibriumofbodiesonlevelsurfacesubjectedtoforceparallelandinclinedtoplane.

Equilibrium of bodies on inclined plane subjected to force parallel to the planeonly.

Unit– IV Centroid and center of gravity
   No. of Lectures required: 8-10

Unit Learning Outcomes:

1.   Calculate Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)(K2)

2.   Determine Centroid of composite figures composed of not more than three geometrical figures (K2)

3.   Identify Centre of Gravity of simple Solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids (K2)

Contents:

Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)

Centroid of composite figures composed of not more than three geometrical figures

Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids.

Unit – V Trusses
No. of Lectures required: 10-12

Unit Learning Outcomes:

1.   Describe Static Determinacy, Indeterminacy, and Instability of Plane Trusses(K2)

2.   Determine Member forces by Method of joints(K2)

3.   Determine Member forces by Method of Section(K2)

Contents:

Assumptions for Analysis of Trusses, Arrangement of Members of Plane Trusses—Internal Stability,

Equations of Condition for Plane Trusses, Static Determinacy, Indeterminacy, and Instability of Plane Trusses

Analysis of Plane Trusses by the Method of Joints

Analysis of Plane Trusses by the Method of Sections

Suggested Learning Resources:

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi(2008)

2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. NewDelhi.

3. Engineering Mechanics, devised by Ural Federal Universityhttps://www.edx.org/course/engineering-mechanics-2.

4. Engineering Mechanics, By Prof. K. Rameshhttps://onlinecourses.nptel.ac.in/noc19_me41/preview.

5. Dhade, Jamadar &Walawelkar, Fundamental of Applied Mechanics, Pune VidhyarthiGruh.

6. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cam- bridge UniversityPress.

7. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

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