

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON



Syllabus of First Year Courses of Revised Curriculum (AY 2022-23 and onwards)

SH102R ENGINEERING CHEMISTRY

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week

Credits : 03

Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE

Total Marks : 100

ESE Duration : 3 Hrs.

FE ALL BRANCHES

COURSE DESCRIPTION

Engineering Chemistry is a one semester compulsory course for the B. Tech first year students of this institute.

The course is aimed for introducing the fundamentals of engineering chemistry to undergraduate students. The course provide knowledge to understand, remember and apply basic principles of engineering chemistry and their applications in different branches of engineering to solve engineering problems and to support their concurrent and subsequent engineering studies.

DESIRABLE AWARENESS / SKILLS

Knowledge of concepts and theory of basic Chemistry.

COURSE OUTCOMES

The concepts developed in this course will aid in the quantification of several concepts in chemistry. After completion of this course students will able to

1. Able to identify chemical behavior, mechanism, proportion and application of various lubricant.
2. Able to interpret various ways of corrosion to find remedy to overcome it.
3. Develop the synthesis, properties and applications of polymers for domestic and industrial application.
4. Identify various water sources. Know problems related to impurities in water to find out water softening processes. Find various energy sources and their properties.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2														
2		2													
3							1								
4							2								

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

Water Treatment

Definition of hard and soft water, Sources of water. classification of impurities, Hardness and its types, Units of hardness, Numericals, Determination of hardness of water by EDTA method, Numerical. Scale & Sludge formation in boiler, Priming & Foaming, Caustic Embrittlement. Water softening process – Zeolite process. Ion exchange and soda lime method numerical on soda lime method.

Corrosion – Definition, causes and consequences, corrosion prevention method. Cathodic and anodic protection, Design and material selection, protective surface coating hot dipping, cladding, electroplating, powder coating,

Lubricants

Introduction, Mechanisms of lubrication - Fluid film, Boundary film & Extreme pressure. Types of lubricants – Solid lubricants – Molybdenum disulphide, Graphite.

Liquid lubricants – Vegetable, Animal, Mineral & Synthetic oils. Semi solid lubricants – Greases, Lubricating Emulsions – Oil in water, Water in oil.

Properties of lubricants & its significance – Physical properties – Viscosity & Viscosity Index. Determination of viscosity by Redwood viscometer, Flash & Fire point by Pensky-Marten's apparatus, Cloud & Pour point.

Chemical properties – Acid value, Saponification value, Steam emulsification number

Polymers

Introduction, Classification of polymers, Mechanism of addition polymerization by free radical method. Preparation, properties & applications of – Polyethylene, Polystyrene, PVC, Nylon 66, Teflon. Polycarbonate, Polyurethane. Synthetic Rubber – preparation, properties & applications of – Styrene butadiene rubber (SBR), Nitrile rubber, Butyl rubber.

Fuels

Definition, Classification of fuels, Calorific value – Gross calorific value, Net calorific value, Different units of Calorific value & their inter-relation, Numerical. Types of fuels – Solid fuel – Coal – Proximate & Ultimate analysis of coal, Determination of calorific value by Bomb calorimeter, Numerical. Liquid fuel – Petroleum – origin, refining & Fractional distillation, Catalytic cracking – Fixed bed and Moving bed type. Gaseous fuel - preparation, properties and applications of – Coal gas, Water gas. Advantages and Disadvantages of solid, liquid and gaseous fuels.

Text Books

1. "Engineering Chemistry", P.C. Jain & M. Jain, Jain & Jain Publication 16th Edition 2015.
2. "A Text Book of Engineering Chemistry", S S Dara, S Chand & Co. Ltd.
3. Krishna, "Engineering Chemistry", B K Sharma, Prakashan Media (P) Ltd.
4. "Engineering Chemistry", B Sivasankar, Tata Mc Graw Hill (P) Ltd.
5. "Engineering Chemistry", B S Chauhan, University Science Press 2009, Third Edition.
6. "Engineering Chemistry", S K Singh, New Age International.
7. "A Text book of Engineering Chemistry", Shashi Chawla, Dhanpat Rai Publishing Co.
8. "Engineering Chemistry", first Edition Sunita Rattan, S.K. Katarina and Sons 2012.
9. Advanced Polymer Chemistry, M, Chanda 2nd Edition 2013.

Reference Books

1. "Polymer Science", V R Gowariker, New Age International.
2. "Fundamentals of organic chemistry", John Wiley & Sons Inc, Graham - Solomon T W.,
3. "Physical Chemistry", Alberty & Silbey, John Wiley & Sons Inc.
4. "Organic Chemistry", Morrison & Boyd, Prentice Hall of India, 6th Edition.
5. "Laboratory manual on Engineering chemistry", S K Basin, Sudha Rani, Dhanpat Rai Publishing Co.
6. "A Textbook on Experiment and calculation in Engineering Chemistry" S S Dara, S. Chand Publication

7. Organic Chemistry , S.H. Pine, Mcgraw Hill Education 5th Edition 2010.
8. Basic in Organic Chemistry, Cotton & Wilkinson, John Wiley Publication, 4th Edition 2011.
“Experiment in General Chemistry” East West Press, New Delhi

SH103R ENGINEERING CHEMISTRY LAB

Teaching Scheme : 02 P; Total: 02 hours/week

Credits : 01

Evaluation Scheme : 50 ICA

Total Marks : 50

FE ALL BRANCHES

COURSE DESCRIPTION

Lab Engineering Chemistry course provides knowledge about analysis of materials with various analytical techniques. It provides knowledge and hands-on practice of analysis, interpretation of result.

DESIRABLE AWARENESS / SKILLS

Concepts and theory of the course SH102R Engineering chemistry :

Awareness of basic handling of glassware and Instruments used in Chemistry laboratory.

COURSE OUTCOMES

After completion of this course students will be able to

1. Perform qualitative and quantitative determination of physical and chemical properties of lubricants for domestic and Industrial application.
2. Explain the objective of experiments, perform the experiments appropriately record the data and analyze the results with accuracy of precision.
3. Demonstrate excellent laboratory skills by use of relevant instruments.
4. Recognize the issue of safety regulation, ethical, societal, economical and environmental issues in the use of chemical in their laboratory work.

RELEVANCE OF COURSE OUTCOMES (COS) WITH POS AND PSOS

(WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2														
2		2													
3	1														
4		3													

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

Minimum 08 Experiments shall be performed to cover the entire curriculum of course SH-103R. The list given below is just a guideline.

List of Experiments

1. Determination of Acid Value of lubricant.
2. Determination of Saponification Value of lubricant.
3. Determination of Viscosity of lubricating oils by Redwood Viscometer.

4. Determination of Flash & Fire point of lubricant oil.
5. To Determination PH value of solutions by indicator, paper and by PH meter.
6. Preparation of Phenol Formaldehyde Resin (Bakelite).
7. Determine the yield percentage of Polystyrene by bulk polymerization.
8. Determination chloride content of water.
9. Determination of hardness of water by EDTA method.
10. Determination of alkalinity of water sample by titrimetry.
11. Determination of Viscosity by Ostwald's Viscometer.
12. Determination of Cloud & Pour point.
13. Chemical analysis of a salt.
14. Adsorption acetic acid of Charcoal.
15. Determination of surface tension and Viscosity coefficient.
16. Thin layer chromatography.
17. Determination of partition coefficient of a substance between two immiscible Liquids.
18. To verify Lambert Beer's Law calorimetrically.
19. Conductometric Titration of mixture of strong and weak acid with strong base.
20. To determine specific rotation and concentration of Dextrose solution using calorimeter.
21. To determine \wedge_{Max} of the solution by calorimeter.
22. Determination of cell constant of conductometer.

SH152R ENGINEERING PHYSICS

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week

Credits : 03

Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE

Total Marks : 100

ESE Duration : 3 Hrs.

FE ALL BRANCHES

COURSE DESCRIPTION

Engineering Physics is a one semester compulsory course for the B. Tech first year students of this institute.

The course is aimed for introducing the fundamentals of engineering Physics to undergraduate students. The course provides knowledge to understand, remember and apply basic principles of Physics and their applications in different fields of engineering to solve the engineering problems and to support their concurrent and subsequent engineering studies.

DESIRABLE AWARENESS / SKILLS

Knowledge of concepts and theory of basic Physics.

COURSE OUTCOMES

The concepts developed in this course will aid in the quantification of several concepts in physics.

After completion of this course students will able to

1. Analyze the intensity distribution and to apply optical phenomenon to design advanced optical instruments.
2. Apply Laser technology for engineering applications and LASER-material interactions.
3. Implement the concepts of quantum mechanics to nano-dimensional systems.
4. Employ the knowledge of semiconductors and magnetic materials to establish the structure-property relationship for material's engineering.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2														
2		2													
3			2												
4		2													

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

Interference and Diffraction

Interference due to thin film of uniform thickness; conditions of minima maxima, Newton's rings, Applications of interference.

Fraunhofer diffraction at a single slit; condition of maxima and minima, Plane diffraction grating (Diffraction at multiple slits) and applications based on diffraction.

Polarization

Polarization of light, linear, elliptical and circular polarization, quarter and half wave plate, Polarization by selective absorption; dichroism, Polarization by double refraction, Nicol prism, Optical activity and specific rotation, Fresnel's theory of optical rotation.

LASER

Introduction to laser, Laser and ordinary light, Laser beam characteristics, Spontaneous and stimulated emission of radiations, Population inversion, Pumping (Three level and four level pumping), Optical resonator, He-Ne Laser, Semiconductor Laser, Nd-YAG Laser, Engineering applications of Laser (Fiber optics, Laser material interaction).

Quantum Mechanics

Matter waves, de-Broglie's concept of matter waves, Properties of matter waves, Heisenberg's Uncertainty principle, Schrödinger's time dependent and time independent wave equations, Physical significance of wave function and expectation values. Applications of Schrödinger's equation; Motion of a free particle, Electron in an infinite deep potential well (rigid box), Electron in a finite deep potential well (non-rigid box), Concept of quantum tunneling, Linear Harmonic oscillator

Physics of Semiconductor and Magnetic materials

Band theory of solids, classification of solids on the basis of band theory, Fermi level and Fermi energy, band structure of p-n junction diode, conductivity of semiconductors, Hall effect. Applications of semiconductors

Introduction to magnetism, Magnetization and hysteresis curve, Magnetic materials and types (qualitative discussion), Ferrites; Hard and soft ferrites. Applications of magnetic materials.

Text Books

1. A text book of Engineering physics, Avadhanulu and Kshirsagar, S. Chand Pub.
2. A Text Book of Optics, N. Subramanyam & Brijlal; (Vikas Publishing House Pvt. Ltd).
3. LASERS Theory and Applications, K. Thyagarajan, A. K. Ghatak; Macmillan India Ltd.

Reference Books

1. Fundamentals of Optics, Francis A. Jenkins and Harvey E. White; Mc-Graw Hill International Edition.
2. Concepts of Modern Physics, Arthur Beiser; Tata McGraw – Hill Edition.
3. Modern Physics, Jeremy Bernstein, Paul M. Fishbane, Stephen Gasiorowicz; Pearson Education.
4. Quantum Mechanics, L. J. Schiff; Mc-Graw Hill International Edition.
5. PHYSICS (Volume I & II), Resnick Halliday and Krane; Wiley India 5th Edition.

SH153R ENGINEERING PHYSICS LAB

Teaching Scheme : 02 P; Total: 02 hours/week

Credits : 01

Evaluation Scheme : 50 ICA

Total Marks : 50

FE ALL BRANCHES

COURSE DESCRIPTION

Lab course of Engineering Physics provides hands on practice of understanding various principles of physics in order to encourage and enable students to apply the principles via practical for the design and development of innovative engineering systems.

DESIRABLE AWARENESS / SKILLS

Concepts and theory of Engineering Physics course (SH152R)

Basic awareness and sophisticated handling of instruments in Physics laboratory.

COURSE OUTCOMES

After completion of this course students will be able to

1. Perform qualitative and quantitative determination of physics principles.
2. Explain the objective of experiments, perform the experiments appropriately record the data and analyze the results with accuracy of precision.
3. Demonstrate excellent laboratory skills by use of relevant instruments.
4. Work effectively and safely in laboratory environment in teams as well as independently.

RELEVANCE OF COURSE OUTCOMES (COS) WITH POS AND PSOS

(WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		2													
2		2													
3			3												
4		2													

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

Minimum 10 Experiments shall be performed to cover the entire curriculum of course SH153R. The experiment list given below.

LIST OF EXPERIMENTS

1. Newton's rings
2. Wavelength by diffraction grating

3. Diffraction experiment with LASER
4. Cosine square law of Malus
5. Brewster's Law
6. Polarimeter
7. Characteristics of P-N junction diode
8. Ultrasonic interferometer
9. Experiment on Solar Cell
10. Experiment on Sound level
11. e/m by Thomson method
12. X-ray diffraction of materials
13. Hall effect

SH 104R : COMMUNICATION SKILLS

Teaching Scheme: 01L

Credit: 01

Evaluation Scheme: 15 MSE + 05 ISA+ 30 ESE

Total marks: 30

Duration of ESE : 02Hrs

COURSE DESCRIPTION :

This course provides knowledge about basic engineering physics to familiarize students with communication: An introduction, effective communication, verbal ability, oral communication, Entrepreneurial Skills, career skills

DESIRABLE AWARENESS/SKILLS :

Concept and theory of course Communication Skills

COURSE OUTCOMES :

On the successful completion of this course; students shall be able to

1. understand basic concepts and techniques of communication that are useful in developing the skills of communicating effectively.
2. Develop positive awareness and interest in language use and the function of each language in our context, which is a multilingual one.
3. Demonstrate proper techniques when communicating in writing.
4. improve fluency through regular practice and speaking drills.

RELEVANCE OF COURSE OUTCOMES [COS] WITH POS AND PSOS

[WITH A TRENGTH OF CO-RELATION] :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1		1	1										
2	2	1		1	1										
3	2	2	3		1										
4	1	2		1	1										

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

Communication: An Introduction:

Definition, nature and scope of communication, importance and purpose of communication, process of communication, types of communication.

Effective Communication:

Essentials of effective communication, skills of communication , barriers to Communication (listening, speaking, reading, and writing)

Verbal Ability :

Error Spotting - Basic Sentence Correction , The concept of word formation, Types of word formation, Use of prefixes and suffixes ,Basic Synonyms and Antonyms, Standard Abbreviations,Para-Jumble Error Spotting , Reading Comprehension.

Oral Communication:

Listening comprehension,Pronunciation,Intonation, Stress and Rhythm, Common everyday situations: conversations and dialogues, Communication at workplace

Entrepreneurial Skills :

Influencing, Negotiation Skills, Networking Skills, Personal Branding

Career Skills :

Resume building , Application Letter, Interview skills report, Letter Writing (formal and Informal), Notices, etc.

REFERENCE BOOKS:

1. Michael Swan, Practical English Usage, OUP.1995
2. F. T. Wood, Remedial English Grammar, Macmillan.2007
3. William Zinsser Harper, On Writing Well, Resource Book.2001
4. Liz Hamp – Lyons and Ben Heasley, Study Writing, Cambridge University Press.2006
5. Sanjay Kumar and Pushp Lata, Communication Skills, Oxford University Press.2011
Exercise in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press

SH 105R : COMMUNICATION SKILLS LAB

Teaching Scheme : 02 PR
Evaluation Scheme: 50 ICA
Duration of ESE : 00 Hrs

Credit: 01
Total marks: 50

COURSE DESCRIPTION:

It is a representative list of practical. The instructor may choose practical as per his requirements (so as to cover entire contents of the course) from the list. Ten practical should be performed to cover entire curriculum of course. The list given below is just a guideline.

COURSE OUTCOMES :

After completing this course, Students will able to -

- 1) use fluency in regular practice
- 2) use proper techniques when communicating in writing.
- 3) recognize and describe various communicative styles.
- 4) apply the basic concepts of communication skills

RELEVANCE OF COURSE OUTCOMES [COS] WITH POS AND PSOS

[WITH A TRENGTH OF CO-RELATION] :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1		1	1										
2	2	1		1	1										
3	2	2	3		1										
4	1	2		1	1										

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

1. Delivering a seminar or speech on the topic of speech mechanism.
2. To look up words in a dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics.
3. Introducing oneself, others and leave taking.
4. Exercises on use of different abbreviations.
5. Group Discussion,.
6. Resume writing.
7. Greetings for different occasions.
8. Report writing.
9. Observation of recorded seminar or speech delivered by student and suggestions for improvement.
10. Re-arranging jumbled words to make sentence.
11. Correction of errors.

GUIDELINES FOR ICA:

Internal continuous assessment should support for regular performance of practical by student and his/her regular assessment with proper understanding practical carried out

SH101R ENGINEERING MATHEMATICS-I

Teaching Scheme : 03 L + 01 T;

Credits : 04

Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE

Total Marks : 100

ESE Duration : 3 Hrs.

COURSE DESCRIPTION

SH101R: Engineering Mathematics-I is a compulsory course for the First Year Engineering students of all six discipline of the Institute. The main objective of this course is to enable the student to demonstrate, communicate, present, and apply the acquired skills in the language of Applied Mathematics in their respective fields of Engineering as well as to motivate and prepare for GATE and higher studies.

DESIRABLE AWARENESS / SKILLS

NCERT/Maharashtra State board syllabus of mathematics for 11th and 12th (Science)

COURSE OUTCOMES

On the successful completion of this course, student shall be able to

1. apply various tools and techniques of Linear algebra (Matrix algebra) and Complex Numbers to determine rank of a matrix, Eigen values, Eigen vectors, the matrix exponential, function of matrix, to determine powers and roots of Complex Numbers, logarithm of Complex Numbers, establish the relationship between the circular and hyperbolic functions etc. required for analytical studies in their respective disciplines
2. apply various tools and techniques of Differential calculus to approximate function of single variable using Taylor's and Maclaurin's series expansion/approximation, evaluate Indeterminate forms of limits, to find higher derivatives of product of functions required for mathematical calculations and analytical studies in their respective disciplines
3. apply the various mathematical tests for convergence analysis of Infinite Series required for mathematical calculations and analytical studies in their respective disciplines
4. approximate periodic functions in trigonometric Fourier Series required for analytical studies in their respective disciplines

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	1	1	3	1	2	1	2			
2	3	2	1	1	1	1	1	3	1	2	1	2			
3	3	2	1	1	1	1	1	3	1	2	1	2			
4	3	2	1	1	1	1	1	3	1	2	1	2			

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

Linear algebra:

Special matrices with Complex elements, Rank of a matrix, Systems of linear algebraic equations, Linear transformation, Orthogonal transformation, Orthogonal Matrix, Characteristic Polynomial, Cayley-Hamilton theorem, Powers of Matrices, The Matrix exponential, Function of Matrix, Eigen values, Eigen vectors.

Differential Calculus of Single variable

n^{th} order differentiation of some elementary functions, Leibnitz's theorem, Taylor's and Maclaurin's series expansion/approximation (of function of single variable) and Indeterminate forms of limits

Convergence of Infinite series

Comparison test, D'Alembert's ratio test, Raabe's Test, Absolute and conditional convergence of a infinite series; Uniform convergence of a infinite series;

Fourier series

Dirichlet's conditions; Fourier series approximation in intervals $[c, c + 2L], [0, 2L], [-L, L], [0, 2\pi], [-\pi, \pi]$, Half range Fourier series, Complex form of Fourier series

Complex Numbers

Powers and Roots of complex numbers, Functions of a Complex Variable, Exponential and Logarithmic Functions, Trigonometric and Hyperbolic Functions, Inverse Trigonometric and Hyperbolic Functions

Text Books

1. Calculus, Gregory Hartman et al. Virginia Military Institute, LiberTexts
2. Higher Engineering Mathematics, John Bird, 6th edition and onwards, Elsevier
3. Higher Engineering Mathematics, B.S. Grewal, 9th edition and onwards, Khanna Publication
3. Higher Engineering Mathematics N.P. Bali, Manish Goyal, 8th edition and onwards, Laxmi Publication, New Delhi
4. Engineering Mathematics, Ravish R Singh, Mukul Bhatt, 2nd edition Mc Graw Hill Edu.
5. Engineering Mathematics, A Foundation for Electronic, Electrical, Communications and Systems Engineers Anthony Croft, Robert Davison, James Flint, 5th edition Mary Attenborough," Newness
6. Mathematics for Electrical Engineering and Computing, 20th edition onwards, H. K. Das, S Chand Publication

Reference Books

1. Advance Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, Inc
2. Advance Engineering Mathematics, Micheal D. Greenberg, Prentice Hall
3. Advance Engineering Mathematics, K.A. Stroud, Dexter J. Booth, Palgrave Macmillan
4. Advance Modern Engineering Mathematics, Glyn James and David Burley, Dick Clements, Phil Dyke, John Searl, Nigel Jerry Wright, Pearson
5. Advance Engineering Mathematics, Dean G. Duffy, CRC press, and Taylor & Francis group
6. Advance Engineering Mathematics, S.S. Sastry, PHI Learning Education, Eastern Economy Edition 2009 onwards
7. Advance Engineering Mathematics, B.S. Grewal, Khanna Publication

8. Advance Engineering Mathematics, H.K. Dass, S. Chand Publication
9. Advanced Engineering Mathematics / Dennis G. Zill, Loyola Marymount University.
- 10 Description: Sixth edition. | Burlington, M.A: Jones & Bartlett Learning, 7TH edition
11. Advanced Engineering Mathematics, Peter V. O'Neil, CENGAGE LEARNING

Evaluation Methodology:

MSE: Mid Semester Examination will be based on 40 % of the syllabus

ESE: End Semester Examination will be based on 100 % syllabus

ISA: ISA will be based on any one or combination of following components-

- 1) Declared test
- 2) Surprise test
- 3) MCQ Test

Assignments/ Tutorial / Punctuality/ Attendance

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course

SH151R ENGINEERING MATHEMATICS-II

Teaching Scheme : 03 L + 01 T

Credits : 04

Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE

Total Marks : 100

ESE Duration : 3 Hrs.

COURSE DESCRIPTION

SH151R: Engineering Mathematics-II is a compulsory course for the First Year Engineering students of all six discipline of the Institute. The main objective of this course is to enable the student to demonstrate, communicate, present, and apply the acquired skills in the language of Applied Mathematics in their respective fields of Engineering as well as to motivate and prepare for GATE and higher studies.

DESIRABLE AWARENESS / SKILLS

NCERT/Maharashtra State board syllabus of mathematics for 11th and 12th (Science), SH101R: Engineering Mathematics-I

COURSE OUTCOMES

On the successful completion of this course, student shall be able to

1. transform Cartesian coordinates to spherical polar coordinates or cylindrical polar coordinates and apply the concepts of differential geometry to trace the simple plane curves;
2. apply the tools of Integral Calculus to evaluate improper integrals, definite integrals and multiple integrals to determine the values of physical quantities (length, area, volume, r. m. s. values) required for analytical studies in their respective disciplines
3. apply the various tools and techniques of Multi variable Differential Calculus to determine the values of higher order partial derivatives, maxima and minima of functions, required for analytical studies in their respective disciplines
4. apply the various tools and techniques of Vector Differential Calculus to determine/calculate Divergence and Curl of physical quantities, Directional derivatives, and apply properties of the vector differential operator ∇ ; required for analytical studies in their respective disciplines

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	1	1	3	1	2	1	2			
2	3	2	1	1	1	1	1	3	1	2	1	2			
3	3	2	1	1	1	1	1	3	1	2	1	2			
4	3	2	1	1	1	1	1	3	1	2	1	2			

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENT

Coordinate Systems and Differential geometry

Relations between Cartesian coordinate system, spherical polar coordinate system, and cylindrical polar coordinate system, Curvature, angle between radius vector and Tangent, Asymptotes, Curve tracing of plane curves (Simple Cartesian curves, parametric curves and polar curves)

Calculus of Special Functions

Some integral functions: Gamma function, Beta function, Error function;

Rule of differentiation under integral sign; Reduction formulae

Multivariable Integral Calculus

Double integration (Cartesian and Polar coordinates), Change of order of double integration.

Triple integration (Cartesian, spherical polar, cylindrical polar coordinates).

Change of order of Integration, The Average Value of function over the region R, Area bounded by plane curves, Volume Between the surfaces

Multivariable Differential Calculus:

Partial derivatives, Homogeneous functions and Euler's theorem, Composite Functions, Total derivative, Jacobian and Chain rule of Jacobian, Maximum and minimum points of a function of two variables, Maxima and Minima problems, Lagrange's multipliers

Vector Differential Calculus:

Scalar and vector point functions, Gradient of scalar point function, Directional Derivatives, Curl and Divergence of vector point functions. Solenoidal and irrotational force fields, properties of the vector differential operator ∇

Text Books

- 1 Calculus, Gregory Hartman et al. Virginia Military Institute, LiberTexts
- 2 Higher Engineering Mathematics, John Bird, 6th edition and onwards, Elsevier
- 3 Higher Engineering Mathematics, B.S. Grewal, 9th edition and onwards, Khanna Publication
4. Higher Engineering Mathematics N.P. Bali, Manish Goyal, 8th edition and onwards, Laxmi Publication, New Delhi
5. Engineering Mathematics, Ravish R Singh, Mukul Bhatt, 2nd edition Mc Graw Hill Edu.
6. Engineering Mathematics, A Foundation for Electronic, Electrical, Communications and Systems Engineers Anthony Croft, Robert Davison, James Flint, 5th edition Mary Attenborough," Newness
7. Mathematics for Electrical Engineering and Computing, 20th edition onwards, H. K. Das, S Chand Publication

Reference Books

1. Advance Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, Inc
2. Advance Engineering Mathematics, Micheal D. Greenberg, Prentice Hall
3. Advance Engineering Mathematics, K.A. Stroud, Dexter J. Booth, Palgrave Macmillan
4. Advance Modern Engineering Mathematics, Glyn James and David Burley, Dick Clements, Phil Dyke, John Searl, Nigel Jerry Wright, Pearson
5. Advance Engineering Mathematics, Dean G. Duffy, CRC press, and Taylor & Francis group
6. Advance Engineering Mathematics, S.S. Sastry, PHI Learning Education, Eastern Economy Edition 2009 onwards
7. Advance Engineering Mathematics, B.S. Grewal, Khanna Publication

8. Advance Engineering Mathematics, H.K. Dass, S. Chand Publication
9. Advanced Engineering Mathematics / Dennis G. Zill, Loyola Marymount University.
Description: Sixth edition. | Burlington, M.A: Jones & Bartlett Learning, 7TH edition
10. Advanced Engineering Mathematics, Peter V. O'Neil, CENGAGE LEARNING

Evaluation Methodology:

MSE: Mid Semester Exam will be based on 40-50% of the syllabus

ISA: ISA will be based on any one or combination of following components-

1. Declared test
2. Surprise test
3. MCQ Test

Assignments/Tutorial/Punctuality/Attendance

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.