COURSE STRUCTURE & DETAILED SYLLABUS

MECHANICAL ENGINEERING

B.TECH. FIRST YEAR I SEMESTER

(Applicable for the batches admitted from 2020-2021)

ACE

Engineering College

Ankushapur(V), Ghatkesar(M), Medchal Malkajgiri (Dist.), Telangana - 501 301.

(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)

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Ankushapur(V), Ghatkesar(M), Medchal Malkajgiri Dist - 501 301
(Autonomous)

B.TECH. FIRST YEAR I SEMESTER

MECHANICAL ENGINEERING
COURSE STRUCTURE

I Year				I Semester			
S.No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	BSC	MA101BS	Mathematics – I	3	1	0	4
2	BSC	PH103BS	Engineering Physics	3	1	0	4
3	ESC	CS103ES	Programming for Problem Solving	3	1	0	4
4	ESC	ME104ES	Engineering Graphics	1	0	4	3
5	BSC	PH106BS	Engineering Physics Lab	0	0	3	1.5
6	ESC	CS106ES	Programming for Problem Solving Lab	0	0	3	1.5
7	*MC	MC107ES	Environmental Science	3	0	0	0
8	*MC	MC108	Business English	2	0	0	0
			Induction Programme				
Total				**15**	**3**	**10**	**18**

R20 B.Tech ME I Year

MA101BS: MATHEMATICS – I

(Linear Algebra and Calculus)
(Common to CE, EEE, ME, ECE, CSE, IT, IOT, AI&ML, DSE)

B.Tech. I Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MA101BS	BSC	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

Prerequisite: Mathematical Knowledge of 12th / Intermediate level

Course Objectives: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyse the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

UNIT – I: Matrices

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT – II: Eigen values and Eigen vectors

Eigen values and Eigen vectors: Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT - III: Sequences & Series

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences. Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

UNIT – IV: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT – V: Multivariable calculus (Partial Differentiation and applications)

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons,2006.

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint,2010.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint,2002.

Web References:

1) SWAYAM Online Courses: https://storage.googleapis.com/uniquecourses/online.html
2) Directory of Open Access Journals: https://doaj.org/
3) Springer Open Journals: https://www.springeropen.com/journals
4) UG/PG MOOCs: http://ugcmoocs.inflibnet.ac.in/ugcmoocs/moocs_courses.php

E-Text Books:

1) National Digital Library: https://ndl.iitkgp.ac.in/
2) NCERT Text Books: http://ncert.nic.in/textbook/textbook.htm
3) Directory of Open Access Books: https://www.doabooks.org/

PH103BS: ENGINEERING PHYSICS

B. Tech. I Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
PH 103BS	**BSC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**0**	**4**	**30**	**70**	**100**
Contact Classes:45	**Tutorial Classes:15**	**Practical Classes: Nil**				**Total Classes :60**		

Prerequisites: Intermediate level Physics and Mathematics

COURSE OBJECTIVES:

To make the students

1. Gain knowledge on the mechanism of physical bodies upon the action of forces on them
2. Understand different types of vibrations
3. Learn on the nature, generation & transmission of different types of waves
4. Get familiarized with the optical phenomena like Interference and diffraction
5. Understand the methods of production of lasers & the basic concepts of optical fibers

COURSE OUTCOMES:

After completion of this course the students will be able to

1. Apply the fundamental concepts of Mechanics to solve numerical problems
2. Explain the characteristics of different types of vibrations
3. Describe the propagation, transmission and reflection of waves
4. Express the basic idea of interference and diffraction
5. Describe different types of lasers, their characteristics and propagation of light through fibers

UNIT - I: INTRODUCTION TO MECHANICS

Transformation of scalars and vectors under Rotation transformation, Forces in Nature, Newton's laws and its completeness in describing particle motion, Form invariance of Newton's second law, Solving Newton's equations of motion in polar coordinates, Problems including constraints and friction, Extension to cylindrical and spherical coordinates

UNIT - II: HARMONIC OSCILLATIONS

Mechanical and electrical simple harmonic oscillators-Damped harmonic oscillator: heavy, critical and light damping, Energy decay in a damped harmonic oscillator- Relaxation time, Quality factor- Mechanical and electrical oscillators, Mechanical and electrical impedances- Steady state motion of forced damped harmonic oscillator, Power absorbed by an oscillator.

UNIT - III: WAVES IN ONE DIMENSION

Transverse wave on a string- wave equation on a string- Harmonic waves, Reflection and transmission of waves at a boundary-Impedance matching -Standing waves and their Eigen frequencies-Longitudinal waves- wave equation- Acoustic waves and speed of sound, Standing sound waves.

UNIT - IV: WAVE OPTICS

Huygens' principle-Superposition of waves- Interference of light by the division of wave front and amplitude -Young's double slit experiment-Newton's rings, Michelson's interferometer- Fraunhofer diffraction from a single slit and circular aperture, Diffraction grating- Grating Spectrum- Rayleigh's criterion- Resolving power.

UNIT - V: LASERS AND FIBER OPTICS

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Applications of laser. Fiber Optics: Introduction, Optical fiber as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibers, Losses associated with optical fibers, Applications of optical fibers.

TEXT BOOKS:

1. MK Harbola, Vijaykrishna&Madhumohan, "Engineering Physics"- Cengage Learning, 2018.
2. HJ Pain, "The physics of vibrations and waves", Wiley, 2006

REFERENCEBOOKS:

1. IG Main, "Vibrations and waves in physics', 3rd ed., Cambridge University Press, 2018.
2. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
3. MK Verma, "Introduction to Mechanics", Universities Press
4. AjoyGhatak, "Optics", McGraw Hill Education, 2012.
5. MK Harbola, "Engineering Mechanics", 2nd ed., Cengage Learning

WEBREFERENCES:

1. http://link.springer.com/book
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

E -TEXT BOOKS:

1. http://www.peaceone.net/basic/Feynman/
2. http://physicsdatabase.com/free-physics-books/
3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html

R20 B.Tech ME I Year

CS103ES: PROGRAMMING FOR PROBLEM SOLVING

B. Tech. I Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
CS103ES	**ESC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	1	0	4	30	70	100
Contact Classes: 45	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes: 60**		

Prerequisite: Basic knowledge of Computer

Course Objectives:

- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.
- To learn modular programming approach in programming
- To understand and learn the concept of derived data types.

Course Outcomes:

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into module (functions) and to develop modular reusablecode.
- To use derived data type to write advances C programs.

UNIT – I: COMPUTER FUNDAMENTALS AND INTRODUCTION TO C LANGUAGE

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems
Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.
Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion,
The main method and command line arguments
Bitwise operations: Bitwise AND, OR, XOR and NOT operators
Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, go to, Iteration with for, while, do while loops
I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

UNIT – II: Derived Data Types

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays **Strings**: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings
Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list(no implementation) **Enumeration data type**

UNIT - III: Files

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef**Files**: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Functions

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT – V: Applications of Arrays & Analysis of algorithms

Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number, etc.

Basic searching in an array of elements (linear and binary search techniques),

Basic algorithms to sort array of elements (Bubble, Insertion, Selection, Quick and Merge sort algorithms)

Stack using Arrays and Queue using Arrays

Basic concept of order of complexity through the example programs

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures,Cengage Learning, (3rdEdition)

Reference Books:

1. 'C Programming: A Modern Approach (2nd Edition)' by K. N.King
2. Let us c by YawanthKanetkar
3. Programming in C, Stephen G. Kochan, Fourth Edition, PearsonEducation.
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,Prentice Hall ofIndia
5. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, PearsonEducation.
7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4thEdition

Web References:

1. https://github.com/EbookFoundation/free-programming-books/blob/master/free- programming-books.md#c
2. https://publications.gbdirect.co.uk//c_book/

E-Text Books:

1. https://books.goalkicker.com/CBook/
2. http://www2.cs.uregina.ca/~hilder/cs833/Other%20Reference%20Materials/The%20C%20Programming%20Language.pdf
3. https://www.stormingrobots.com/prod/tutorial/pdf/kingBook-ch1to10.pdf

ME104ES : ENGINEERING GRAPHICS

B.Tech. I Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ME104ES	ESC	1	0	4	3	30	70	100
Contact Classes: 15	Tutorial Classes: 0	Practical Classes: 60				Total Classes: 75		

Prerequisite: NIL

Course Objectives:

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection ofobjects.
- To draw sectional views and pictorial views of solids.

Course Outcomes: At the end of the course, the student will be able to:

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

UNIT – II

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere.

UNIT – IV

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder.

UNIT – V

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Introduction to CAD: (For Internal Evaluation Weightage only)

Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package.

Text Books

1. Engineering Drawing N.D.Bhatt/Charotar.
2. Engineering Drawing / N. S. Parthasarathy and VelaMurali/Oxford.

Reference Books

1. Engineering Drawing / Basant Agrawal and McAgrawal/McGrawHill.
2. Engineering Drawing/ M. B. Shah, B.C. Rane/Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al –CBSPublishers.

Web References:

1. http://www.ndl.iitkgp.ac.in/

E-Text Books:

1. http://www.pdfdrive.com/engineering-drawing-books.html
2. http://www.examupdates.in/engineering-drawing-text-book/

PH106BS: ENGINEERING PHYSICS LAB

B.Tech. I Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
PH 106 BS	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**3**	**1.5**	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**		

Prerequisite: Nil

COURSE OBJECTIVES:

To make the student

1. To gain knowledge by applying the experimental methods to correlate with the theoretical concepts.
2. To learn the usage of mechanical, electrical, magnetic and optical systems for various measurements.
3. To Apply the analytical techniques to the experimental data
4. To develop communication skills while working in a group

COURSE OUTCOMES:

After completion of this course the student will be able to

1. Operate different sets of measuring tools like spectrometer, travelling microscope, diffraction grating and techniques, Melde's apparatus, diffraction grating, coupled oscillator, Torsional pendulum, LCR circuit, Fiber optic kit
2. Compute relevant physical quantities from the observed measurements and interpret through graphical methods
3. Compare the experimental results with their theoretical counterparts
4. Demonstrate basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results

List of Experiments:

1) Dispersive power of the material of a prism – Spectrometer
2) Determination of wavelengths of white source – Diffraction grating
3) Newton's Rings – Radius of curvature of Plano convex lens
4) Melde's experiment – Transverse and longitudinal modes
5) Coupled Oscillator
6) L-C-R circuit – Resonance & Q-factor
7) Torsional pendulum – Rigidity modulus
8) Laser Diffraction-Determination of Wavelength
9) Calculation of attenuation coefficient of an optical fiber
10) Determination of Numerical aperture of an optical fiber

(Any eight experiments to be mandatorily performed by the student)

List of Equipment Required:

Name of the Equipment		Quantity
Spectrometers	**:**	**6**
Diffraction Gratings	**:**	**6**
Prisms	**:**	**8**
Sodium Vapour lamps	**:**	**2**
Mercury Vapour Lamps	**:**	**2**
Newton's Rings-Sets	**:**	**6**
Melde's Apparatus	**:**	**6**
Stewart- Gee's Apparatus	**:**	**6**
Circular Brass Discs	**:**	**8**
Coupled Oscillators	**:**	**6**

Text Books:

1. C. L. Arora, "Practical Physics", S. Chand & Co., New Delhi, 3rd Edition, 2012.
2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering Students", S M Enterprises, 2nd Edition, 2014
3 Y. Aparna, K. Venkateswarao, "Engineering Physics Lab Manual", VGS Book links 2010

Reference Books:

1. C.F. Coombs, "Basic Electronic Instrument Handbook", McGraw-Hill Book Co., 1972.
2. C.H. Bernard and C.D. Epp, John Wiley and Sons, "Laboratory Experiments in College Physics" Inc., New York, 1995.

Web References:

1. https://www.scribd.com/doc/143091652/engineering-physics-lab
2. https://www3.nd.edu/~wzech/LabManual_0907c.pdf
3. https://www.morebooks.de/store/gb/book/engineering-physics-lab-manual/isbn/978-3-330-34402.