

**Nagarjuna College of Engineering and Technology,
Bengaluru – 562 164**



An Autonomous College under VTU

**Scheme and Syllabus
2015 -16**

College of Engineering & Technology

Scheme of Study - First Semester – Physics Cycle

Sl. No	Subject Code	Subject	Teaching Dept	L-T-P-S (Hrs/week)	Total Credits	Marks
1.	15MAT11	Engineering Mathematics-1	MAT	3-2-0-4	5	100
2.	15PHY12	Engineering Physics	PHY	3-0-0-0	3	100
3.	15CEF13	Civil Engineering Foundation	CV	3-2-0-4	5	100
4.	15CED14	Computer Aided Engineering Drawing	ME	2-0-4-0	4	100
5.	15ELN15	Basic Electronics(IC)	EC	3-0-2-0	4	100
6.	15PHL16	Engineering Physics Lab	PHY	1-0-2-0	2	100
7.	15ENV17	Environmental Studies	CHE/CV	0-2-0-0	1	100
8.	15PDP18	Personality Development Programme	HSS	2-0-0-0	2	100
9.	15ENG19	Functional English (Mandatory)	HSS	1-0-0-0	-	-
Total				18-6-8-8	26	800

Scheme of Study - First Semester – Chemistry Cycle

Sl. No	Subject Code	Subject	Teaching Dept	L-T-P-S	Total Credits	Marks
1.	15MAT11	Engineering Mathematics-1	MAT	3-2-0-4	5	100
2.	15CHE12	Engineering Chemistry(IC)	CHE	4-0-2-0	5	100
3.	15CCP13	Computer Concepts & C Programming	CS/IS	3-0-0-0	3	100
4.	15MEF14	Mechanical Engineering Foundation (IC)	ME	3-0-2-0	4	100
5.	15ELE15	Basic Electrical Engineering(IC)	EC	3-0-2-0	4	100
6.	15CPL16	Computer Programming Lab	CS/IS	1-0-2-0	2	100
7.	15CPH17	Constitution of India, Professional ethics and Human rights	HSS	0-2-0-0	1	100
8.	15CSD18	Communication Skill Development	HSS	2-0-0-0	2	100
9.	15KAN19	Kannada language (Mandatory)	HSS	1-0-0-0	-	-
Total				20-4-8-4	26	800

IC – Integrated Course

L – Lecture

T-Tutorials

P-Practical

S – Self Study

Scheme of Study – Second Semester – Physics Cycle

Sl. No	Subject Code	Subject	Teaching Dept	L-T-P-S (Hrs/week)	Total Credits	Marks
1.	15MAT21	Engineering Mathematics-1	MAT	3-2-0-4	5	100
2.	15PHY22	Engineering Physics	PHY	3-0-0-0	3	100
3.	15CEF23	Civil Engineering Foundation	CV	3-2-0-4	5	100
4.	15CED24	Computer Aided Engineering Drawing	ME	2-0-4-0	4	100
5.	15ELN25	Basic Electronics(IC)	EC	3-0-2-0	4	100
6.	15PHL26	Engineering Physics Lab	PHY	1-0-2-0	2	100
7.	15ENV27	Environmental Studies	CHE/CV	0-2-0-0	1	100
8.	15PDP28	Personality Development Programme	HSS	2-0-0-0	2	100
9.	15ENG29	Functional English (Mandatory)	HSS	1-0-0-0	-	-
Total				18-6-8-8	26	800

Scheme of Study - Second Semester – Chemistry Cycle

Sl. No	Subject Code	Subject	Teaching Dept	L-T-P-S	Total Credits	Marks
1.	15MAT21	Engineering Mathematics-1	MAT	3-2-0-4	5	100
2.	15CHE22	Engineering Chemistry(IC)	CHE	4-0-2-0	5	100
3.	15CCP23	Computer Concepts & C Programming	CS/IS	3-0-0-0	3	100
4.	15MEF24	Mechanical Engineering Foundation (IC)	ME	3-0-2-0	4	100
5.	15ELE25	Basic Electrical Engineering(IC)	EC	3-0-2-0	4	100
6.	15CPL26	Computer Programming Lab	CS/IS	1-0-2-0	2	100
7.	15CPH27	Constitution of India, Professional ethics and Human rights	HSS	0-2-0-0	1	100
8.	15CSD28	Communication Skill Development	HSS	2-0-0-0	2	100
9.	15KAN29	Kannada language (Mandatory)	HSS	1-0-0-0	-	-
Total				20-4-8-4	26	800

IC – Integrated Course

L – Lecture

T-Tutorials

P-Practical

S – Self Study

Engineering Mathematics - 1

Course Code	: 15MAT11	L:T:P:S	Credits	: 5
Exam marks	: CIE: 50 SEE: 50	3:2:0:4	Exam Duration	: 3 hours

Course Objectives:

- The course is aimed at developing the basic mathematical skills of engineering students for effective understanding of engineering subjects.
- To develop the ability of mathematical modeling of systems using differential equations.
- To introduce the concept of Vector differentiation.
- To expose the students with the concept of linear algebra in solving system of equations

Syllabus:

Module -I

Differential Calculus-I : Determination of nth order derivatives of standard functions-problems. Leibnitz theorem for nth order derivative of product of two functions (without proof)-problems. Taylor's and Maclaurin's series for functions of one variable-(statements only)- problems. Polar curves-angle between radius vector and tangent, length of the perpendicular from pole on the tangent , angle between two curves-problems, pedal equations for polar curves-problems
***Indeterminate forms-L'Hospitalrule (statement only)-problems .** 8hrs

Module -II

Differential Calculus-II : Derivative of arc lengths in Cartesian , parametric and polar forms(without proof)-problems. Curvature and Radius of Curvature in Cartesian , parametric, polar and pedal forms-problems. Partial derivatives basic problems, total derivatives, partial derivatives of composite functions-problems
***Jacobian definition and problems.** 8hrs

Module -III

Vector Calculus and Applications: Scalar and vector point functions and their differentiations, vector differential operator ∇ , gradient, directional derivative, divergence, curl, solenoidal and irrotational vectors and Laplacian.
Integral Calculus : Evaluation of the reduction formula $\int \sin^n(x)dx$, $\int \cos^n(x)dx$, $\int_0^{\pi/2} \sin^n(x)dx$, $\int_0^{\pi/2} \cos^n(x)dx$ where n is a positive integer. Reduction formula for $\int_0^{\pi/2} \sin^m(x)\cos^n(x)dx$, where m and n are +ve integers (without proof) – problems

***Leibnitz's rule for differentiation under the integral sign- standard problems** 8hrs

Module -IV

Differential equations and its applications: Solutions of ordinary differential equations of first order and first degree:-Bernoulli's equations, Exact differential equations, equations reducible to exact equations:- Integrating factor of homogeneous equation, Integrating factor of the equation $f_1(x,y).y dx + f_2(x,y).x dy = 0$, Integrating factor of the equation $Mdx + Ndy = 0$ if $\frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right) = f(x)$ and $\frac{1}{M} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right) = -g(y)$.
Applications of Differential equations:- Orthogonal trajectories, Newton's law of cooling.
***Flow of electricity and laws of decay and growth.** 8hrs

Module - V

Linear algebra : Rank of the matrix by elementary transformations, solutions of system of linear equations- Gauss elimination method and Gauss seidel method. Linear transformations and orthogonal transformations.

Eigen values and Eigen vectors of a square matrix – problems. Rayleigh's power method to find the largest Eigen value and corresponding Eigen vector – problems.

***Cayley-Hamilton theorem (statement only) – problems.**

8hrs

Course Outcomes:

On Completion of this course the students are able to:

- Find the nth derivative of the functions of single variable and product of two functions.
- Evaluate situations where polar curves and multivariable functions are involved.
- Apply the vector and scalar operators in solving fluid flow and electric field applications.
- Formulate the mathematical models for engineering applications.
- Obtain the solution of system of linear equations.
- Evaluate the integrals of higher powers using the reduction formulae.

Text Books:

1. B.S. Grewal, "**Higher Engineering Mathematics**", Khanna publishers.
2. N.P.Bali and Manish Goyal, "**A text book of Engineering mathematics**", Laxmi publications.

Reference Books:

1. Erwin Kreyszig, "**Advanced Engineering Mathematics**", Wiley.
2. B.V. Ramana, "**Higher Engineering Mathematics**", Tata Mc Graw-Hill.
3. H.K.Dass and Er. Rajnish Verma, "**Higher Engineering Mathematics**", S.Chand Publishing.

E-Resources:

1. <http://bookboon.com/en/essential-engineering-mathematics-ebook>
2. <https://www.free-ebooks.net/ebook/essential-engineering-mathematics>
3. www.zums.ac.ir/.../ebooks/mathematics/essential-engineering-mathematic.
4. <https://archive.org/details/AdvancedEngineeringMathematics10thEdition>

***Self Study Topics to be study by the students and submit the report to the department**

Engineering Physics

Course Code : 15PHY12/22	L:T:P:S	Credits : 3
Exam marks : CIE: 50 SEE: 50	3:0:0:0	Exam Duration : 3 hours

Course Objectives:

- Explain the concepts of Laser and its applications in various fields.
- Expose the students to the areas of solid state physics and quantum mechanics.
- Enrich the students with the knowledge of Optical fibers and semiconductors.
- To give an insight into the emerging field of nano science and nano technology.
- Educate students to think and participate deeply, creatively and analytically in emerging areas of modern physics.

Syllabus:

Module - I

Laser: Interaction of radiation with matter (induced absorption, spontaneous emission and stimulated emission), Einstein coefficients, Expression for Energy density. Requirements of lasing system, Condition for Laser action (meta stable state, population inversion). Construction and working of Nd-YAG laser. Applications of laser. Basic Principle of Holography, recording and reconstruction of Image on hologram. Applications of holography.

8 hrs

Module – II

Crystal Structure: Space lattice, Bravais lattice, Unit cell, Primitive cell, Lattice parameters. Seven Crystal systems, Miller indices. Expression for inter-planar spacing in terms of Miller indices. Atomic packing factor for Simple Cubic, BCC & FCC. Crystal structure of Diamond. Quartz crystal and its applications. Bragg's law, Determination of wavelength of X-rays using Bragg's X-ray spectrometer.

7 hrs

Module - III

Quantum Mechanics: Wave Particle dualism, de Broglie hypothesis. Matter waves. Davission –Germer Experiment. Heisenberg's uncertainty principle and its application (Non-existence of electron in nucleus). Wave function, Properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one dimensional time independent Schrodinger's wave equation. Eigen values and Eigen functions. Applications of Schrodinger's wave equation. Energy Eigen values and Eigen functions for a particle in one dimensional potential well of infinite height.

8hrs

Module –IV

Optical Fibers: Principles of optical fiber, Angle of acceptance, Numerical aperture (derivation), Types of Optical fibers. Attenuation, Applications of Optical Fiber Communication.

Semiconductors: Classification of solids based on energy gap. Intrinsic and extrinsic semiconductors. Expression for electrical conductivity of semiconductors (intrinsic and extrinsic semiconductors). Hall Effect and Hall Co-efficient.

8hrs

Module V

Science of Nano materials: Introduction. Quantum structures. Variations of density of states with energy for different quantum structures (qualitative). Synthesis of nano materials - Top down and bottom up approach. Synthesis of nano materials -Ball Milling method. Carbon nano-tubes, Synthesis of carbon nano tubes-Arc discharge method. Properties and Applications.

Elasticity: Introduction. Stress, Strain, Hooke's law, Young's modulus, bulk modulus, Rigidity modulus (qualitative), Poisson's ratio. Experimental determination of Young's modulus of a rectangular bar as single cantilever beam.

8 hrs

Course Outcomes:

The students will,

- Demonstrate the knowledge and comprehension of the basic and applied fields of physics.
- Understand the utilization of laser technology and optical fibers in various disciplines.
- Apply the knowledge of Crystal structure to study various engineering materials.
- Gain knowledge about quantum mechanics.
- Recognize the mechanical properties of materials.
- Learn the basic concepts of semiconductors and nano materials.

Text Books:

1. Prof. S P Basavaraju ,“Engineering Physics” Subhas Stores, Bangalore-2,2014.
2. R K Gaur and S L Gupta, “Engineering Physics”,Dhanpat Rai Publications, New Delhi-2008.
3. Dr.M N Avadhanulu,Dr. P G Kshirsagar, “Text Book of Engineering Physics”,S Chand Publishing,New Delhi-2012.

Reference Books:

1. Wiley Precise Text, “Engineering Physics”, Wiley India Private Ltd, New Delhi. Book Series-2014.
2. S. O. Pillai” Solid State Physics” New Age International Sixth Edition.
3. V Rajendran, “Engineering Physics”, Tata McGraw Hill Company Ltd, New Delhi-2012.
4. A Marikani, “Engineering Physics”, PHI Learning Private Limited Delhi-2013.
5. S Mani Naidu, “Engineering Physics”, Pearson India Limited-2014.

E- resources:

1. Atomic and Laser physics by A M FOX. http://www.mark-fox.staff.shef.ac.uk/PHY332/phy332_notes.pdf
2. Quantum Mechanics by S H Patil, <http://nptel.ac.in/courses/115101010/>

NAGARJUNA
College of Engineering & Technology

Civil Engineering Foundation

Course Code	: 15CEF13/23	L:T:P:S	Credits	: 5
Exam marks	: CIE: 50 SEE: 50	3:2:0:4	Exam Duration	: 3 hours

Course Objectives:

- To impart the basic knowledge of civil engineering.
- To expose the student to different types of infrastructure and smart city concepts.
- To study the force/force systems on an object/structural element under static conditions.

Syllabus:

Module - I

Introduction to Civil Engineering: Introduction, scope of different fields of civil engineering-surveying, Building materials, Construction technology, geotechnical engineering, Structural engineering, Hydraulics, Water resources and irrigation engineering, transportation engineering, environmental engineering.

Types of Infrastructure: Types of infrastructure, Role of civil engineers in the infrastructural development, effect of infrastructural facilities on socio-economic development of a country.

Roads: Classification of roads and their functions, Comparison of flexible and rigid pavements (advantages & limitations)

Bridges: Types of bridges and culverts, RCC, Steel and composite bridges.

Dams: Different types of dams based on material, structural behaviour and functionality with simple sketches.

Building Materials- Bricks & Blocks, Classification & Quality Building Stones, properties & their uses. Cement – Types of Cement. Steel-different types, Concrete- Ingredients of Concrete-Grade of Concrete

8 Hours

Module -II

Prefabricated structures: Comparison with monolithic construction, Advantages and limitations, applications. **Construction safety:** Importance, Construction safety measures. **Smart Cities:** Concept, Features, Advantages and limitations, Bye laws: Necessity, Basic bye laws.

Introduction to Civil Engineering Mechanics: Basic idealizations of Particle, Continuum and Rigid Body & Its Characteristics. Types of Forces, Classification of Force System. Principle of Physical Independence of Forces, Principle of Transmissibility of Forces. Introduction to SI Units, Couple, Moment of a Couple. Characteristics of Couple, Moment of a Force. Equivalent Force-Couple System. Numerical Problems on Moment of Forces and Couples & on Equivalent Force-Couple System.

8Hours

Module -III

Analysis of Force System: Concurrent Force System-Composition of Forces- Definition of Resultant. Composition of Coplanar-Concurrent Force System. Parallelogram Law of Forces, Principle of Resolved Parts. Numerical Problems on Composition of Coplanar Concurrent Force System.

Non-Concurrent Force System: Composition of Coplanar- Non-Concurrent Force System. Varignon's Principle of Moments. Numerical problems on Composition of Coplanar Non Concurrent Force System.

8 Hours

Module - IV

Equilibrium of Concurrent and Non Concurrent Forces: Equilibrium of Forces- Definition of Equilibrant, Conditions of Static Equilibrium For Different Force Systems, Lami's Numerical Problem on Equilibrium of Coplanar-Concurrent and Non-Concurrent Force Systems.

Support Reaction : Types of Loads and Supports. Statically Determinate Beams. Numerical Problems on Support Reactions for statically determinate beams with point load (Normal & Inclined), Uniformly Distributed Loads and varying Loads.

8 Hours

Module - V

Centroid and Centre of Gravity : Definition, Derivation of Expressions for Centroidal Distances of Simple Planar Laminas like Rectangle, Triangle, Quarter and Semicircle. Determination of Centroidal Distances of Compound Laminas.

Moment of Inertia: Introduction, Definition, Theorems of Perpendicular and Parallel Axis. Concept of axis of symmetry, Derivation of Expressions of Moment of Inertia of Simple Planar Laminas like Rectangle, Triangle, Quarter, Semicircle & Circle. Definition of Polar Moment of Inertia, Radius of Gyration. Determination of Moment of Inertia. Polar Moment of Inertia, Radius of Gyration of Compound Laminas about Centroidal axis and about any specified reference line. **8 Hours**

Course Outcomes:

Students will be able to:

1. Appreciate the importance of civil engineering in nation building.
2. Use the knowledge of construction materials and techniques.
3. Apply the concepts and principles of force system & mechanics.
4. Compute centre of gravity, centroid, moment of inertia and radius of gyration.

Text Books:

1. Elements of civil Engineering & Engineering Mechanics - S. S. Bhavikatti, 5th edition, 2015, New Age International Pvt Ltd, New Delhi
2. Elements of Civil Engineering & Engineering Mechanics - T.R Jagdish and M.A Jayaram. 7th edition, 2011, Sapna Book House. Bengaluru.

Reference Books:

1. Engineering Mechanics - B.K.Kolhapure, 8th edition, 2014, Eastern Book Promoters, Belgaum
2. Mechanics for Engineering Statics - Ferdinand P. Beer and E. Russel Johnson 1986, Mc Graw- Hill Book Company, New York.
3. Elements of Civil Engineering and Engineering Mechanics - M.N. Shesha Prakash and G.B. Mogaveer, 4th Edition (2014) PHI Learning
4. Building Drawing – M.G.Shah, C.M.Kale & S.Y.Patki, 5th Edition (2012), Tata McGraw Hill Education Pvt. Ltd. New Delhi.

E-Resources:

1. <http://elearning.vtu.ac.in/CV1323.html>
2. <http://moud.gov.in/model>

COMPUTER AIDED ENGINEERING DRAWING

Course Code	: 15CED14/24	L:T:P:S	Credits	: 4
Exam marks	: CIE: 50 SEE: 50	2:0:4:0	Exam Duration	: 3 hours

Course Objectives:

- To equip the students to communicate information by graphical means.
- To expose the students to use drafting software.
- To develop visualization skills and sketching of orthographic views.
- To understand 3 dimensional representation of models

Syllabus:

Module - I

Introduction to Computer Aided Sketching:

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions and lettering. (Demonstration only)

Orthographic Projections:

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems). **9 hrs**

Module - II

Orthographic Projections of Plane Surfaces: Introduction, Definitions—projections of plane surfaces—triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates). **15hrs**

Module – III

Projections of Solids: Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions (No problems on octahedrons and combination solid). **18hrs**

Module – IV

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of regular prisms, pyramids, cylinders and cones resting with base on HP, their frustums and truncations. Development of a simple tray. **18hrs**

Module – V

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids. **18hrs**

Course Outcomes:

After completing this course, the student shall be able to:

1. Interpret the engineering drawings with respect to actual objects.
2. Create 3-D model of the simple objects using 2-D drawings.
3. Develop simple objects using knowledge of isometric projections and development of solids.
4. Produce the orthographic projections of simple objects in various positions.

Text Books:

- 1) Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.

- 2) A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.

Reference Books:

- 1) Computer Aided Engineering Drawing - S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
- 2) Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
- 3) Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production- Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi.
- 4) Computer Aided Engineering drawing- Prof. M. H. Annaiah, New Age International Publisher, New Delhi. 2009.

Scheme of Examination:

Continuous Internal Evaluation (CIE)

CIE – 1	-	30 marks
CIE – 2	-	30 marks
Surprise test	-	10 marks
Submission of Sketch Book	-	30 marks.
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Total	-	100 marks

Semester End Examination (SEE):

Part A - Module 1 or Module 2	-	30 marks
Part B - Module 3	-	40 marks
Part C - Module 4 or Module 5	-	30 marks
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Total	-	100 marks

Note: One question to be set from module 1, 2, 4 and 5 each. Two questions are to be set from module 3. Students have to answer any one question from each part.

E-Resources:

1. <https://www.youtube.com/watch?v=ZXJPHBjflyY>
2. <https://www.youtube.com/watch?v=hET58JV-oZI>
3. <https://www.youtube.com/watch?v=ZFRcAfBSEhQ>

Basic Electronics (IC)

Course Code	: 15ELN15/25	L:T:P:S	Credits	: 4
Exam marks	: CIE: 50 SEE: 50	3:0:2:0	Exam Duration	: 3 hours

Course Objectives:

- To introduce the concept and application of semiconductor diodes and transistors
- To provide the fundamental knowledge of digital electronic circuits involving logic and universal gates.
- To expose the students to the principle of operation of an op-amp and communication systems.

Syllabus:

MODULE-I

Semiconductor Diodes and Applications: pn-junction diode and its characteristics, diode approximations, DC load line analysis, diode applications: Half-Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Zener diode as voltage regulator(with no load), Numerical examples as applicable.

(Text 1: 2.1,2.2,2.3,2.4, 3.1 3.2,3.7)

8Hours

MODULE-II

Bipolar Junction Transistors: BJT Operation, BJT Voltages and Currents, BJT Amplification: voltages and currents, Common Base characteristics, Common Emitter characteristics and Common Collector Characteristics, DC load line and Bias Point, Base Bias, Voltage divider bias, Comparison of BJT with MOSFET and JFET. Numerical examples as applicable.

(Text1:4.1,4.2,4.3,4.5,4.6,4.7,5.1,5.2,5.4,11.7)

8Hours

MODULE-III

Digital Electronics: Introduction, switching and Logic levels, digital waveforms, Number Systems, Conversions of number system, addition and subtraction using 1's and 2's compliment, Boolean Algebra, De Morgan's theorem, Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate. Algebraic Simplification, NAND and NOR Implementation, Half adder, Full adder.

(Text 3:1.2 1.3,2.1,2.2,2.3,2.4,2.5,2.8,2.9,3.1-3.6,4.1-4.7,5.3,5.4,6.1)

7Hours

MODULE-IV

Operational Amplifiers: Introduction to OP-AMP, Block diagram and stages, Pin configuration of OP-AMP(Text1:14.1), Ideal versus practical characteristics of OP-AMP, Virtual ground concept, Inverting and Non Inverting OPAMP circuits, OP-AMP applications: Voltage Follower, Adder, Subtractor, Integrator, Differentiator, Numerical examples as applicable.

(Text2:6.1,6.2)

7Hours

MODULE-V

Communication Systems: Introduction, Elements of Communication Systems, Modulation, Need for modulation, Amplitude Modulation, Spectrum Power, AM Detection (Demodulation), Frequency modulation, comparison of AM and FM. Feedback Concepts, Oscillators: Operation of RC phase shift oscillator (using only BJT), Numerical Examples as applicable.

(Text2:18.1,18.2,18.3)(Text3:14.1,14.5,14.6)

8 Hours

List of experiments:

1. Introduction to electronic devices and components.
2. Verification of all logic gates.
3. Simplification of Boolean expression and verify using gates.
4. Input and output characteristics of BJT.
5. OP-AMP application.
6. V-I characteristics of Diode.
7. Half wave and full wave rectifier.
8. RC phase shift oscillator.
9. AM modulation.
10. Crystal oscillator.

Course Outcomes:

Students will be able to:

- Use diodes and transistors for various applications.
- Carry out inversion, integration, differentiation etc using Op-Amps.
- Design and implement simple logic function using basic/universal gates.
- Analyze the concept of transmitters, receivers and oscillators.

Text Books:

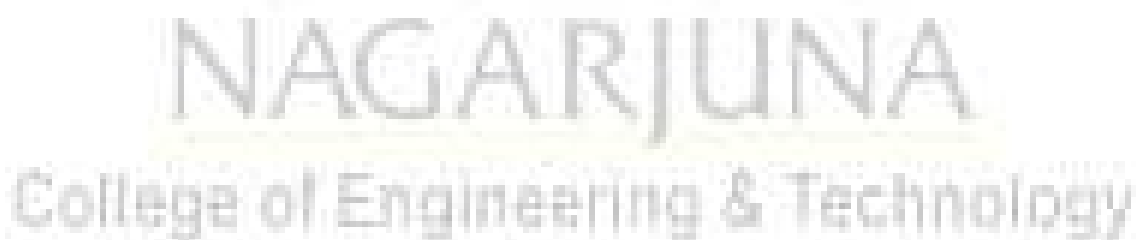
1. David Bell, Electronic Devices and Circuits: Oxford University Press, 5th Edition, 2008.
2. D.P. Kothari, I. J. Nagrath, Basic Electronics: McGraw Hill Education (India) Private Limited, 2014.
3. Thomas L Floyd and R.P Jain, Digital Fundamentals, Pearson education.

Reference Books:

1. Electronic Communication Systems, George Kennedy, TMH 4th Edition.
2. R.L Boylestad and Louis Nashlesky, Electronic Devices and Circuit Theory, Pearson Education

E-Resources:

1. www.vlab.co.in
2. www.basicelectronics.iitkgp.ernet.in



Engineering Physics Lab

Course Code : 15PHL16/26	L:T:P:S	Credits : 2
Exam marks : CIE: 50 SEE: 50	1:0:2:0	Exam Duration : 3 hours

Course Objectives:

- Demonstrate competence in the physics laboratory, including a working knowledge of basic electronics and the ability to work independently.
- Provide and facilitate teamwork and multidisciplinary experiences throughout the curriculum.
- Educate students in the basics of instrumentation, measurement, data acquisition, interpretation and analysis.

List of Experiments:

1. Laser Diffraction. (Determination of wavelength of laser using diffraction grating.)
2. Planck's Constant.(Determination of Planck's constant)
3. Photodiode characteristics.(Study the V-I characteristics of Photodiode)
4. Zener Diode characteristics (Study the V-I characteristics of Zener Diode)
5. Energy gap of a semiconductor (Determination of Energy gap of a semiconductor)
6. Dielectric constant.(Determination of dielectric constant of a dielectric material)
7. LCR circuits(Determination of resonance frequency, quality factor in a Series and Parallel LCR circuit)
8. Transistor characteristics(Study input and Output characteristics of a transistor)
9. Single Cantilever(Determination of Young's modulus of a given material bar)
10. Torsional Pendulum(Determination of rigidity modulus of given wire)
11. Resistivity by Four Probe Method through virtual lab
12. Ultrasonic Interferometer through virtual lab

Scheme of Practical Examination for SEE:

1. Conduction of two experiments -	40 marks
2. Viva Voce -	10 marks
Total -	50 marks

The students have to conduct any two experiments from the list of experiments.

Course Outcomes:

The Students will be able to,

- Design new instruments with the practical knowledge.
- Develop skills that enhance individual problem solving ability.
- Learn to work in team in the laboratory.

E-resources:

1. www.vlab.amrita.edu,. (2013). Resistivity by Four Probe Method. Retrieved 18 July 2015, from www.vlab.amrita.edu/?sub=1&brch=282&sim=1512&cnt=1.
2. www.vlab.amrita.edu,. (2011). Ultrasonic Interferometer. Retrieved 18 July 2015, from www.vlab.amrita.edu/?sub=1&brch=201&sim=803&cnt=1

Environmental Studies

Course Code	: 15ENV17/27	L:T:P:S	Credits	: 1
Exam marks	: CIE: 50 SEE: 50	0:2:0:0	Exam Duration	: 2 hours

Course Objectives:

1. To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment.
2. To understand the importance of Carbon Credits, ozone level depletion, global warming and green house effects.
3. To educate the students about the importance of pollution free air, water and food.

Syllabus:

Module - I

Environment and Effects of Human Activities

Environment: Definition, components of Environment. Ecosystem, Balanced ecosystem.

Effects of Human Activities: Human activities, Food, Shelter, Economic and Social security. Impacts of Agriculture, Housing, Industry, Mining & Transportation, Environmental Impact Assessment. **3 hours**

Module - II

Natural resources and Energy

Natural resources: Availability and quality aspects, Water borne disease and Water induced diseases, Fluoride problem in drinking water, Mineral resources.

Energy: Different types of energy, Conventional & Non Conventional sources of energy. Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Fossil Fuels. **3 hours**

Module - III

Environmental Pollution and Global Environmental Issues

Environmental Pollution: Water pollution, Air pollution, Noise pollution, Land pollution, Radio-active pollution, Automobile pollution, Effects- Global warming, Acid Rain & Ozone layer depletion and controlling measures.

Global Environmental Issues: Population Growth, Urbanization, Land Management, Water and Waste Water Management. **4 hours**

Module - IV

Solid Waste management: Introduction, E-waste management & Biomedical Waste Management – Sources, Characteristics & Disposal methods. **3 hours**

Module - V

Introduction to GIS: Applications of GIS, Environmental Acts & Regulations, Role of Government, Role of Non-governmental Organizations (NGOs), Women Education. **3 hours**

Course Outcomes:

Students will be able to:

- Take preventive measures to reduce air pollution, water pollution and contaminants in food.
- Effectively carry out waste disposal at individual level.
- Involve in preservation of natural resources.
- Demonstrate ecology knowledge of the complex relationship between predators, prey and the plant community.

Text Books:

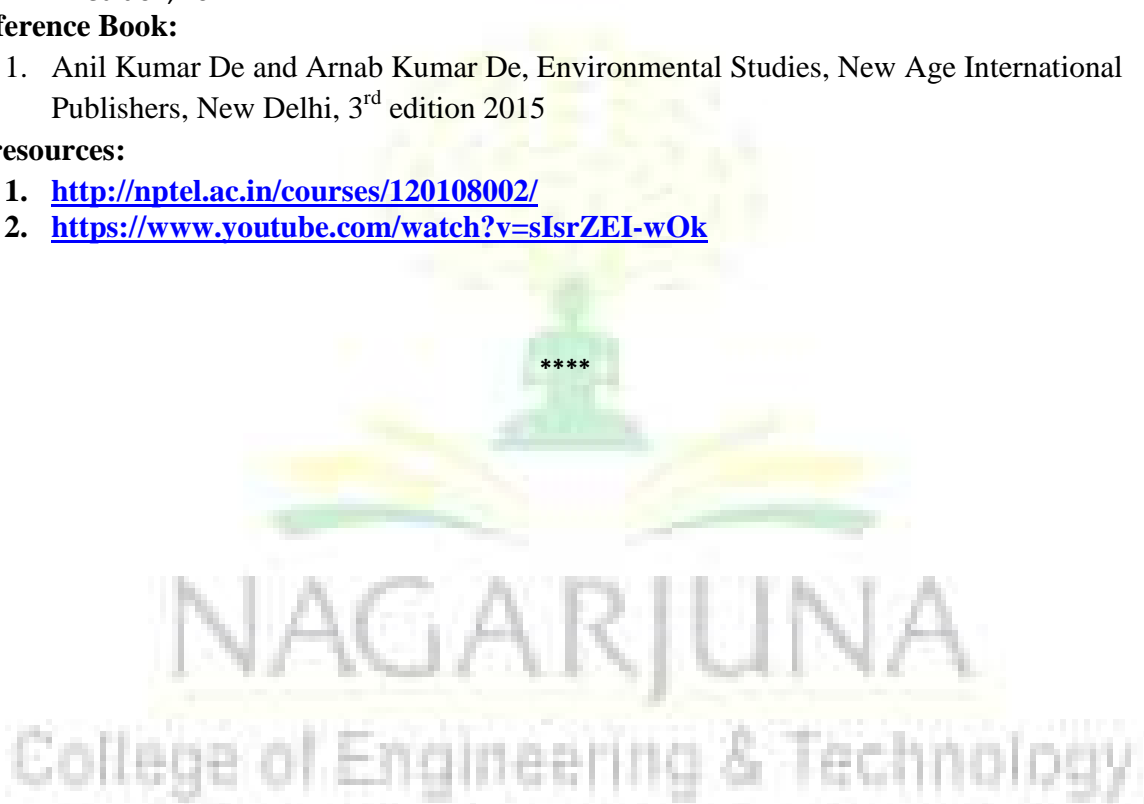
1. P. Meenakshi, Elements of Environmental Science and Engineering, Prentice Hall of India Private Limited, New Delhi, 2nd edition, 2006.
2. R. Geetha Balakrishna, K. G. Lakshminarayana Bhatta, Environmental Studies, SM Publications, 4th edition, 2011.

Reference Book:

1. Anil Kumar De and Arnab Kumar De, Environmental Studies, New Age International Publishers, New Delhi, 3rd edition 2015

E-resources:

1. <http://nptel.ac.in/courses/120108002/>
2. <https://www.youtube.com/watch?v=sIsrZEI-wOk>



Personality Development Programme

Course Code	: 15PDP18/28	L:T:P:S	Credits	: 2
Exam Marks	: CIE: 50 SEE: 50	2:0:0:0	Exam Duration	: 2 hours

Course Objectives:

1. To catalyze all-round development focused on all dimensions of personality: physical, emotional, intellectual and spiritual
2. To empower and help to successfully resist temptations and distractions present in the surroundings
3. To help comprehend the importance of being independently thoughtful

Syllabus:

Module - I

Setting the Scene

4 hours

Urban landscape: An analysis; The Myth of more; Spirit over matter; A universal frame of reference

Module - II

Selective Entertainment

6 hours

Meaning of entertainment; Need for entertainment; Need for selective entertainment; Ill-effects of indiscriminate entertainment; Techniques to escape the web of mundane entertainment

Module - III

Handling Peer Pressure

6 hours

Meaning of peer pressure; External and internal factors that cause peer pressure; Productive and counter-productive friendship; Factors that nurture friendship; Techniques to handle peer pressure effectively

Module - IV

Relationship Management

6 hours

Meaning of relationship; Inevitability of relationships; Need for relationship management, Factors that promote healthy relationships, Techniques to manage relationships effectively

Module - V

Healthy Living

6 hours

Meaning of healthy living; Dimensions of life (Physical, Mental/Emotional, Intellectual, Spiritual); Factors that impede healthy living; Techniques to practice holistic healthy living through lifestyle modification

Course Outcomes:

By the end of the course, the student will:

- Predict the ill-effects of indiscriminate entertainment and select the right modes of entertainment
- Comprehend the importance of choosing one's association carefully by distinguishing between the external and internal factors that cause peer pressure
- Learn various techniques to manage, nurture and develop relationships
- Learn techniques to maintain equilibrium between the physical, emotional, intellectual and spiritual dimensions of personality

Reference Books:

- 1 *Coming Back* by HDG A.C. Bhaktivedanta Swami Prabhupada (BBT)
- 2 *Engineering, Ethics, and the Environment* by Vesilind & Gunn (Cambridge UP)
- 3 *On Myself, And Other, Less Important Subjects* by Caspar Hare (Princeton UP)
- 4 *Philosophy and Education* by Mrinal Miri (Oxford UP)
- 5 *Professional Ethics and Etiquette (Second Edition)* by Ferguson (Facts on File Inc)

E-Resources:

- 1 Bhaktivedanta Vedabase: <http://www.vedabase.com/>
- 2 Online Ethics Center (For Engineering and Science): <http://www.onlineethics.org/>

Functional English

Course Code : 15ENG19/29	L:T:P:S	Credits : Mandatory
Exam marks : CIE: 50 SEE: 50	1:0:0:0	Exam Duration : 2 hours

Course Objectives:

- Understand the significance of English language as a tool for global communication
- To develop and enhance the linguistic and communicative competence of the students.
- To hone the skills of reading, writing, listening, and speaking.
- Expose the students to various forms of personal and professional communication.

Syllabus:

Module - I

Introduction, Importance of Languages, Grammar, Parts of Speech, Usage of Preposition and Article, Punctuation Tenses & Degrees of Comparison 5 Hours

Module - II

Transformation of Sentences Active-Passive, Affirmative-Negative, Exclamatory-Assertive, Interrogative-Assertive, Kinds of sentences Direct-Indirect Speech 6 Hours

Module - III

Vocabulary Usage Homonyms, Correcting Spelling, One-word equivalents Precise Writing 3 Hours Essay/Report Writing 6 Hours

Module - IV

Letter Writing Personal, Official, Applications Idioms & Phrases Meaning & Usage in sentences 5 Hours

Module - V

Comprehension of an unseen passage, Elaboration Expansion of ideas, proverbs Presentation: Preparation of materials and presentation – steps 6 Hours

Course Outcomes:

By the end of the course, the student will:

- Understand the dynamics of communication.
- Be able to read and write effectively.
- Use better presentation skills.

Suggested Text Books:

- 1) SLN Sharma & K Shankaranarayana, "Basic Grammar", Nava karnataka Publications.
- 2) Jones "New International Business English", published by Cambridge University Press.

Reference Books:

- 1) G. Sankaran, "English Rank Scorer", Add one Publishing group, Thiruvananthapuram, Kerala
- 2) Wren & Martin "English Grammar".
- 3) John Seely, "Oxford Guide to Speaking and Writing", 2

E Resources:

- 1) Teaching English (British Council) <http://www.teachingenglish.org.uk/>
- 2) Useful Websites for English Language Learning and Teaching http://www.edb.gov.hk/en/curriculum-development/cla/eng-edu/references-resources/useful-websites-secondary.html#links_s

Engineering Chemistry (IC)

Course Code	: 15CHE12/22	L:T:P:S	Credits	: 5
Exam marks	: CIE: 50 SEE: 50	4:0:2:0	Exam Duration	: 3 hours

Course Objectives:

- To introduce the students to the basic concepts of chemistry
- To impart the knowledge about futuristic materials for high-tech application in the area of engineering and technology.
- To expose the students with the application of engineering chemistry in a comprehensive, economic, environmental and social context.
- To enlighten the students with the knowledge of polymer and nano composites.

Syllabus:

Module - I

Electrochemistry and Battery Technology

Electrochemistry: Introduction, Derivation of Nernst equation for single electrode potential. Types of electrodes: metal-metal ion, metal-metal salt ion, gas, amalgam, redox and ion selective. Reference electrodes – calomel electrode, Ag - AgCl electrode. Measurement of electrode potential using calomel electrode, Electrolyte concentration cells, numerical problems on Electrolyte concentration cells.

Battery technology: Introduction, Classification of batteries – primary, secondary and reserve batteries, battery characteristics-cell potential, current, capacity, electricity storage density, cycle life, shelf life and energy efficiency. Classical batteries – construction, working & applications of Lead acid battery, Construction, working and applications of Li-ion batteries. Fuel cell – Introduction, difference between conventional cell and fuel cell, limitations and advantages. Construction, working and applications of CH₃OH-O₂ fuel cell with H₂SO₄ electrolyte.

10 hours

Module -II

Corrosion Science and Metal Finishing

Corrosion Science: Introduction, electrochemical theory of corrosion, Galvanic series, types of corrosion - differential metal corrosion, differential aeration corrosion - pitting and water line corrosion, stress corrosion (caustic embrittlement in boilers), Factors affecting the rate of corrosion: Nature of metal, Nature of corrosion product, ratio of anodic and cathodic areas, nature of medium - P^H, Conductivity and temperature. Corrosion control: metal coatings – galvanization and tinning, cathodic protection - sacrificial anodic and impressed current methods.

Metal finishing: Introduction, Technological importance, Electroplating, Factors influencing the nature of electro deposit- Current density, plating bath - concentration of metal ion, complexing agents, pH, temperature, throwing power. Electroplating of decorative Chromium. Electroless plating–Introduction, Electroless plating of copper, manufacture of PCB.

10 hours

Module -III

Chemical fuels and Photovoltaic cells :

Chemical fuels: Introduction, classification, Calorific value-gross and net calorific values, determination of calorific value of a solid/liquid fuel using Bomb calorimeter and numerical problems. Petroleum cracking: Introduction, Fluidized catalytic cracking, Reformation of petrol, Petrol knocking – mechanism and their ill effects, antiknocking agents, Fuel rating system – Octane and Cetane numbers, catalytic converters.

Photovoltaic cells: Construction, Working, Design Modules, Panels & Arrays. Advantages and disadvantages of PV cells. Production of solar grade silicon by union carbide method, doping of silicon by diffusion technique (n & p type), zone refining.

10 hours

Module - IV

Water technology: Impurities in the water, boiler feed water, scaling and sludge formation, Hardness - types of hardness and its determination by EDTA method, Alkalinity - Determination by phenolphthalein and methyl orange indicator. Determination of Dissolved Oxygen (DO) by Winkler's method. Biological Oxygen Demand (BOD) - determination and numerical problems. Chemical Oxygen Demand (COD)– determination and numerical problems. Sewage treatment – Primary treatment, Secondary treatment by activated sludge treatment and tertiary treatment. Potable water–softening of water by ion exchange process. Desalination of sea water by Reverse Osmosis.

10 hours

Module –V

Polymer Nano composites and Instrumental methods of analysis

Polymer Nano composites: Introduction- Overview of nanocomposites, classification, Properties and Applications- Nano clay-reinforced composites. Carbon nano tube-reinforced composites. Nano fibre reinforced composites and inorganic particle-reinforced composites. Nano composites, applications.

Instrumental methods of analysis: Theory, Instrumentation and applications of Potentiometry, Conductometry, Colorimetry and Flame photometry.

10 hours

List of Experiments:

1. Determination of Total Hardness of a sample of water using disodium salt of EDTA.
2. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.
3. Conductometric estimation of an Acid mixture (HCl & CH₃COOH) using standard NaOH solution.
4. Potentiometric estimation of FAS using standard K₂Cr₂O₇ solution.
5. Determination of total alkalinity of water sample.
6. Flame photometric estimation of metal ions in the given sample of water.
7. Spectrophotometric estimation of metal ions.
8. Acid-Base titration of strong acid v/s strong base.
9. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer.
10. Measurement of electrode potential (EMF) with respect to metal electrodes.

Course Outcomes:

The students will be able to:

- Overcome the ill effects of corrosion by adopting the appropriate remedial measures
- Use the knowledge of polymers and nano composites in the material selections for engineering applications.
- Appreciate the knowledge of electro chemistry in analysis of water and bio medical engineering applications.
- Use the knowledge of water contamination and take appropriate preventive measures.

Text Books:

1. B. S. Jaiprakash, R. Venugopal, Sivakumaraiah, Pushpalyengar, Chemistry for Engineering students, Subhash Publications, 1st edition, 2014.
2. O. G. Palanna, "Engineering Chemistry", Tata McGraw Hill Education Private Ltd, New Delhi, 4th edition, 2014.
3. Arthur I. Vogel's quantitative Inorganic analysis including elementary instrumental analysis, ELBS, Longman group, 6th edition, 2008.

Reference Books:

1. B. R. Puri, L. R. Sharma, Principles of Physical chemistry, Vishal Publishing Company, 2008.
2. V. R. Gowariker, N. L. Viswanathan, J. Sreedhar. Polymer Science, New Age International Publishers, reprint 2012.
3. Hari Singh Nalwa, Nano structured Materials and Nanotechnology, Academic Press, 1st edition, 2001.

E-Resources:

1. vlab.amrita.edu,. (2011). Spectrophotometry. Retrieved 31 July 2015, from vlab.amrita.edu/?sub=2 &brch=190&sim=338&cnt=1
2. vlab.amrita.edu,. (2011). Acid Base Titration. Retrieved 31 July 2015, from vlab.amrita.edu/?sub=2&brch =193 &sim=352&cnt=1
3. vlab.amrita.edu,. (2011). Determination of Viscosity of Organic Solvents. Retrieved 31 July 2015, from vlab.amrita.edu/?sub=2&brch=190&sim=339&cnt=1
4. vlab.amrita.edu,. (2011). EMF measurement. Retrieved 31 July 2015, from vlab.amrita.edu/? sub=2&brch=190&sim=361&cnt=1
5. <http://ocw.mit.edu/courses/chemistry/5-111-principles-of-chemical-science-fall-2008/video-lectures/lecture-25/>
6. <http://nptel.ac.in/courses/113108051/>



Computer Concepts & C Programming

Course Code	: 15CCP13/23	L:T:P:S	Credits	: 3
Exam marks	: CIE: 50 SEE: 50	3:0:0:0	Exam Duration	: 3 hours

Course Objectives:

- To acquire the sophomore knowledge of Computer and Information systems.
- To learn the semiotics of intricacies of programming language with their flexibilities.
- To develop skills to syllogise the semantics of the programming language for realizing the end product/service/result.
- To develop skills to syllogise control & data flows of statements & attributes for their optimum realization in the programming language code.

Syllabus:

Module - I

Introduction to Computer System: Definition, basic structure and features of Computer, Categorizing Computers, Information systems, Information processing life cycle, Fundamentals of Information Technology and its principles, computer hardware and software.

Fundamentals of problem solving: The basic model of computation, Steps for program Development, Flow Charts, Algorithms and Programming structure. **7 hours**

Module - II

Introduction to C Language: Basic concepts in a C program, constants, variables, declaration and initialization of variables, data types and statements.

Operators and Expressions, precedence and association, type conversions, managing input/output functions, with programming examples. **8 hours**

Module -III

Decision making, Looping and Branching: Decision making statements:- if, if-then-else, nested if-else, cascaded if-else and switch statements, Looping statements: for, while, do-while, Branching statements: go to, break and continue, applicative programming examples.

Arrays: Introduction, One-dimensional and two dimensional arrays: initialization, declaration, applicative programming examples. **9 hours**

Module- IV

Strings and Functions
Introduction to strings, declaration and initialization, string handling functions, introduction to functions, types of functions, definition, elements of user defined functions. Category of user defined functions, parameter passing mechanisms, Recursion and iterations, applicative programming examples. **8 hours**

Module - V

Structures, pointers and operating systems:

Structures: Introduction, definition, declaration, initialization, accessing structure members.

Pointers: definition, initialization of pointer variables, accessing the address of variable, applicative programming examples.

Preprocessor directives: macro substitution, file inclusion.

Operating system: definition, types of operating systems.

Networking: Basic components of a network, exploring the types of networks, characteristics of networks. **8 hours**

Course Outcomes:

Students will be able to:

- Know the logic to transform the manual procedure into automated procedure through the realization of the programming language code.
- Write computer programs for engineering applications
- Develop the tagmemics of programming language code for automating the executable behaviour

Text Books:

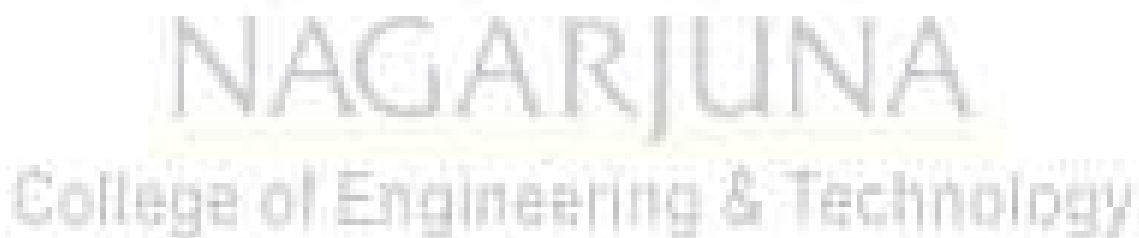
1. Programming in ANSI C by E. Balaguruswamy, Fifth edition, Tata McGraw-Hill, India. (Chapter 2, 3, 4, 5, 6, 7.1 – 7.6, 8.2, 8.8, 9.1,9.4-9.14, 9.16, 10.1-10.5, 11.1-11.6, 14.1-14.3)
2. Computer Concepts & C Programming by Vikas Gupta, Dreamtech Press, 2010. (Chapter 1, 5.3, 5.4, 6.5, 6.6, 6.7, 7)

Reference Books:

1. Computer Science: A Structured programming approach using C by Behrouz A. Forouzan, Richard F Gilberg, 2nd edition, Thomson India Edition.
2. Programming with C by Byron Gottfried, Schaum's Outlines 2nd edition.

E-Resources:

1. <http://www.cprogramming.com/tutorial/c-tutorial.html>
2. <https://books.google.co.in/books?isbn=0132781190>



Mechanical Engineering Foundation (IC)

Course Code	: 15MEF14/24	L:T:P:S	Credits	: 4
Exam marks	: CIE: 50 SEE: 50	3:0:2:0	Exam Duration	: 3 hours

Course Objectives:

- Impart the fundamental concepts related to mechanical engineering
- Expose the students to the working of various machines, prime movers, robots and Refrigeration & Air conditioning systems.
- To introduce the students to the various metal joining methods.
- To provide basic knowledge of various mechanical systems, equipments and processes.

Syllabus:

Module - I

Energy Resources: Non-renewable and renewable energy resources. **Solar Power:** Solar Radiation, Solar constant (definition only), Solar Thermal energy harvesting, ex: liquid flat plate collectors, solar ponds (principle of operation only), Solar photovoltaic principle. **Wind Power:** principle of operation of a typical windmill. **Hydro Power:** Principles of electric power generation from hydropower plants. **Nuclear Power:** Principles of Nuclear power plants. **Steam Formation and Application of steam:** Classification of boilers, Lancashire boiler, Babcock and Wilcox boiler, Applications of steam. **9 hours**

Module - II

Turbines and IC Engines

Steam turbines: Classification, Principle of operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine. (No compounding of turbines).

Gas turbines: Classification, Working principles and Operations of Open cycle and Closed cycle gas turbines.

Water turbines: Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine.

Internal Combustion Engines: Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4 stroke diesel engines. PV diagrams of Otto and Diesel cycles. **9 hours**

Module – III

Refrigeration and Air-Conditioning

Refrigerants: properties of refrigerants, list of commonly used refrigerants.

Refrigeration – Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration. Principle and working of vapour compression refrigeration and vapour absorption refrigeration.

Air-Conditioning: Principles and applications of air conditioners, Room air conditioner.

Simple calculations related to vapour compression refrigeration system, to find out refrigeration effect, power consumption of the compressor and COP. **7 hours**

Module - IV

Engineering Materials and Joining Processes

Engineering Materials: Types and applications of Ferrous & Nonferrous metals and alloys.

Composites: Introduction, Definition, Classification and applications (Air-craft and Automobiles)

Soldering, Brazing and Welding: Definitions, classification and method of Soldering, Brazing and Welding. Differences between Soldering, Brazing and Welding. Description of Electric Arc Welding and Oxy-Acetylene Welding. **7 hours**

Module – V

Machine Tools, Robotics and Automation

Machine Tools: Working principle of lathe, drilling machine and milling machines (No sketches of Machine tools, sketches to be used only for explaining operations. Students to be shown the machine tools in the Machine Shop). Application of Gears and simple Gear Trains in machine tools. Simple calculations related to simple gear train to find out the speed ratio, speed and direction of rotation of the driving or driven gear.

Robotics and Automation:

Robotics: Introduction, classification based on robots configuration; Polar, Cylindrical, Cartesian Coordinate and Spherical. Applications, Advantages and disadvantages.

Automation: Definition, types–Fixed, Programmable & Flexible automation, advantages and disadvantages of automation. **7 hours**

List of Experiments:

1. Demonstration of fitting tools and processes
2. Sheet metal development of 2 models (Prism and Pyramid)
3. Demonstration of welding process
4. Metal joining processes using Soldering
5. Simple programming of Robots (2 simple programs)
6. Studies on solar PV system
7. Performance studies on Refrigeration systems.
8. Studies on Simple Gear Trains.
9. Studies on Valve and Port timing Diagrams.
10. Demonstration of Working Principle of Water Turbines.

Note: *No mini drafters and drawing boards required. Drawings (Developments) can be done on sketch sheets using scale, pencil and Geometrical Instruments.*

Course Outcomes:

At the end of the course, the student shall be able to demonstrate the knowledge associated with,

1. Various types of Energy sources and understanding the importance of renewable energy sources.
2. The working principles of various types of prime movers.
3. The metal removal processes using different machine tools such as lathe, drilling machine, and milling machine and understanding the metal removal process in different engineering fields.
4. The robots and automation and studying their applications in different engineering fields.
5. Application and usage of various engineering materials and different metal joining methods.
6. Working of refrigeration and air-conditioning systems.

Text Books:

1. V.K.Manglik, “**Elements of Mechanical Engineering**”, PHI Publications, 2013.
2. Mikell P.Groover, “**Automation, Production Systems & CIM**”, 3rd Edition, PHI
3. K.R. Gopalkrishna, “**A Text Book of Elements of Mechanical Engineering**”- Subhash Publishers, Bangalore.

Reference Books:

1. S.Trymbaka Murthy, “**A Text Book of Elements of Mechanical Engineering**”, 4th Edition 2006, Universities Press (India) Pvt Ltd, Hyderabad.
2. K.P.Roy, S.K. Hajra Choudhury, Nirjhar Roy, “**Elements of Mechanical Engineering**”, Media Promoters & Publishers Pvt Ltd, Mumbai, 7th Edition, 2012
3. Pravin Kumar, “**Basic Mechanical Engineering**”, 2013 Edition, Pearson.
4. M.M.El-Wakil, “**Power Plant Technology**”, International Edition 1984, McGraw-Hill book Company, Singapore.
5. S.K.Garg, “**Workshop Technology(Manufacturing Processes)**”, 3rd Edition 2013, University Science Press, Bangalore.
6. C P Arora, “**Refrigeration and Air Conditioning**, 2nd Edition 2007, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
7. G.D.Rai, Solar Energy Utilization, Jain Book Depot, 11th Edition. House, New Delhi

Basic Electrical Engineering (IC)

Course Code	: 15ELE15/25	L:T:P:S	Credits	: 4
Exam marks	: CIE: 50 SEE: 50	3:0:2:0	Exam Duration	: 3 hours

Course Objectives:

- To expose the students to the fundamental concepts in electrical engineering.
- To teach the students about domestic wiring, functioning of various electrical apparatus and safety measures in home and industry.
- To provide the working knowledge of basic AC and DC circuits used in electrical and electronic devices.
- Highlight the importance of transformers in transmission and distribution of electric power.

Syllabus:

Module I

D.C.Circuits: Ohm's law, Kirchoff's current law, Kirchoff's voltage law- applications of these law for the analysis of series, parallel and series parallel resistive circuits excited by independent voltage sources. Illustrative examples.

8Hrs

Module II

Electromagnetism : Definitions of Magnetic force, flux, flux density, reluctance, magnetomotive force (mmf), emf. Faraday's Laws, Lenz's laws, Fleming's Rules, Statically and dynamically induced emf. Concept of self and mutual inductance and concept of coefficient of coupling. Energy stored in magnetic field. Illustrative examples.

Domestic wiring: Two-way and three way position control switch. Necessity and types of earthing. Elementary discussion on fuses and circuit protective devices: fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock.

8Hrs

Module III

Single Phase A.C.Circuits: Generation of sinusoidal AC voltage, definition of average value, rms value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis with phasor diagram of R,L, C, R-L, R-C, R-L-C circuits and series, parallel. Real power, reactive power, apparent power and power factor. Illustrative examples.

8Hrs

Module IV

Transformers: Principle of operation and construction of single phase transformers (core and shell type). Emf equation, voltage regulation and its significance. Efficiency condition for maximum efficiency, power losses and illustrative examples.

Three Phase Circuits: Necessity and advantages of three phase systems, generation of three phase power. Definition of Phase sequence, balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced three phase circuits, measurement of power by two-wattmeter method. Determination of power factor using wattmeter readings. Illustrative examples.

8Hrs

Module V

DC & AC Machines: Electro-mechanical energy conversion machines, importance of DC machines, need for three phase synchronous generator, introduction to induction motors, concept of rotating magnetic field in induction motor, working principle of induction motors, construction of induction motors, slip and its importance, Illustrative examples.

7Hrs

List of experiments :

1. Verification of ohm's law
2. Verification of Kirchhoff's law
3. Study the characteristics of a Fluorescent tube
4. Study experiment on domestic wiring and TWO way & THREE way Control of a lamp.
5. Verification of effective resistance between the terminal of series and parallel combination of resistors.
6. Verification of voltage and current distribution in both series and parallel circuits.
7. Analysis of current flowing in series and parallel RL circuit
8. Analysis of current flowing in series and parallel RC circuit
9. Analysis of current flowing in series and parallel LC circuit
10. To plot the frequency and current characteristic of series and parallel RLC circuits.

Course Outcomes:

Students will be able to:

- Carry out simple domestic wiring involving two way and three way controls.
- Select the motor for a given application.
- Take precautions as per the electrical safety standards.
- Determine performance parameters of electrical apparatus and transformers.
- Use single and three phase circuits for appropriate applications.

Text Books:

1. D C Kulshrestha, 'Basic Electrical Engineering', Tata Mc Graw Hill, 2010.

Reference Books:

1. B.L.Theraja, "Fundamentals of Electrical Engineering and Electronics", S.Chand & Company Ltd, Reprint Edition 2013
2. Rajendra Prasad , 'Fundamentals of Electrical Engineering', Prentice Hall of India Pvt Ltd.2005
3. E.Hughes, " Electrical Technology' E.Hughes International students 9th edition, Pearson, 2005

E-resources:

1. vlab.ambita.edu/index.php
2. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=108105053>
3. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=108108076>
4. <http://nptel.ac.in/courses/108108076/>

Computer Programming Lab

Course Code	: 15CPL16/26	L:T:P:S	Credits	: 2
Exam Marks	: CIE: 50 SEE: 50	1:0:2:0	Exam Duration	: 3 hours

Course Objectives:

- To understand the semiotics of design diagrams in programming.
- To study the application of mathematics in the automation process.
- To learn the difference in tagmemics of lexemes between the manual and automated procedures.

Syllabus:

Part A

Demonstration of Personal Computer and Its Accessories

Acquisition of knowledge on assembly of a Personal Computer. Clairvoyant study through the observation of its demonstration. Students have to prepare a write-up on the same as part of laboratory record to be evaluated.

Laboratory Session: MS-Word : Creation of document, Applying different font styles and size, Text alignment, Line spacing, Bullets & numbering, Page borders, Working on tables, Insertion of Header & footer, use of format painter

MS- Excel : Working on Tables, Simple formulas, working on charts. **MS- Power Point**: Creating presentations using designs & Animations. Introduction to Flowchart and Algorithms.

Part B

1. Design and develop a flowchart that takes three coefficients (**a**, **b**, and **c**) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program for the developed flowchart and execute the same to output the possible roots for a given set of coefficients with appropriate messages.
2. Design and develop an algorithm to find the **reverse** of an integer number and check whether it is PALINDROME or NOT. Implement a C program for the developed algorithm that takes a valid 4 digit integer as input and output the reverse of the same with suitable messages. Ex: Num: **2015**, Reverse: **5102**, Not a Palindrome
3. Design and develop a flow chart & an automated procedure to find the prime numbers below a given fixed integer. Realize the procedure through the execution of C program.
4. Draw the flowchart and write a recursive C function to find the factorial of a number, $n!$ defined by $1!=0$ and $n! = n * (n - 1)!$ for a positive integer n . Using this function, write a C program to compute the binomial coefficients of $(a + b)^n$ using ${}^n C_r$ for a given n .
5. Design and develop a C program that outputs the sequence of Fibonacci numbers below a given integer.
6. Develop, implement and execute a C program that reads two matrices **A** ($m \times n$) and **B** ($p \times q$) and Compute product of matrices **A** and **B**. Read matrix **A** and matrix **B** in row major order and in column major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only. Program must check the compatibility of orders of the matrices for multiplication and report appropriate message in case of incompatibility.
7. Design and develop a flowchart and implement a C program using Euclid's algorithm to find the GCD and LCM of 2 integers.
8. Develop a C program that reads **N** integer numbers in random order and arrange them in ascending/descending order as required using Bubble Sort technique.
9. Develop, implement and execute a C program to search a required integer number in an array of given numbers using **Binary searching** technique.
10. Write a C program to maintain a record of **n** student details using an array of structures with four fields (Roll number, Name, Marks, and Grade). Assume appropriate data type for each field. Print the marks of the student, given the student name as input.

Scheme of Practical Examination:

Part A	-	10 marks
Part B	-	30 marks
Viva voce	-	10 marks
Total	-	50 marks

1. All laboratory experiments (Ten) are to be included for practical examination.

2. Students are allowed to pick one experiment from each part.
3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.

Course Outcomes:

- Knowhow regarding switching capability from manual procedure to automated procedure.
- Knowledge of quality parameters viz., correctness, completeness, robustness, efficacy and efficiency and the techniques to enhance their values in the procedure.



Constitution of India, Professional ethics and Human Rights

Course Code	: 15CPH17/27	L:T:P:S	Credits	: 1
Exam marks	: CIE: 50 SEE: 50	0:2:0:0	Exam Duration	: 2 hours

Course Objectives:

- To expose the students to the fundamental rights and duties of a citizen.
- To provide basic information about Indian constitution.
- To identify individual role and ethical responsibility towards society.
- To develop awareness about special privileges for SC/ST, women, children, socially and economically weaker sections of the society.

Syllabus:

Module - I

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution. Preamble to the Indian Constitution, Fundamental Rights & its limitations. **3 Hours**

Module - II

Directive Principles of State Policy & Relevance of Directive Principles of State Policy, Fundamental Duties. Union Executives – President, Prime Minister, Parliament, Supreme Court of India. **3 Hours**

Module -III

State Executives – Governor, Chief Minister, State Legislature High Court of State. Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st Amendments. **2Hours**

Module - IV

Special Provision for SC & ST, Special Provision for Women, Children & Backward Classes, Emergency Provisions. Human Rights- Working of National Human Rights Commission in India, Powers and functions of Municipalities, Panchayats and Co - Operative Societies. **3 Hours**

Module - V

Scope & Aims of Engineering Ethics, Responsibility of Engineers, Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering. **2 Hours**

Course Outcomes:

After study of the course, the students are able to:

- Gain general knowledge and legal literacy and thereby to take up competitive examinations
- Develop the understanding of state and central policies, fundamental duties
- Understand the Electoral Process, special provisions
- Understand Engineering ethics and responsibilities of Engineers.

Text Books:

1. Durga Das Basu: "Introduction to the Constitution on India", (Students Edn.) Prentice Hall EEE, 19th / 20th Edn., 2001
2. Charles E. Haries, Michael S Pritchard and Michael J. Robins "Engineering Ethics", Thompson Asia, 2003-08-05.

Reference Books:

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 2004
3. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.

E Resources:

1. <http://www.cgsird.gov.in/constitution.pdf>
2. <http://indiacode.nic.in/coiweb/welcome.html>

Communication Skill Development

Course Code	: 15CSD18/28	L:T:P:S	Credits	: 2
Exam Marks	: CIE: 50 SEE: 50	2:0:0:0	Exam Duration	: 2 hours

Course Objectives:

- To empower with essentials of English grammar necessary for fluent and effective communication
- To introduce basics of communication and equip with introductory presentation skills
- To enable effective understanding of Engineering subjects

Syllabus:

Module I

Essentials of the Communication Process and its Types

5 hours

Introduction to communication; Benefits of good communication skills; The communication process; Ethical communication; Characteristics of a good communicator; Types of communication

Module II

Basics of the English Language and its Grammar

6 hours

History of English; English grammar: Words (Parts of speech, Spelling rules, Determiners, Paragraphs, Punctuation marks, Structure of a sentence, Basic sentence types); Classification of inflection; Forms of inflection; Inflection of nouns (Number, Gender); Inflection of verbs (Tense, Person, Voice); Inflection of adjectives (Degree)

Module III

Introduction to Etymology and Development of Vocabulary

5 hours

Test Your Present Vocabulary (Word Power Made Easy); Etymology in English language; Start building your vocabulary (Word Power Made Easy); Personality Types (Word Power Made Easy)

Module IV

Common Errors in English Language

6 hours

Categories of errors; Grammar error; Word choice error; Pronunciation error; Punctuation error; Spelling error; Test Your Grammar (Word Power Made Easy)

Module V

Presentation Skills

6 hours

Introduction; Talking vs Presenting; The deadly sins; Overcoming nervousness; Attention and interest (Visual aids, Humor, Eye contact, Voice, Movement, Analogies, Human interest, Conviction and enthusiasm, Body language); Presentation steps

Course Outcomes:

By the end of the course, the student will:

- Understand the dynamics of communication and display the ability to participate in simple group discussions
- Discover the practical aspects of the basics of English language grammar and identify the common errors in English language
- Illustrate an understanding of the science of etymology and adapt to developing the vocabulary through this method

Text Books:

- Basic English Grammar (Third Edition)* by Betty Schramper Azar (Pearson Longman, 2005)
- Presentations Plus* by David A Peoples (John Wiley & Sons, 1992)
- Word Power Made Easy (Revised and Expanded Indian Edition)* by Norman Lewis (Goyal Publishers, 2012)

Reference Books:

- English Grammar in Use* by Raymond Murphy (Cambridge)
- High School English Grammar & Composition* by Wren & Martin (Chand & Co)
- slide:ology* by Nancy Duarte (O'Reilly Media)

E-Resources:

- Public Speaking 101: <http://www.mastersincommunication.com/public-speaking/>
- Toastmasters International: <https://www.toastmasters.org/>
- TED – Ideas worth spreading: <https://www.ted.com/>

Kannada Language

Course Code	: 15KAN19/29	L:T:P:S	Credits	: Mandatory
Exam marks	: CIE: 50 SEE: 50	1:0:0:0	Exam Duration	: 2 hours

Course Objectives:

- To expose the students to the official language of the state.
- To enable students from different parts of the country to speak and understand Kannada language.

Syllabus:

Module - I

Lesson 1 : Introducing each other – 1.
Personal Pronouns, Possessive forms, Interrogative words.
Lesson 2 : Introducing each other – 2.
Personal Pronouns, Possessive forms, Yes/No Type Interrogation
Lesson 3 : About Ramayana.
Possessive forms of nouns, dubitive questions, Relative nouns
Lesson 4 : Enquiring about a room for rent.
Qualitative and quantitative adjectives.

Module - II

Lesson 5 : Enquiring about the college.
Predicative forms, locative case.
Lesson 6 : In a hotel
Debatable cases, defective verbs.
Lesson 7 : Vegetable market.
Numeral, plurals.
Lesson 8 : Planning for a picnic.
Imperative, Permissive, hortative.

Module - III

Lesson 9 : Conversation between Doctor and the patient.
Verb- iru, negation – illa, non – past tense.
Lesson 10: Doctors advise to Patient.
Potential forms, no – past continuous.
Lesson 11: Discussing about a film.
Past tense, negation.
Lesson 12: About Brindavan Garden.
Past tense negation.

Module - IV

Lesson 13: About routine activities of a student.
Verbal Participle, reflexive form, negation.
Lesson 14: Telephone conversation.
Past and present perfect past continuous and their negation.
Lesson 15: About Halebid, Belur.
Relative participle, negation.
Lesson 16: Discussing about examination and future plan.
Simple conditional and negative

Module - V

Lesson 17: Karnataka (Lesson for reading)
Lesson 18: Kannada Bhaashe (Lesson for reading)
Lesson 19: Mana taruva Sangatiialla (Lesson for reading)
Lesson 20: bEku bEDagaLu (lesson for reading)

Course Outcomes:

At the end of the course, the students will be:

- Able to understand and communicate in Kannada with local people

Engineering Mathematics - 2

Course Code	: 15MAT21	L:T:P:S	Credits	: 5
Exam marks	: CIE: 50 SEE: 50	3:2:0:4	Exam Duration	: 3 hours

Course Objectives:

- To enhance the mathematical skills acquired in previous course to solve the engineering problems.
- To trace the curves by analyzing the function and fit the curves for the given data.
- To expose the students with the knowledge of multiple integrals in finding area and volume and use of Laplace Transforms in engineering problems.

Syllabus:

Module - I

Differential Equations –I : Linear differential equations with constant coefficients:- Solution of second and higher order differential equations –By inverse differential operator method, Method of variations of parameter. 08 hrs

***Initial value and boundary value problems**

Module –II

Differential Equations –II: Solution of simultaneous differential equations of first order. Linear differential equation with variable coefficients: - Solution of Cauchy's and Legendre's Linear equations. Application of Linear differential equations: - Simple Harmonic Motion.

*** Application of Linear Differential Equations to LCR-Circuits.** 08hrs

Module –III

Tracing of curves and curve fitting: Tracing of curves :- Cartesian, parametric and polar forms. Curve fitting by the method of least square: Straight line, parabola and exponential curves, rank correlation, Correlation and regression lines. 08 hrs

Module –IV

Integral calculus : Multiple integrals:- Evaluation of double and triple integrals. Evaluation of double integrals by changing the order of integration and changing into polar coordinates.

Beta and Gamma functions: Definition, relations and simple problems.

***Applications of double and triple integrals to find area and volume.** 08 hrs

Module –V

Laplace Transforms: Definition, L.T of standard functions, L.T of $e^{at}f(t)$, $t^n f(t)$ and $\frac{f(t)}{t}$ - Problems, L.T of periodic functions and unit step functions.

Inverse Laplace Transforms:- Inverse Laplace Transforms of the form :- $e^{-as} \bar{f}(s)$, completing square, partial fractions, logarithmic and inverse functions.

Solution of Linear Differential Equations using Laplace Transform. 8 hrs

***Convolution Theorem - Problems**

Course Outcomes:

On Completion of this course the students are able to:

- Solve the higher order differential equations in different engineering applications.

- To carry out curve fitting using the experimental/theoretical data.
- Find the area and volume by using double and triple integrals.
- Methods of solving Laplace and inverse transforms of the real valued functions and Initial Value Problems.

Text Books:

1. B.S.Grewal, "**Higher Engineering Mathematics**", Khanna Publishers.
2. N.P. Bali and Manish Goyal, "**A textbook of Engineering Mathematics**", Laxmi Publications.

Reference Books:

1. Erwin Kreyszig, "**Advanced Engineering Mathematics**", Wiley.
2. B.V. Ramana, "**Higher Engineering Mathematics**", TataMcGraw-Hill.
3. H.K. Dass and Er. Rajnish Verma, "**Higher Engineering Mathematics**", S.Chand Publishing.

***Self Study topics to be studied by students and submit the report to the department**

