CURRICULUM OF CIVIL ENGINEERING
RGUKT BASAR

I YEAR
I SEMESTER

Subject Code	Subject Name	L-T-P	Credits
MA1101	Mathematics-I	4-0-0	4
CE1101	Engineering Mechanics-I	4-0-0	4
HS1001	English	4-0-0	3
PH1001	Physics	4-0-0	4
CS1101	Programming in C	4-0-0	4
HS1101	Communication Skills-I	2-0-0	1
HS1601	English Lab	0-0-3	2
PH1601	Physics Lab	0-0-3	2
CS1701	Programming in C-Lab	0-0-3	2
Total		22-0-9	26

MA1101   **MATHEMATICS - I**

Externals: 60Marks   **L-T-P-C**

Internals: 40Marks   **4-0-0-4**

Objectives:
- To give a thorough explanation of real sequences and series.
- To introduce the concepts of Euclidean space and the behavior of functions in them.
- To emphasize the applications of differentiation on real functions and their geometrical inferences.
- Introduction to Numerical analysis.
- To Introduce Fourier series and it's applications.

UNIT-I

Sequence: Definition of sequence, convergence, limit of a sequence, divergence, oscillation, bounded and monotonic sequences, Bounded sequences, Sandwich theorem, Algebra of limits, L'Hospital Rule in sequences, subsequences and its limit.

Series: Infinite series, partial sum, convergence, divergence, oscillation, Geometric series, Telescoping series, Algebra of Limits, n^{th}- term test, Comparison test, Comparison test (Limit Form), Integral test, D'Alembert's Ratio test, Cauchy's Root test, Alternating series, Leibnitz's Rule, Absolute convergence, Conditional convergence, Power series, Radius of convergence for a power series.

UNIT-II

Differential calculus: Rolle's theorem, Lagrange's mean value theorem, Cauchy's Mean-value theorem, Taylor's Theorem and Expansion, Maclaurin's Theorem and Expansion, Indeterminate forms and application of L'Hospital Rule. Radius of curvature, Envelope, Increasing and decreasing functions, concavity, convexity and point of inflexion, Asymptotes-Curve Tracing(Sketching)

UNIT-III

Functions of Several Variable Calculus:

Definition of continuity and differentiability in single variable, n-dimensional Euclidean space, Neighborhood of a point in n-dimensional Euclidean space, Functions in n-variables, Functions in 2 & 3 variables, Interior points, Boundary points, open and closed regions, Limit and continuity, Two-path test, Discontinuities, Partial Differentiation, Clairaut's theorem(for mixed Partial Derivatives), Laplace equation, Homogeneous functions , Euler's theorem for Homogeneous functions, Differentials and derivatives, Derivatives of composite functions, Chain Rule, Jacobians, Taylor's Theorem, Maxima and minima, Lagrange's method of multipliers.

UNIT-IV:

Fourier Series:
Definition of Fourier Series, Fourier Series representation of function, Limit of Convergence of Fourier Series, Even & Odd functions, Gibb's Phenomenon, Sine and Cosine Series, Limit of Convergence of Sine & Cosine Series. Integration and Differentiation of Fourier Series, Bessel's Inequalities, Parseval's Theorem.

UNIT-V

Numerical Methods:
Introduction: True value, Approximate Value, Error, Error percentage, Application of Numerical Analysis in various fields.

Numerical Analysis in solving Algebraic equations: Algebraic equations, Transcendental equations, Bisection Method, Regula -Falsi Method, Newton-Raphson Method.

Numerical Integration: Trapezoidal Rule, Simpson $\frac{1}{3}$ Rule, Simpson $\frac{3}{8}$ Rule

Text Books:
1. Thomas Calculus, Maurice D.Wier, Joel Hass Eleventh Edition, Pearson Education ,2008

2. R.K. Jain & S.R.K.Iyengar, Advanced Engineering Mathematics, Third Edition, Narosa publications, 2007.

3. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons Ltd 2006.

Suggested References:
1. B.S. Grewal and J.S. Grewal, "Higher Engineering Mathematics",(40th Edition), Khanna Publishers,2007
2. S.S. Sastry ,Introductory Methods of Numerical Analysis ,Third Edition, Prentice Hall India

*L-T-P-C stands for number of lectures, tutorials, practices and credits

CE1101   ENGINEERING MECHANICS - I

Externals: 60Marks   **L-T-P-C**

Internals: 40Marks   **4-0-0-4**

Objectives:
- To understand the resolution of forces, equilibrium and compatibility conditions ofstatic loads
- To determine the various forces in the members, and analyze the sections using various methods
- To obtain friction, centroid, and moment of Inertia for various regular and irregularbodies

UNIT-I
Force Systems: Resultant of collinear, parallel, coplanar and non-coplanar concurrent and non-concurrent force systems. Resolving a planar or non-coplanar force system into different directions. Moment of force and its applications, Couples and Wrench of a force system.

UNIT -II
Equilibrium of Force Systems: Free body diagram, Equations of equilibrium, Equilibrium of planner and spatial system.

UNIT -III
Analysis of structures: Analysis of trusses by method of joints and method of sections, Analysis of frames by method of members.

UNIT -IV
Friction: Laws of friction. Application to simple systems, connected systems and belt friction. Wedge friction.

UNIT -V
Centroid and Moment of Inertia: Centroids of lines, areas and volumes, Areas and volumes of revolution, Pappu's theorems and their applications, Area moment of inertia, Product moment of Inertia, Composite areas, radius of gyration.

Suggested Readings:
1. Ferdinand L. Singer (1975). "Engineering Mechanic" *Collins, Singapore*.
2. Timoshenko, S.P. and D.H. Young. (1983). "Engineering Mechanics." *McGraw-Hill International Edition.*
3. Rajeshakharam, S. and Sankarasubrahmanyam, G. (2002). Mechanics." *Vikas Publications.*
4. Junarkar, S.B. and H.J. Shah. (2001). "Applied Mechanics, Publishers.
5. Shames, J.H (1987). "Engineering Mechanics", *Prentice Hall.*
6. Bhattacharyyya, B. (2015). "Engineering Mechanics." *Oxford Higher Education*

HS1001   **ENGLISH**

Externals: 60 Marks   **L-T-P-C***

Internals: 40 Marks   **4-0-0-3**

Objectives:
> ➢ To improve the English language learning ability of the students by emphasizing on LSRW.
> ➢ To complement the comprehensibility of the Technical subjects in a better way.
> ➢ To make them competent to attempt and qualify in various tests.
> ➢ To develop the study skills in formal and informal situations.

UNIT -I

A Road Not Taken Robert Frost: Understanding the Poem - Decision Making -Themes of the Poem -Figures of Speech –Simile- Alliteration- Onomatopoeia

UNIT-II

Phonetics: Consonants - Vowels – BBC Phonetic Transcription – Syllabification - Word Stress - Voiced and Voiceless - Rules of Pronunciation - Tongue Twisters

UNIT-III

What's Up? An Excerpt from The Hindu (September 29, 2015): Article,Tenses, Prepositions and Speech: A Revision -Common Errors in English Usage -Commonly Mispronounced Words -Punctuation

UNIT-IV

Malala's Speech: An Excerpt from www.noble.org (10 December 2014) :Interviews/Self-Introduction - Debate - Group Discussion

UNIT-V

The Nightingale and the Rose by Oscar Wilde: Recollecting the Rules of Spelling - Commonly Mis-spelt Words list -Dialogue writing: Seeking Permission, Requesting, Interrupting - Skimming and Scanning

 UNIT –VI

Anand's Super 30 for IIT-JEE: An Excerpt from The India Today (July 11,15): Essay Writing- How to Write a Report- Formats of report writing- Letter writing - Formal Letter - Informal Letter- Notice Writing - On various events e.g. Annual Day -Email writing - Emailing e.g. Formal and In Formal - Curriculum Vitae or Resume preparation

UNIT –VII

Education and Technology-Burj Khalifa: www.natgeotv.com : Burj Khalifa (Documentary Video)-JAM/PPT Presentations

UNIT-VIII

A Missile Man-Dr. APJ Kalam: An Excerpt from The Hindu (Sept 25, 2006) -Binomials and Portmanteau - Words often Confused - Reading Comprehension - Affixes (Prefixes and Suffixes) - One Word Substitutes on How to Describe People -Homophones, Homonyms and Homographs - Antonyms and synonyms - Spotting the Error -Commonly Used Phrasal Verbs/Idioms

Supplementary Sources:

The King's Speech : Speech Therapy Tricks
Invictus : Inspirational Story
Lord of the Flies : Thematic Movie
Tangled : A Fairy Tale
> ➢ Debates from (BBC and NDTV)
> ➢ A course in Spoken English

*L-T-P-C stands for number of lectures, tutorials, practices and credits

PH 1001   **ENGINEERING PHYSICS**

Externals: 60Marks   **L-T-P-C***

Internals: 40Marks   **4-0-0-4**

Objectives:

1. To inculcate in the Students a sense of yearning to learn the basic Physics behind the applications that we look around in day to day life.

2. To deliver the basic Principles of Physics that forms the basis for the development of Technology.

3. The basic details of Solid state Physics, Optics and Electrodynamics and Quantum Physics provided in a subtle fashion dealt in finer details to have strong basics in these areas.

UNIT – I
MATHEMATICAL PHYSICS (3)

Gradient, Divergence, Curl and their physical significance
  Scalar and Vector point Functions, Differential operator, Gradient , Physical significance, Divergence, Significance, Curl, Physical Significance, Vector Identities

1. Stokes theorem & Gauss theorem
   Vector Integral Theorems, Line Integral, Surface and Volume Integrals, Stokes Theorem, Gauss-Divergence Theorem, Application

1. Curvilinear coordinates
   Types of Coordinate systems, Polar coordinates, Cylindrical and Spherical coordinates, Equations Relating Cartesian, Spherical and Cylindrical coordinate

UNIT – II
ELECTRODYNAMICS (6)

1. Maxwell's Equations
   Electrodynamics before Maxwell, Fixing of Ampere's Law, Maxwell Equation in matter, Boundary Conditions.

2. Poynting theorem and conservation laws
   Continuity Equation, Poynting Theorem, Conservation Law Newton Third law in Electrodynamics

2.3 Wave equation
   Wave equation, wave form Boundary conditions, Reflection and Transmission for a string

2.4 Electro Magnetic Waves in vacuum

Wave equation for E and B, Monochromatic Plane Waves, Energy and Momentum in EM Waves in vacuum

1. Electro Magnetic waves in Matter
   Propagation in Linear Media, Reflection and Transmission at Normal Incidence Oblique Incidence

1. EM wave in conducting surface.

Reference Books :

1. Electrodyamics by David j.Griffiths

UNIT – III
OPTICS (12)

1. Interference by division of wave front (Biprism)
   Introduction , Interference of Light Waves, Interference Pattern , Intensity Distribution, Fresnel Biprism

3.2 Interference by division of amplitude (Newton's rings)
   Interference by Plane parallel Wave, Cosine Law, Interference by a film with Non-Parallel reflecting surface, Wedge, Newton's Rings.

3.3 Michelson's interferometer
   Interference by Plane film illuminated by a point source, Michelson's Interferometer.

3.4 Fraunhoffer diffration (Single slit)
   Introduction, Types of Diffraction,Single Slit Frauhoffer Diffraction, Position of Maxima and Minima,Graphical Method for determining roots

3.5 Frauhoffer diffraction Double slit & multiple slits
   Double slit Fraunhoffer diffraction by N- Parallel slits

3.6 Diffraction Gratings, Grating and Resolving Power
   Diffraction Grating, Construction of Grating, Grating Spectrum, Resolution, Resolving Power of a diffraction Grating

3.7 Fresnel diffraction and Zone Plate
   Types of Diffraction, Fresnel diffraction, Fresnel Half Period zones, Zone plate Application of Zone, Lens

3.8 Production of Plane Polarised light & double refraction
   Introduction , Polarisation of Light waves, Representation of various types of light, Polarization by Reflection,Brewster's Law, Laws of Malus and proof, Geometry of Calcite Crystal, Double Refraction, Nicol's Prism, Applications.

3.9 Quarter & Half – wave plate, elliptical & circular polarized lights

Huygen's Theory of Double Refraction, Quarter Wave plate, Half Wave Plate, Elliptically and Circularly Polarised light.

3.10 Production & detection of elliptical & circular Polarised lights

Elliptically polarised Light, Circularly polarised light, Conversion of Elliptically polarized light to Circularly polarised light, Analysis of polarized light of Different Kinds.

3.11 Theory of Laser

Introduction, Spontaneous Emission, Stimulated Emission, Relation between Spontaneous and Stimulated emission Probabilities, Population Inversion, Pumping, Active systems.

3.12 Different kinds of Lasers

Ruby laser Working Semiconductor laser,He-Ne laser ,Application of Laser.

Reference Books :

1. Engineering Physics By Malik and Singh
2. Optics by Ajoy Ghatak
3. Optics by Pedrotti and Pedrotti.

UNIT – IV
QUANTUM MECHANICS (6)

4.1 Failures of classical physics

Limitations of classical physics, Blackbody Radiation, Spectral Lines, Photoelectric Effect, Planck's Quantum Hypothesis, Einstein's Theory of photoelectric Effect, Compton effect, Existence of stationary states, Stern-Gerlach Experiment

4.2 DeBroglie waves & Uncertainity Principle

Introduction, Matter waves Electron Diffraction Experiment Standing waves of an electron in orbit, Uncertainity Principle Single Slit Experiment, Application of Uncertainty Principle.

4.3 Wave function, Schrodinger Equation & probablity interpretation

Time Dependent Schrodinger Equation ,1- D Equation for a free particle, extension to 2-D, Inclusion of forces, Probability current Density

4.4 Operators , expectation values & Time independent Schrodinger Equation

Operators ,Expectation Value, Ehrenfest Theorem, time independent schrodinger Equation and Admissibility Conditions on Wave function.

4.5 Solution for generalised potential

Motion of a particle in a Potential – Classical view .

4.6 Particle in a box
   Square well potential with Rigid walls, Energies and Wave functions

Reference Books:

1. Modern Physics by A. Beiser
2. Quantum Mechanics by Aruldhas.

UNIT – V
CONDENSED MATTER PHYSICS (6)

5.1 CRYSTALLOGRAPHY-I
   Introduction, Crystal ,Single, poly and Amorphous state, Lattice Points and Space Lattice, Unit cell, Primitive Unit Cell in 2-D ,Non-primitive Unit Cell in 2-D lattice ,Primitive unit cell in 3-D ,Non Primitive unit cell in 3-D,Bravais Lattice and crystal systems, Atomic Packing, Crystal structure

5.2 Crystallography-II
   Miller Indices, Positions, Directions, Planes Obtaining Miller indices, Important Cubic crystal   structures, SC, BCC, FCC, Closed Packed structures, Packing fraction, NaCl Structure, Diamond , ZnS Structure.

5.3 X-ray diffraction
   Introduction, Bragg's Law, Diffraction Direction Experimental Methods of x-Ray Diffraction, Powder method Debye - Scherrer Method Measurement of Bragg Angle

5.4 Defects in crystals
   Introduction, Classification of Imperfections, Point Defects, vacancies, Schottky   defects, Intersitial, Frenkel defects, Impurities, Colour centres, Line defect Planar Defects, Volume Defects, Thermodynamical consideration for Existence of Defect   equilibrium concentration of Schottky defects in metals, Equilibrium concentration of   schottky defects in Ionic crystals, Frenkel defect in metals, Frenkel defects in ionic crystals

5.5 Electron theory of metals
   Important properties of metals, electron theory of solids, classical free elecrtron theory, DC Electrical Conductivity, Gains of Drude Model, Sommerfeld quantum Model, Fermi Energy, Density of Energy States, carrier Concentration, Drawbacks of Sommerfeld Theroy

5.6 Band theory of solids

   Introduction, Formation of Energy Bands in Crystals, Characteristics, Bonding, Classification, Intrinsic and Extrinsic Semiconductors, Band structure, Energy Bands, Fermi Level and Fermi Energy, Carrier Concentration, Density of electrons in Conduction band, Position of Fermi level, Hall Effect, Applications

Reference Books:
1. Solid state Physics by Dekker
2. Solid state Physics By C.Kittel

CS1101   **PROGRAMMING IN C**

Externals: 60Marks   **L-T-P-C**

Internals: 40Marks   **4-0-0-4**

Prerequisites
1. No prerequisites
2. Requires analytical skills and logical reasoning.

Objectives

This course starts from the basics of computers and program development

☐ It covers various concepts of C programming language

☐ To learn how to write modular and readable C Programs

☐ To learn to write programs (using structured programming approach) in C to solve problems.

☐ To introduce the students to basic data structures

Outcomes

1.Develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings and Implement searching and sorting algorithms

UNIT – I
Introduction to Computer Programming: Computing Environments, Computer Languages, Creating and Running Programs. Algorithms and Flow charts : Definition of Algorithms, examples, Symbols used in Flow chart, examples. Introduction to C Language - Background, C Identifiers, Data Types, Operators, Variables, Constants, Input / Output, Expressions, C Programs, Precedence and Associativity, Evaluating Expressions, Type Conversion, Statements, Bitwise Operators.

UNIT-II
Selection: Logical Data and Operators, if-else, switch Statements, Standard Functions. Repetition: loops, while, for, do-while statements, Loop examples, break, continue, go to. Arrays - Concepts, Using Arrays in C, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection, Bubble, Insertion Sorts.

UNIT – III
Functions: Designing Structured Programs, Functions Basics, User Defined Functions, Inter Function Communication, Standard Functions, Scope, Storage Classes-auto, Register, Static, Extern, Scope Rules, and Type Qualifiers. Recursion- Recursive Functions, Preprocessor Commands. Strings - Concepts, C Strings, String Input / Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT – IV
Pointers - Introduction, Pointers to Pointers, Compatibility, void Pointers, Arrays and Pointers, Pointer constants, Pointers and Strings, Pointers to Functions, Point ers to Constant Objects, Constant Pointers, Pointer Arithmetic.Call-by-reference: Pointers for Inter-Function Communication, Passing Arrays to a Function.Dynamic Memory Allocation: Memory Allocation Functions, Programming Applications, Command-line Arguments.

UNIT – V
The Type Definition (type def), Enumerated Types Structure: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions. Input and Output: Files, Streams, Standard library Input Output Functions, Character Input Output Functions.

Suggested References:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice

Hall of India.

2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.

3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

4. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, Tata McGraw-Hill.

5. Ellis Horowitz, SatrajSahni and Susan Anderson-Freed, Fundamentals of Data Structures

in C, W. H. Freeman and Company.

6. R. G. Dromey, How to Solve it by Computer, Prentice-Hall of India.

HS1101   **COMMUNICATION SKILLS-I**

Externals: 60   **L-T-P-C***
Internals: 40   **2-0-0-1**

Objectives:
- To improve the English language learning ability of the students by emphasizing on LSRW.
- To complement the comprehensibility of the Technical subjects in a better way.

UNIT-I
Basics of Technical Communication - Introduction - Importance of Technical Communication (2hrs) - **Visual Aids in Technical Communication** - Tables - Graphs - Chart - Drawings and Diagrams - Photographs – Maps - **Non-verbal Communication** - Introduction - Kinesics - Proxemics - Chronemics - Correlating Verbal and Non-verbal Communication - Cross-cultural Variations - Significance of Understanding Culture

UNIT-II
Speaking – JAM - Dialogue conversations - Telephonic Conversations and Etiquette - Telephonic Conversation Practice – Jokes – Proverbs – Quotes

UNIT-III
Writing- Dialogue writing

<u>**Suggested References:**</u>

1. Technical Communication – Meenakshi Raman & Sangeeta Sharma

HS1601   **ENGLISH LAB**

Externals: 60 Marks   **L-T-P-C***

Internals: 40 Marks   **0-0-3-2**

Objectives:
* To sensitize students to their communication skills.
* To make the students practice the language skills (L, S, R, W).

UNIT- I
Grammar – Adjectives – Comparatives and Superlatives – Adverbs – Countable and Uncountable Nouns – Pronouns – Simple present – Present continuous – Simple past- Conjunctions – Prepositions – Plurals – Articles a, an, the – Infinitive or –ing – Questions and Negatives -1 - Questions and Negatives -2

UNIT-II
Pronunciation – Pill/Fill – Buy/My – Tie/Die – Ship/Chip – Yet/ Jet – Game/ Came – Wail/Veil – Think/Sink – There/Dare – Price/ Prize – Asia/ Hard – Ran/Rang – Right/Light – Ship/Sheep – Head/Had- Schwa – Luck/ Look - Hat/Heart – But/Boot – Who/ Her – Pot/Port – Hair/ Hear – Pay/Pie – Boy/Buy – Know/ Now

UNIT-III
Writing – Writing a Thank You Letter – Writing about your life – Writing Instructions – Writing a Story – Writing an Essay – Writing a Business Letter – Writing a Film Review – Writing a Biography – Writing a Complaint Letter – Writing a Covering Letter - Writing a Pen friend Post - Writing about a Special Day - Writing an E-mail of Apology - Writing a Short Report - Writing a Post Card

UNIT – IV
Reading - The diamond thief – The guru and sweets – Taking a course – Reading a story - Using a dictionary – Making a journey – Reading a newspaper – Making friends – Reading an email – Finding information – A pen friend letter – The doctor says…- Choosing a holiday – Struck by lightning – Health matters :Yoga

UNIT – V
Listening – What shall we play? – An exciting weekend – A school outing – The morning assembly – Instructions on planting – Excuse me, can you lend me…- Manish's summer – Vignesh's hobby – What can I do for you? – What are you doing Ramesh? – I've got a few questions…- Geetha's day – Anil's new purchase – What are we having tonight? – What is the problem?

Suggested References:
1. Clarity English Success

PH 1001   ENGINEERING PHYSICS LAB

Externals: 60Marks   **L-T-P-C***
Internals: 40Marks   **0-0-2-2**

1. Coupled Pendula

2. Specific rotation - Polarimeter

3. Diffraction Grating

4. Dispersive power of a prism

5. Franck Hertz experiment

6. Photoelectric effect

7. Four probe Experiment

8. Hall effect

9. Ultrasonic Waves

CS1701 **PROGRAMMING IN C LAB**

Externals: 60Marks   **L-T-P-C**

Internals: 40Marks   **0-0-3-2**

Objectives:

   1. Able to have fundamental concept on basics commands in Linux.

   2. Able to write, compile and debug programs in C language.

   3. Able to formulate problems and implement algorithms in C.

   4. Able to effectively choose programming components that efficiently solve computing problems in real-world

Experiments:
Suggested assignments to be conducted on a 3-hour slot. It will be conducted in tandem with the theory course so that the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below:
1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Files

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS1101 can be substituted

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