VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.E.SYLLABUS FOR 2018-2022

Calculus and Linear Algebra

(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-19)

Course Code : 18MAT11
Contact Hours/Week : 05(3L+2T)
Total Hours:50 (8L+2T per module)
Semester : I

CIE Marks : 40
SEE Marks: 60
Exam Hours:03
Credits: 04 (3:2:0)

Course Learning Objectives: This course Calculus and Linear Algebra (**18MAT11**) will enable students:

- To familiarize the important tools of calculus and differential equations that are essential in all branches of engineering.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner.

MODULE-I

Differential Calculus-1: Review of elementary differential calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature- Cartesian and polar forms; Centre and circle of curvature (All without proof-formulae only) –applications to evolutes and involutes. (RBT Levels: L1 & L2)

MODULE-II

Differential Calculus-2: Taylor's and Maclaurin's series expansions for one variable (statements only), indeterminate forms - L'Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions. Maxima and minima for a function of two variables; Method of Lagrange multipliers with one subsidiary condition. Applications of maxima and minima with illustrative examples. Jacobians-simple problems.
(RBT Levels: L1 & L2)

MODULE-III

Integral Calculus: Review of elementary integral calculus.
Multiple integrals: Evaluation of double and triple integrals. Evaluation of double integrals-change of order of integration and changing into polar co-ordinates. Applications to find area volume and centre of gravity
Beta and Gamma functions: Definitions, Relation between beta and gamma functions and simple problems.(RBT Levels: L1 & L2)

MODULE-IV

Ordinary differential equations(ODE's)of first order:
Exact and reducible to exact differential equations. Bernoulli's equation. Applications of ODE's-orthogonal trajectories, Newton's law of cooling and L-R circuits. Nonlinear differential equations: Introduction to general and singular solutions ; Solvable for p only; Clairaut's and reducible to Clairaut's equations only.(RBT Levels: L1,L2 and L3)

MODULE-V

Linear Algebra: Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss –Jordan method and Approximate solution by Gauss-Seidel method. Eigen values and eigenvectors-Rayleigh's power method. Diagonalization of a square matrix of order two. (RBT Levels: L1,L2 and L3)

Text Books:

1. **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. **E. Kreyszig**: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. **C.Ray Wylie, Louis C.Barrett** : "Advanced Engineering Mathematics", 6th Edition, 2. McGraw-Hill Book Co., New York, 1995.
2. **James Stewart** : "Calculus –Early Transcendentals", Cengage Learning India Private Ltd., 2017.
3. **B.V.Ramana**: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. **Srimanta Pal & Subobh C Bhunia:** "Engineering Mathematics", Oxford University Press,3rd Reprint, 2016.
5. **Gupta C.B., Singh S.R. and Mukesh Kumar**: "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

Course Outcomes: On completion of this course, students are able to:

CO1: Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.

CO2: Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.

CO3: Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.

CO4 : Solve first order linear/nonlinear differential equation analytically using standard methods

CO5 : Make use of matrix theory for solving system of linear equations and compute eigenvalues and eigenvectors required for matrix diagonalization process.

Question Paper Pattern:

- **The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.**
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

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COMPUTER PROGRAMMING LABORATORY (Effective from the academic year 2018 -2019) SEMESTER – I/II			
Subject Code	18CPL17/27	**CIE Marks**	40
Number of Contact Hours/Week	0:0:2	**SEE Marks**	60
Total Number of Lab Contact Hours	30	**Exam Hours**	3 Hrs
Credits – 1			

Descriptions (if any):

- The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm being implemented / implemented for the problems given.
- Note that experiment 1 is mandatory and written in the journal.
- Questions related with experiment 1, need to be asked during viva-voce for all experiments.
- Every experiment should have algorithm and flowchart be written before writing the program.
- Code should be traced using minimum two test cases which should be recorded.
- It is preferred to implement using Linux and GCC.

Laboratory Programs:

1.	Familiarization with computer hardware and programming environment, concept of naming the program files, storing, compilation, execution and debugging. Taking any simple C- code.
	PART A
2.	Develop a program to solve simple computational problems using arithmetic expressions and use of each operator leading to simulation of a commercial calculator. (No built-in math function)
3.	Develop a program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
4.	Develop a program to find the reverse of a positive integer and check for palindrome or not. Display appropriate messages.
5.	An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.
6.	Introduce 1D Array manipulation and implement Binary search.
7.	Implement using functions to check whether the given number is prime and display appropriate messages. (No built-in math function)
	PART B
8.	Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked.
9.	Develop a Program to compute Sin(x) using Taylor series approximation .Compare your result with the built- in Library function. Print both the results with appropriate messages.
10.	Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.
11.	Develop a program to sort the given set of N numbers using Bubble sort.
12.	Develop a program to find the square root of a given number N and execute for all possible inputs with appropriate messages. Note: Don't use library function sqrt(n).
13.	Implement structures to read, write, compute average- marks and the students scoring above and below the average marks for a class of N students.
14.	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.

15.	Implement Recursive functions for Binary to Decimal Conversion.

Laboratory Outcomes: The student should be able to:

- Write algorithms, flowcharts and program for simple problems.
- Correct syntax and logical errors to execute a program.
- Write iterative and wherever possible recursive programs.
- Demonstrateuse of functions, arrays, strings, structures and pointers in problem solving.

Conduct of Practical Examination:

- All laboratory experiments, excluding the first, are to be included for practical examination.
- Experiment distribution
  - For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
  - For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution *(Subjected to change in accoradance with university regulations)*
  a) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  b) For questions having part A and B
     i. Part A – Procedure + Execution + Viva = 4 + 21 + 5 = 30 Marks
     ii. Part B – Procedure + Execution + Viva = 10 + 49+ 11 = 70 Marks

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C PROGRAMMING FOR PROBLEM SOLVING (Effective from the academic year 2018 -2019) SEMESTER – I/II			
Subject Code	18CPS13/23	**CIE Marks**	40
Number of Contact Hours/Week	2:2:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	3 Hrs
CREDITS –3			

Module 1	**Contact Hours**
Introduction to computer Hardware and software: Computer generations, computer types, bits, bytes and words, CPU, Primary memory, Secondary memory, ports and connections, input devices, output devices, Computers in a network, Network hardware, Software basics, software types. Overview of C: Basic structure of C program, executing a C program. Constant, variable and data types, Operators and expressions, **Reference 1: Chapter 1, Chapter 2 (2.2, 2.3)** **Text book 1: Ch 1, 2 and 3**	08
Module 2	
Managing Input and output operations. Conditional Branching and Loops.Example programs, Finding roots of a quadratic equation, computation of binomial coefficients, plotting of Pascals triangle. **Text book 1: 4, 5 and 6**	08
Module 3	
Arrays: Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching and Sorting Algorithms (Linear search, Binary search, Bubble sort and Selection sort). **Text book 1: Ch 5, 6, 7 (7.1 to 7.6) and 8 (8.1 to 8.8)**	08
Module 4	
User Defined Functions and Recursion. Example programs, Finding Factorial of a positive integers and Fibonacci series. **Text book 1: Ch 9 (9.1 to 9.18)**	08
Module 5	
Structure and Pointers, Preprocessor Directives **Text book 1: Ch 10 (10.1 to 10.9) and 11(11.1 to 11. 6 and 11.16)**	08

Course Outcomes: The student will be able to :

- Illustrate simple algorithms from the different domains such as mathematics, physics, etc.
- Construct a programming solution to the given problem using C.
- Identify and correct the syntax and logical errors in C programs.
- Modularize the given problem using functions and structures.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill

2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

Reference Books:

1. Sumitabha Das, Computer Fundamentals & C Programming, Mc Graw Hill Education.
2. Gary J Bronson, ANSI C Programming, 4th Edition, Ceneage Learning.
3. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press 2013.
4. R S Bichkar, Programming with C, University Press, 2012.
5. V Rajaraman: Computer Programming in C, PHI, 2013.
6. Basavaraj S. Anami, Shanmukhappa A Angadi, Sunilkumar S. Manvi, Computer Concepts and C Programming: A Holistic Approach to Learning C, Seond edition, PHI India, 2010.

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BASIC ELECTRONICS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Course Code	**18ELN14/24**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03 (02 + 01 Tutorial)**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course objectives: This course will enable students to:

- Understand characteristics, operation and applications of the diodes, bipolar junction transistors, field effect transistors, SCRs and operational amplifiers in electronic circuits.
- Understanddifferent number systems and working of fundamental building blocks of digital circuits.
- Understand the principle of basic communication system and mobile phones.

Modules	**RBT Levels**
Module-1	
Semiconductor Diodes and Applications: p-n junction diode, Equivalent circuit of diode, Zener Diode, Zener diode as a voltage regulator, Rectification-Half wave rectifier, Full wave rectifier, Bridge rectifier, Capacitor filter circuit (2.2, 2.3, 2.4 of Text 1). Photo diode, LED, Photocoupler. (2.7.4, 2.7.5, 2.7.6 of Text 1). 78XX series and 7805 Fixed IC voltage regulator (8.4.4 and 8.4.5 of Text 1).	L1, L2, L3
Module-2	
FET and SCR: Introduction, JFET: Construction and operation, JFET Drain Characteristics and Parameters, JFET Transfer Characteristic, Square law expression for I_D, Input resistance, MOSFET: Depletion and Enhancement type MOSFET- Construction, Operation, Characteristics and Symbols,(refer 7.1, 7.2, 7.4, 7.5 of Text 2), CMOS (4.5 of Text 1). Silicon Controlled Rectifier (SCR) – Two-transistor model, Switching action, Characteristics, Phase control application (refer 3.4 upto 3.4.5 of Text 1).	L1, L2, L3

Module-3	
Operational Amplifiers and Applications: Introduction to Op-Amp, Op-Amp Input Modes, Op-Amp Parameters-CMRR, Input Offset Voltage and Current, Input Bias Current, Input and Output Impedance, Slew Rate (12.1, 12.2 of Text 2). Applications of Op-Amp -Inverting amplifier,Non-Inverting amplifier, Summer, Voltage follower, Integrator, Differentiator, Comparator (6.2 of Text 1).	L1, L2, L3
Module-4	
BJT Applications, Feedback Amplifiers and Oscillators: BJT as an amplifier, BJT as a switch, Transistor switch circuit to switch ON/OFF an LED and a lamp in a power circuit using a relay (refer 4.4 and4.5 of Text 2). Feedback Amplifiers – Principle, Properties and advantages of Negative Feedback, Types of feedback, Voltage series feedback, Gain stability with feedback (7.1-7.3 of Text 1). Oscillators – Barkhaunsen's criteria for oscillation, RC Phase Shift oscillator, Wien Bridge oscillator (7.7-7.9 of Text 1). IC 555 Timer and Astable Oscillator using IC 555 (17.2 and 17.3 of Text 1).	L1, L2, L3
Module-5	
Digital Electronics Fundamentals: Difference between analog and digital signals, Number System-Binary, Hexadecimal, Conversion- Decimal to binary, Hexadecimal to decimal and vice-versa, Boolean algebra, Basic and Universal Gates, Half and Full adder, Multiplexer, Decoder, SR and JK flip-flops, Shift register, 3 bit Ripple Counter (refer 10.1-10.7 of Text 1). Basic Communication system, Principle of operations of Mobile phone (refer 18.2 and 18.18 of Text 1).	L1, L2

Course Outcomes: After studying this course, students will be able to:

- Describe the operation of diodes, BJT, FET and Operational Amplifiers.
- Designand explainthe construction of rectifiers, regulators, amplifiers and oscillators.
- Describe general operating principles of SCRs and its application.
- Explain the working and design of Fixed voltage IC regulator using 7805 and Astable oscillator using Timer IC 555.
- Explain the different number system and their conversionsand construct simple combinational and sequential logic circuits using Flip-Flops.
- Describe the basic principle of operation of communication system and

mobile phones.

Proposed Activities to be carried out for 10 marks of CIE:

Students should construct and make the demo of the following circuits in a group of 3/4 students:

1. +5v power supply unit using Bridge rectifier, Capacitor filter and IC 7805.
2. To switch on/off an LED using a Diode in forward/reverse bias using a battery cell.
3. Transistor switch circuit to operate a relay which switches off/on an LED.
4. IC 741 Integrator circuit/ Comparator circuit.
5. To operate a small loud speaker by generating oscillations using IC 555.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. D.P.Kothari, I.J.Nagarath, "Basic Electronics", 2nd edn, McGraw Hill, 2018.
2. Thomas L. Floyd, "Electronic Devices", Pearson Education, 9th edition, 2012.

Reference Books:

1. D.P.Kothari, I.J.Nagarath, "Basic Electronics", 1st edn, McGraw Hill, 2014.
2. Boylestad, Nashelskey, "Electronic Devices and Circuit Theory", Pearson Education, 9th Edition, 2007/11th edition, 2013.
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
4. Muhammad H. Rashid, "Electronics Devices and Circuits", Cengage Learning, 2014.

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Advanced Calculus and Numerical Methods

(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-19)

Course Code : 18MAT21
Contact Hours/Week : 05(3L+2T)
Total Hours:50 (8L+2T per module)
Semester : II

CIE Marks : 40
SEE Marks: 60
Exam Hours:03
Credits: 04 (3:2:0)

Course Learning Objectives: This course viz., Advanced Calculus and Numerical Methods (**18MAT21**) aims to prepare the students:

- To familiarize the important tools of vector calculus, ordinary/partial differential equations and power series required to analyze the engineering problems.
- To apply the knowledge of interpolation/extrapolation and numerical integration technique whenever analytical methods fail or very complicated, to offer solutions.

MODULE-I

Vector Calculus:-
Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- Illustrative problems.
Vector Integration: Line integrals, Theorems of Green, Gauss and Stokes (without proof). Applications to work done by a force and flux.
(RBT Levels: L1 & L2)

MODULE-II

Differential Equations of higher order:-Second order linear ODE's with constant coefficients-Inverse differential operators, method of variation of parameters; Cauchy's and Legendre homogeneous equations. Applications to oscillations of a spring and L-C-R circuits.
(RBT Levels: L1 ,L2 and L3)

MODULE-III

Partial Differential Equations(PDE's):-
Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables.
(RBT Levels: L1, L2 & L3)

MODULE-IV

Infinite Series: Series of positive terms- convergence and divergence. Cauchy's root test and D'Alembert's ratio test(without proof)- Illustrative examples.

Power Series solutions-Series solution of Bessel's differential equation leading to $J_n(x)$-Bessel's function of first kind-orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$-Legendre polynomials. Rodrigue's formula (without proof), problems.

(RBT Levels: L1 & L2)

MODULE-V

Numerical Methods:
Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods(only formulae)- Illustrative examples.

Numerical integration: Simpson's (1/3)th and (3/8)th rules, Weddle's rule (without proof) – Problems.

(RBT Levels: L1, L2 & L3)

Text Books:

1. **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. **E. Kreyszig**: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. **C.Ray Wylie, Louis C.Barrett** : "Advanced Engineering Mathematics", 6th Edition, 2. McGraw-Hill Book Co., New York, 1995.
2. **James Stewart** : "Calculus –Early Transcendentals", Cengage Learning India Private Ltd., 2017.
3. **B.V.Ramana**: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics",Oxford University Press,3rd Reprint,2016.
5. **Gupta C.B., Singh S.R. and Mukesh Kumar**: "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME – 20

Course Outcomes: On completion of this course, students are able to:

CO1: Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.

CO2: Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.

CO3: Construct a variety of partial differential equations and solution by exact methods/method of separation of variables.

CO4: Explain the applications of infinite series and obtain series solution of ordinary differential equations.

CO5: Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.

Question Paper Pattern:

- **The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.**
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

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ENGINEERING PHYSICS

Semester	**: I/II**	**CIE Marks**	**: 40**
Course Code	**: 18PHY12/22**	**SEE Marks**	**: 60**
Teaching Hours/week (L:T:P)	**: 3:2:0**	**Exam Hours**	**: 03**
	Credits : 04		

Course Learning Objectives:

This course **(18PHY12/22)** will enable students to

- Learn the basic concepts in Physics which are very much essential in understanding and solving engineering related challenges.
- Gain the knowledge of newer concepts in modern physics for the better appreciation of modern technology

MODULE-I

Oscillations and Waves

Free Oscillations: Definition of SHM, derivation of equation for SHM, Mechanical simple harmonic oscillators (mass suspended to spring oscillator), complex notation and phasor representation of simple harmonic motion. Equation of motion for free oscillations, Natural frequency of oscillations.

Damped and forced oscillations: Theory of damped oscillations: over damping, critical & under damping, quality factor. Theory of forced oscillations and resonance, Sharpness of resonance. One example for mechanical resonance.

Shock waves: Mach number, Properties of Shock waves, control volume. Laws of conservation of mass, energy and momentum. Construction and working of Reddy shock tube, applications of shock waves.

Numerical problems

(RBT Levels : L1, L2 & L3)

MODULE-II

Elastic properties of materials:

Elasticity: Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress, compressive stress, strain hardening and strain softening, failure (fracture/fatigue), Hooke's law, different elastic moduli: Poisson's ratio, Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of and β. Relation between Y, n and K, Limits of Poisson's ratio.

Bending of beams: Neutral surface and neutral plane, Derivation of expression for bending moment. Bending moment of a beam with circular and rectangular cross section. Single cantilever, derivation of expression for Young's' modulus.

Torsion of cylinder: Expression for couple per unit twist of a solid cylinder (Derivation), Torsional pendulum-Expression for period of oscillation.
Numerical problems.

(RBT Levels : L1, L2 & L3)

MODULE- III

Maxwell's equations, EM waves and Optical fibers

Maxwell's equations: Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum.

EM Waves: The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves (Qualitative).

Optical fibers: Propagation mechanism, angle of acceptance. Numerical aperture. Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and Mention of expression for attenuation coefficient. Discussion of block diagram of point to point communication. Merits and demerits Numerical problems.

(RBT Levels : L1 & L2)

MODULE IV

Quantum Mechanics and Lasers

Quantum mechanics: Introduction to Quantum mechanics, Wave nature of particles, Heisenberg's uncertainty principle and applications (non confinement of electron in the nucleus), Schrodinger time independent wave equation, Significance of Wave function, Normalization, Particle in a box, Energy eigen values of a particle in a box and probability densities.

Lasers: Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of CO_2 and semiconductor Lasers.
Application of Lasers in Defense (Laser range finder) and Engineering (Data storage).
Numerical problems

(RBT Levels : L1, L2 & L3)

MODULE-V

Material science

Quantum Free electron theory of metals: Review of classical free electron theory, mention of failures. Assumptions of Quantum Free electron theory,

Mention of expression for density of states, Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level, Derivation of the expression for Fermi energy, Success of QFET.

Physics of Semiconductor: Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression), Conductivity of semiconductors(derivation), Hall effect, Expression for Hall coefficient (derivation)

Dielectric materials: polar and non-polar dielectrics, internal fields in a solid, Clausius-Mossotti equation(Derivation), mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers. Numerical problems.

(RBT Levels : L1, L2 & L3)

Textbooks:

1. A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand & Company Ltd, New Delhi.
2. Engineering Physics-Gaur and Gupta Dhanpat Rai Publications-2017.
3. Concepts of Modern Physics-Arthur Beiser: 6th Ed, Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006.

Reference books:

1. Introduction to Mechanics, MK Verma: 2nd Ed, University Press(India) Pvt Ltd, Hyderabad 2009.
2. Lasers and Non Linear Optics, BB laud, 3rd Ed, New Age International Publishers 2011.
3. Solid State Physics-S O Pillai, 8th Ed New Age International Publishers-2018.
4. Shock waves made simple- Chintoo S Kumar, K Takayama and KPJ Reddy: Willey India Pvt. Ltd., New Delhi, 2014.
5. Introduction to Electrodynamics, David Griffiths, 4th Ed, Cambridge University Press 2017.

Course Outcomes:

Upon completion of this course, students will be able to

1. Understand various types of oscillations and their implications, the role of Shock waves in various fields and Recognize the elastic properties of materials for engineering applications.
2. Realize the interrelation between time varying electric field and magnetic field, the transverse nature of the EM waves and their role in optical fiber communication.
3. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent 1-D Schrodinger's wave equation.
4. Apprehend theoretical background of laser, construction and working of different types of laser and its applications in different fields

5. Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.

Question paper pattern:

Note:- The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 60.

- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **20** marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

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BASIC ELECTRICAL ENGINEERING

Semester	**: I/II**	**CIE Marks**	**: 40**
Course Code	**: 18ELE13/23**	**SEE Marks**	**: 60**
Teaching Hours/week (L:T:P)	**: 2:2:0**	**Exam Hours**	**: 03**
	Credits : 03		

Lecture hours per module: Six hours and Tutorials per module: **one of 2 hours**

Course Objectives:

- To explain Ohm's law and Kirchhoff's laws used for the analysis of DC circuits.
- To explain fundamentals of AC circuits and the behaviour of R, L and C and their combinations in AC circuits.
- To discuss three phase balanced circuits.
- To explain principle of operation, construction and performance of electrical machines such as single phase transformer, DC machines, synchronous generator and three phase induction motor.
- To introduce concepts of electrical wiring, circuit protecting devices and earthing.

MODULE-I

D.C.Circuits: Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy.

A.C. Fundamentals: Generation of sinusoidal voltage, frequency of generated voltage, definition and numerical values of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities.

(RBT Levels : L1, L2, L3 & L4)

MODULE - 2

Single Phase Circuits: Analysis, with phasor diagram, of circuits with R, L, C, R-L, RC, R-L-C for series and parallel configurations. Real power, reactive power, apparent power and power factor.

Three Phase circuits: Advantages of 3-phase power, Generation of 3-phase power, Three-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of three phase power using two wattmeter method.

(RBT Levels : L1, L2, L3 & L4)

MODULE - 3

Single Phase Transformers: Necessity of transformer, Principle of operation, Types and construction of transformers. emf equation, losses, variation of losses with respect to load, efficiency, Condition for maximum efficiency.

Domestic Wiring: Service mains, meter board and distribution board. Brief discussion on concealed conduit wiring. Two-way and three-way control. Elementary discussion on circuit protective devices: Fuse and Miniature Circuit Breaker (MCB's),electric shock, precautions against shock. Earthing: Pipe and Plate earthing.

(RBT Levels : L1, L2 & L3)

MODULE – 4

DC Generators: Principle of operation, Construction of D.C. Generators. Expression for induced emf,Types of D.C. Generators,Relation between induced emf and terminal voltage.

DC motors: Principle of operation,Back emf,Torque equation, Types of dc motors, Characteristics of dc motors (shunt and series motors only) and Applications.

(RBT Levels : L1, L2 & L3)

MODULE – 5

Three Phase Synchronous Generators: Principle of operation, Constructional details, Synchronous speed, Frequency of generated voltage, emf equation, Concept of winding factor (excluding the derivation and calculation of distribution and pitch factors).

Three Phase Induction Motors: Principle of operation, Generation of rotating magnetic field, Construction and working of three-phase induction motor, Slip and its significance. Necessity of starter, star-delta starter.

(RBT Levels : L1, L2 & L3)

Textbooks:

1 Basic Electrical Engineering, D C Kulshreshtha, Tata McGraw Hill, Revised First Edition.

2 Principles of Electrical Engineering & Electronics, V.K. Mehta, Rohit Mehta, S.ChandPublications.

Reference Books:

1 Fundamentals of Electrical Engineering and Electronics, B. L. Theraja, S. Chand & Company Ltd, Reprint Edition 2013.

2 Electrical Technology, E. Hughes, International Students 9th Edition, Pearson, 2005.

3 Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 2017.

Course Outcomes:

At the end of the course the student will be able to:

- Analyse D.C and A.C circuits.
- Explain the principle of operation andconstruction of single phase transformers.

- Explain the principle of operation andconstruction of DC machines and synchronous machines.
- Explain the principle of operation and construction of three phase induction motors.
- Discuss concepts of electrical wiring, circuit protecting devices and earthing.

Graduate Attributes (As per NBA): Engineering Knowledge, Problem Analysis.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

PROPOSED B.E. SYLLABUS FOR 2018-2022

ELEMENTS OF MECHANICAL ENGINEERING
18ME15/25

(Common to all Branches)

(Effective from the academic year 2018-19)

Course Code: 18ME15/25	**CIE Marks: 40**
Contact Hours/Week: 03 (2L+1T)	**SEE Marks: 60**
Total Hours: 40	**Credits: 03**
Exams. Hours: 03	

Course Learning Objectives: This course (**18ME15/25**) will enable students to

CLO1	Learn the fundamental concepts of energy, its sources and conversion.
CLO2	Comprehend the basic concepts of thermodynamics.
CLO3	Understand the concepts of boilers, turbines, pumps, internal combustion engines and refrigeration
CLO4	Distinguish different metal joining techniques.
CLO5	Enumerate the knowledge of working with conventional machine tools, their specifications.

MODULES

MODULE-I

Sources of Energy : Introduction and application of energy sources like fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion.

Basic concepts of Thermodynamics: Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics. Concept of internal energy, enthalpy and entropy (simple numericals).

Steam: Formation of steam and thermodynamic properties of steam (simple numericals).

8 Hours
(RBT: L1, L2, L3)

MODULE-II

Boilers: Introduction to boilers, classification, Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories (no sketches).

Turbines: Hydraulic Turbines – Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine (elementary treatment only).
Hydraulic Pumps: Introduction, classification and specification of pumps, reciprocating pump and centrifugal pump, concept of cavitation and priming. **8 Hours**
(RBT: L1, L2, L3)

MODULE – III

Internal Combustion Engines

Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.

Refrigeration and Air conditioning

Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration. Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Domestic refrigerator. Principles and applications of air conditioners, window and split air conditioners. **8 Hours**

(RBT: L1, L2, L3)

MODULE IV

Properties, Composition and Industrial Applications of engineering materials

Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics - Glass, optical fiber glass, cermets. Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators.

Joining Processes: Soldering, Brazing and Welding

Definitions. Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.

Belt drives

Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple numerical problems.

Gear drives

Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio. **8 Hours**

(RBT: L1, L2, L3)

MODULE-V

Lathe - Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe.

Milling Machine - Principle of milling, types of milling machines. Working of horizontal and vertical milling machines. Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.
(Layout sketches of the above machines need not be dealt. Sketches need to be used only for explaining the operations performed on the machines)

Introduction to Advanced Manufacturing Systems

Computer Numerical Control (CNC): Introduction, components of CNC, open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning centers.

Robots: Robot anatomy, joints and links, common robot configurations.
Applications of Robots in material handling, processing and assembly and inspection.

8 Hours

(RBT: L1, L2, L3)

Course Outcomes:

Upon completion of this course, students will be able to

CO1	Identify different sources of energy and their conversion process.
CO2	Explain the working principle of hydraulic turbines, pumps, IC engines and refrigeration.
CO3	Recognize various metal joining processes and power transmission elements.
CO4	Understand the properties of common engineering materials and their applications in engineering industry.
CO5	Discuss the working of conventional machine tools, machining processes, tools and accessories.
CO6	Describe the advanced manufacturing systems.

Question paper pattern:

- **The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.**
- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **20** marks.
- There will be **two** full questions (with a **maximum** of **three** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

Note

- To illustrate the concepts of operations of turbines, pumps, conventional machines like lathe, drilling, milling, grinding etc., the instructions should be blended with video presentations and visit to the laboratories/ machine shop concerned.
- Demonstration of soldering, brazing and welding should be arranged in the workshop.
- To illustrate the fundamentals of CNC machining and turning centers and robots, video presentations should be adapted in addition to class room instructions.
- The boiler mountings and accessories should be shown in the engine lab.
- Assignments should be submitted by students on materials, sources of energy, global warming, welding processes, robots and their applications. These assignments should be given due credit in awarding CIE marks.

TEXT BOOKS

1. **Elements of Mechanical Engineering,** K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
2. **Elements of Mechanical Engineering,** Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.
3. **A Text Book of Elements of Mechanical Engineering",** S. Trymbaka Murthy, 3rd revised edition 2006, I .K. International Publishing House Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. **Elements of Mechanical Engineering,** R.K. Rajput, Firewall Media, 2005.
2. **Elements of Mechanical Engineering,** Dr. A. S. Ravindra, Best Publications, 7th edition, 2009.
3. **CAD/CAM/CIM,** Dr. P Radhakrishnan, 3rd edition, New Age International Publishers, New Delhi.
4. **Introduction to Robotics: Mechanics And Control,** Craig, J. J., 2nd Ed.Addison-Wesley Publishing Company, Readong, MA, 1989.
5. **Introduction to Engineering Materials",** B.K. Agrawal ,Tata McGraHill Publication, New Delhi
6. **Thermal Science and Engineering",** Dr. D.S. Kumar, S.K. Kataria & sons Publication, New Delhi

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ENGINEERING PHYSICS LABORATORY

Semester	**: I/II**	**CIE Marks**	**: 40**
Course Code	**: 18PHYL16/26**	**SEE Marks**	**: 60**
Teaching Hours/week (L:T:P)	**: 0:0:2**	**Exam Hours**	**: 03**
	Credits : 01		

Course Learning Objectives:

This course (18PHY16/26) will enable students

- To realize experimentally, the mechanical, electrical and thermal properties of materials, concept of waves and oscillations
- Design simple circuits and hence study the characteristics of semiconductor devices

Sl. No.	Title of the Experiment	To which Module it belongs
1	Determination of spring constants in Series and Parallel combination	I
2	Determination of Magnetic field intensity is along the axis of a circular coil carrying current(by deflection method)	III
3	n & I by Torsional pendulum (radius of the wire, mass and dimensions of the regular bodies to be given). (In the examination either n or I to be asked)	II
4	Young's modulus of a beam by Single Cantilever experiment (breadth and thickness of the beam to be given)	II
5	Radius of curvature of piano convex lens using Newton's rings(wavelength of light to be given)	III
6	Study Series and parallel LCR resonance and hence Calculate inductance, band width and quality factor using series LCR Resonance	I/III
7	Determine Acceptance angle and Numerical aperture of an optical fiber	III
8	Determine Wavelength of semiconductor laser using Laser diffraction by calculating grating constant.	IV
9	Estimation of Fermi Energy of Copper	V
10	Study of input and output Transistor characteristics and hence calculate input resistance, and	V
11	Draw photodiode characteristics and calculate power responsivity	V
12	Calculation of Dielectric constant by RC charging and Discharging	V

Note:

1.In addition to above experiments, Reddy shock tube must be introduced as compulsory demo experiment.

2.All 12 experiments are mandatory. Student has to perform 2 experiments in the semester end examination.

Course Outcomes:

Upon completion of this course, students will be able to

1. Apprehend the concepts of interference of light, diffraction of light, Fermi energy and magnetic effect of current
2. Understand the principles of operations of optical fibers and semiconductor devices such as Photodiode, and NPN transistor using simple circuits
3. Determine elastic moduli and moment of inertia of given materials with the help of suggested procedures
4. Recognize the resonance concept and its practical applications
5. Understand the importance of measurement procedure, honest recording and representing the data, reproduction of final results

Scheme of Evaluation

(with effect from 2018-19 Scheme)

Subject : Engineering Physics Lab **Code : 18PHYL16/26**

The student has to perform **TWO** experiments during the practical examination of **THREE** hours duration. The scheme of valuation shall be as follows.

Sl. No.	Description	Max.Marks	Part:A Marks for First experiment	Part:B Marks for Second experiment
01	Write up: Formula, Tabular column and Circuit diagram/Ray Diagram	16	4+2+2=08	4+2+2=08
02	Experimental set up/Circuit connection	10	05	05
03	Conduction and reading	40	20	20
04	Graph, Calculations, Results and accuracy	20	2+4+2+2=10	2+4+2+2=10
06	Viva-Voce	14	07	07
Total		100	50	50

Note: The student is required to obtain a minimum of 40 % Marks in the practical examination to pass.

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