Go, change the world

RV College of Engineering®

(An Autonomous Institution Affiliated to VTU, Belagavi)
Approved by AICTE, New Delhi, Accredited By NBA, New Delhi
R.V. Vidyaniketan Post, 8th Mile, Mysuru Road, Bengaluru - 560 059.

Bachelor of Engineering (B.E.)
Scheme and Syllabus

(2021 SCHEME)

I & II Semester
(COMMON TO ALL B.E. PROGRAMS)

ACADEMIC YEAR 2021-2022

Estd: 1963

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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU, Belagavi)
R.V. Vidyaniketan Post, 8th Mile, Mysuru Road, Bengaluru - 560 059.

One of the most preferred Technical Institutions in Karnataka

PROGRAMS OFFERED

2020 Ranked 70th in Engineering Category

Accredited by NBA

B.E., Programs : AI, AS, BT, CH, CS, CV, EC, EE, EI, ET, IM, IS, ME.

M.Tech (15) MCA, M.Sc. (Engg.)

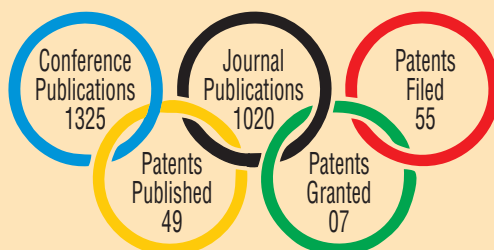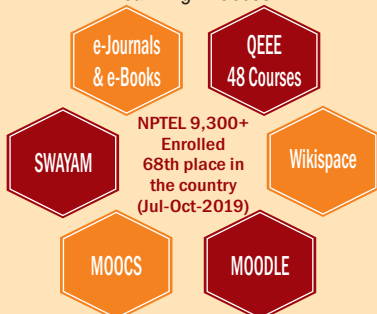**Ph.D. Programs** : All Departments are recognized as Research Centres by VTU Except AI & AS

Five RVCE Alumni cleared Civil Services Exam in 2020-21

Ranked in top 10 Pvt. College in the country by various magazines

Ranked 3rd in Sports & Cultural Activities under VTU (2019-20)

Use of ICT in Teaching Learning Process

e-Journals & e-Books

QEEE 48 Courses

NPTEL 9,300+ Enrolled 68th place in the country (Jul-Oct-2019)

SWAYAM

Wikispace

MOOCS

MOODLE

Conference Publications 1325

Journal Publications 1020

Patents Filed 55

Patents Published 49

Patents Granted 07

Holistic development of students through NCC, NSS cultural activities, Community services & Sports.

16 Centres of Excellences

MoUs:90+with Industries / Academic Institutions in India & abroad

Executed more than Rs. 40 crores worth sponsored research projects & consultancy works since 3 years

UPSC Results (2020) : RVCE - Alumni
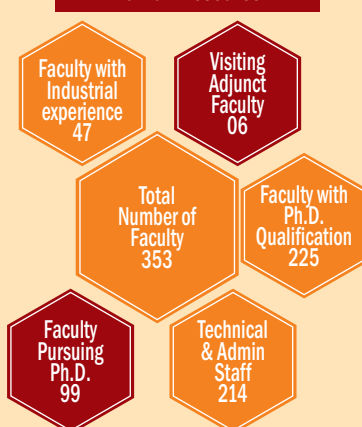
Name : Yatish R
Rank : 115
Branch: EEE
Batch : 2013

Name : Shrinivas MP
Rank : 235
Branch: IT
Batch : 2010

Name : Raghavendra N
Rank : 555
Branch: ECE
Batch :

Human Resource

Faculty with Industrial experience 47

Visiting Adjunct Faculty 06

Total Number of Faculty 353

Faculty with Ph.D. Qualification 225

Faculty Pursuing Ph.D. 99

Technical & Admin Staff 214

RVCE - Greaves Cotton Ltd Centre of excellence om e-mobility

RV-Mercedes Benz Centre for Automotive Merchatronics

nirf

Certificate

NATIONAL INSTITUTIONAL RANKING FRAMEWORK

INDIA RANKINGS 2021

R.V. College of Engineering, Bengaluru
Ranked 77 in Engineering Category

QS I-GAUGE

DIAMOND

RV Educational Institutions ®
RV College of Engineering ®

Autonomous
Institution Affiliated
to Visvesvaraya
Technological
University, Belagavi

Approved by AICTE,
New Delhi

Go, change the world

Bachelor of Engineering (B.E.)
Scheme and Syllabus

(2021 Scheme)

I & II Semester
(COMMON TO ALL B.E. PROGRAMS)
(AS PER NEP-2020 GUIDELINES)

ACADEMIC YEAR 2021-2022

VISION

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology

MISSION

1. To deliver outcome based Quality education, emphasizing on experiential learning with the state of the art infrastructure.
2. To create a conducive environment for interdisciplinary research and innovation.
3. To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
4. To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
5. To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.

QUALITY POLICY

Achieving Excellence in Technical Education, Research and Consulting through an Outcome Based Curriculum focusing on Continuous Improvement and Innovation by Benchmarking against the global Best Practices.

CORE VALUES

Professionalism, Commitment, Integrity, Team Work, Innovation

ABBREVIATIONS

Sl. No.	Abbreviation	Meaning
1.	AI & ML	Artificial Intelligence & Machine Learning
2.	AS	Aerospace Engineering
3.	BS	Basic Sciences
4.	BT	Biotechnology
5.	CH	Chemical Engineering
6.	CIE	Continuous Internal Evaluation
7.	CS	Computer Science & Engineering
8.	CV	Civil Engineering
9.	CY	Chemistry
10.	EC	Electronics & Communication Engineering
11.	EE	Electrical & Electronics Engineering
12.	EI	Electronics & Instrumentation Engineering
13.	ET	Electronics & Telecommunication Engineering
14.	GE	Global Elective
15.	HSS	Humanities and Social Sciences
16.	IDEA	Idea Development, Evaluation & Application
17.	IM	Industrial Engineering & Management
18.	IS	Information Science & Engineering
19.	L	Lectures
20.	P	Practicals
21.	T	Tutorials
22.	MA	Mathematics
23.	ME	Mechanical Engineering
24.	PE	Professional Core Elective
25.	PY	Physics
26.	SEE	Semester End Examination
27.	VTU	Visvesvaraya Technological University

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RV COLLEGE OF ENGINEERNG, BENGALURU-560 059
(Autonomous Institution Affiliated to VTU, Belagavi)

FIRST SEMESTER CREDIT SCHEME
(Effective from the Academic year 2021-22)

PHYSICS CYCLE

(COMMON TO ALL B.E. PROGRAMS)

Sl. No.	Course Code	Course Title	BoS	CREDIT ALLOCATION			
				Lecture	Tutorial	Practical	Total Credits
1.	21MA11	Multivariable Calculus	MA	3	1	0	4
2.	21PH12	Engineering Physics	PY	3	0	1	4
3.	21EE13	Elements of Electrical Engineering	EE	2	1	0	3
4.	21CV14	Engineering Mechanics	CV	2	1	0	3
5.	21ME15	IDEA Lab	ME	0	0	1	1
6.	21ME16	Computer Aided Engineering Graphics	ME	0	0	3	3
7.	21HSE17	Technical English – I	HSS	0	0	1	1
8.	21HSI18	Indian Knowledge Systems	HSS	1	0	0	1
		Total number of Credits		**11**	**03**	**06**	**20**
		Total Number of Hours / Week		**11**	**06**	**12**	

CHEMISTRY CYCLE

(COMMON TO ALL B.E. PROGRAMS)

Sl. No.	Course Code	Course Title	BoS	CREDIT ALLOCATION			
				Lecture	Tutorial	Practical	Total Credits
1.	21MA11	Multivariable Calculus	MA	3	1	0	4
2.	21CH12	Engineering Chemistry	CY	3	0	1	4
3.	21CS13	Programming in C	CS	3	0	1	4
4.	21ME14	Elements of Mechanical Engineering	ME	2	1	0	3
5.	21EC15	Elements of Electronics Engineering	EC	2	1	0	3
6.	21HSY16	Yoga Practice	HSS	0	0	1	1
7.	21HSE17	Technical English - I	HSS	0	0	1	1
		Total number of Credits		**13**	**03**	**04**	**20**
		Total Number of Hours / Week		**13**	**06**	**08**	

R V COLLEGE OF ENGINEERNG, BENGALURU-560 059
(Autonomous Institution Affiliated to VTU, Belagavi)

SECOND SEMESTER CREDIT SCHEME
(Effective from the Academic year 2021-22)

PHYSICS CYCLE
(COMMON TO ALL B.E. PROGRAMS)

Sl. No.	Course Code	Course Title	BoS	Lecture	Tutorial	Practical	Total Credits
1.	21MA21	Differential Equations & Numerical Methods	MA	3	1	0	4
2.	21PH22	Engineering Physics	PY	3	0	1	4
3.	21EE23	Elements of Electrical Engineering	EE	2	1	0	3
4.	21CV24	Engineering Mechanics	CV	2	1	0	3
5.	21ME25	IDEA Lab	ME	0	0	1	1
6.	21ME26	Computer Aided Engineering Graphics	ME	0	0	3	3
7.	21HSE27	Technical English - II	HSS	0	0	1	1
8.	21HSI28	Indian Knowledge Systems	HSS	1	0	0	1
Total number of Credits				**11**	**03**	**06**	**20**
Total Number of Hours / Week				**11**	**06**	**12**	

CHEMISTRY CYCLE
(COMMON TO ALL B.E. PROGRAMS)

Sl. No.	Course Code	Course Title	BoS	Lecture	Tutorial	Practical	Total Credits
1.	21MA21	Differential Equations & Numerical Methods	MA	3	1	0	4
2.	21CH22	Engineering Chemistry	CY	3	0	1	4
3.	21CS23	Programming in C	CS	3	0	1	4
4.	21ME24	Elements of Mechanical Engineering	ME	2	1	0	3
5.	21EC25	Elements of Electronics Engineering	EC	2	1	0	3
6.	21HSY26	Yoga Practice	HSS	0	0	1	1
7.	21HSE27	Technical English - II	HSS	0	0	1	1
Total number of Credits				**13**	**03**	**04**	**20**
Total Number of Hours / Week				**13**	**06**	**08**	

<table>
<tr><td colspan="6" align="center">Semester: I</td></tr>
<tr><td colspan="6" align="center">MULTIVARIABLE CALCULUS
(Theory)</td></tr>
<tr><td>Course Code</td><td>:</td><td>21MA11</td><td>CIE</td><td>:</td><td>100 Marks</td></tr>
<tr><td>Credits: L:T:P</td><td>:</td><td>3:1:0</td><td>SEE</td><td>:</td><td>100 Marks</td></tr>
<tr><td>Total Hours</td><td>:</td><td>45L+30T</td><td>SEE Duration</td><td>:</td><td>3 Hours</td></tr>
</table>

Unit-I	**09 Hrs**
Multivariable functions and Partial Differentiation Functions of several variables, Partial Derivatives - Definition and notations, Higher order partial derivatives, Total derivatives (differentials), Composite functions and Chain rule, Extreme values for functions of two Variables-Method of Lagrange multipliers. Jacobians – properties.	
Unit – II	**09 Hrs**
Vector Differentiation Vector valued functions – 2 space and 3 space, Scalar and vector fields, Derivative of vector function-tangent, velocity and acceleration vectors, Gradient of a scalar field –normal vector to the surface, directional derivative, scalar potential. Divergence and Curl of a vector field, Laplacian of scalar field, Solenoidal and irrotational fields, physical interpretations.	
Unit –III	**09 Hrs**
Curvilinear Co-Ordinates Curvilinear co-ordinates- Scale factors, Base vectors, Cylindrical-polar coordinates, Spherical-polar coordinates - Transformations between Cartesian and curvilinear systems, Orthogonality. Elements of arc, area and volume in curvilinear system, Gradient, Divergence, Curl and Laplacian in orthogonal curvilinear coordinates.	
Unit –IV	**09 Hrs**
Integral Calculus **Gamma and Beta functions**- Definitions, relationship between these functions and simple problems. **Multiple integrals** - Double integrals – Introduction and method of evaluation. Change of order of integration and Change of variables to polar coordinates. Applications – Area, Volume and Centre of gravity. Triple integrals - Introduction and method of evaluation. Applications – Volume of a solid.	
Unit –V	**09 Hrs**
Vector Integration Line, surface and volume integrals. Green's theorem, Stoke's theorem and Gauss Divergence theorem (statements only), solenoidal fields and irrotational fields. Work done by a force.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate the understanding of the basics of partial differentiation, elements in curvilinear systems, multiple integrals, vector differentiation and improper integrals.
CO2	Solve problems on total derivatives, different curvilinear systems, change of order of integration, velocity, acceleration vectors, vector integration.
CO3	Apply acquired knowledge to find Jacobians, change of variables, different operations using Del operator and to verify integral theorems.
CO4	Estimate extremal points, area and volume using multiple integrals, solenoidal and irrotational fields.

Reference Books	
1	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 978-81-933284-9-1.
2	Calculus, Thomas and Finney, 9th Edition, 2006, Pearson Education, ISBN: 81-7758-325-5.
3	Schaum's Outline of Advanced Calculus, Robert Wrede and Murray Spiegel, 3rd Edition, 2010, McGraw-Hill Education, ISBN -10: 0071623663, ISBN -13: 978-0071623667.
4	Advanced Engineering Mathematics, E. Kreyszig, 10th Edition (Reprint), 2016. John Wiley & Sons, ISBN: 978-0470458365.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING (40 marks)		
MATLAB	**20**	
Model preparation/case study/video preparation, etc.	**20**	
MAXIMUM MARKS FOR THE THRORY	**100 MARKS**	**100 MARKS**

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	3	1	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1

High-3: Medium-2: Low-1

Semester: II						
DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS (Theory)						
Course Code	:	21MA21		**CIE**	:	100 Marks
Credits: L:T:P	:	3:1:0		**SEE**	:	100 Marks
Total Hours	:	45L+30T		**SEE Duration**	:	3 Hours

Unit-I	**09 Hrs**
Elementary Linear Algebra Rank of matrices - Rank of a matrix by Echelon form, consistency of system of linear equations-homogeneous and non-homogeneous equations, Gauss elimination, Gauss-Jordan and Gauss-Seidel methods. Eigen values and Eigen vectors-properties, largest Eigen value by Rayleigh's power method.	
Unit – II	**09 Hrs**
Linear Ordinary Differential Equations of Higher Order Standard form of higher order linear differential equations with constant coefficients, concept of different types of solutions. Solution of homogeneous equations – complementary functions. Non homogeneous equations- Concept of inverse differential operator, methods of finding particular integral based on input function (force function), method of variation of parameters. Equations with functional coefficients – Cauchy equations. Applications-Simple harmonic motion, LRC circuits.	
Unit –III	**09 Hrs**
Partial Differential Equations Formation of partial differential equations by elimination of arbitrary constants/functions. Solution of Lagrange's linear equations. Solution of partial differential equations by method of separation of variables. Solution of Wave and Heat equations in one dimension and Laplace equation in two dimensions by the method of separation of variables.	
Unit –IV	**09 Hrs**
Numerical Methods – I Finite differences, concept of forward and backward differences, introduction to interpolation (extrapolation). Newton-Gregory (N-G) forward and backward interpolation formulae, Lagrange interpolation formula, application oriented problems. Numerical differentiation based on N-G forward and backward interpolation, applications – velocity and acceleration. Numerical integration- Newton-Cotes approach – Simpson's 1/3rd, 3/8th rules and Weddle's rule.	
Unit –V	**09 Hrs**
Numerical Methods – II Algebraic and Transcendental equations – Roots of equations, intermediate value property, Regula-Falsi and Newton-Raphson methods. Taylor's and Maclaurin's series for a function of single variable and problems. Methods of solving first order ordinary differential equations – Taylor series method, 4th order Runge - Kutta method and Milne predictor–corrector method.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate the understanding of – rank of a matrix, types of solutions of higher order linear & partial differential equations and basics of numerical methods.
CO2	Solve – system of linear equations, linear differential equations, Lagrange linear pde, interpolating data and finding roots of equations.
CO3	Apply acquired knowledge to find – solution of equations using Gauss Seidel method, derivatives and integrals of numerical data and solve differential equations numerically.
CO4	Estimate the solutions of problems involving applications of differential equations using both analytical and numerical methods.

	Reference Books
1	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 978-81-933284-9-1.
2	Advanced Engineering Mathematics, E. Kreyszig, 10th Edition (Reprint), 2016. John Wiley & Sons, ISBN: 978-0470458365.
3	Numerical methods for scientific and engineering computation, M.K. Jain, S.R.K. Iyenger and R.K. Jain, 6th Edition, 2012, New Age International Publishers, ISBN: 9788122433234, 8122433235.
4	A Textbook of Engineering Mathematics Vol. I & II (AICTE), N. P. Bali and Manish Goyal, 10th Edition, Laxmi Publications Pvt Ltd, ISBN: 9789352743766, 9789352743766.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
MATLAB	**20**	
Model preparation/case study/video preparation, etc.	**20**	
MAXIMUM MARKS FOR THE THRORY	**100 MARKS**	**100 MARKS**

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	3	1	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1

High-3: Medium-2: Low-1

Semester: I/II					
		ENGINEERING PHYSICS			
		(Theory and Practice)			
Course Code	:	21PH12/22		**CIE**	:	**150 Marks**
Credits: L: T:P	:	3:0:1		**SEE**	:	**150 Marks**
Total Hours	:	45L + 30P		**SEE Duration**	:	**3 Hours**

Unit-I	**9 Hrs**
Elasticity and Oscillations: **Elasticity:** Hooke's law (qualitative), bending of beams, single cantilever (derivation), torsion of a cylinder: torsion pendulum, Numerical problems. **Oscillations:** Damped and forced harmonic oscillations: differential equation for damped and forced oscillations, LCR circuit (qualitative), electrical resonance, Numerical problems.	
Unit – II	**9 Hrs**
Quantum mechanics Blackbody radiation, Matter waves, Group velocity and phase velocity, Heisenberg's Uncertainty principle and its application, Broadening of spectral lines, One dimensional time independent Schrodinger's wave equation (TISE), Properties of wave function, Eigen functions and Eigen values, application of TISE: One dimensional infinite potential well and free particle. Numerical problems.	
Unit –III	**9 Hrs**
Electrical Conductivity in solids: Postulates of Classical free electron theory (CFET) and Quantum free electron theory (QFET), Density of states in three dimensions (qualitative) and Fermi factor. Fermi energy: variation of Fermi factor with temperature. Band theory of solids (qualitative approach), electron concentration in metals at 0K. Intrinsic semiconductors: electronic concentration in conduction band and hole concentration (qualitative), Fermi level in intrinsic semiconductors, Extrinsic semiconductors: Variation of carrier concentration with temperature and Fermi energy with doping, Hall effect for metals and semiconductors, Numerical problems. **Dielectrics:** Types of Polarizations**.** Qualitative treatment of Internal field in solids for one dimensional infinite array of dipoles (Lorentz field). Clausius-Mossotti equation(derivation). Numerical problems.	
Unit –IV	**9 Hrs**
Lasers and Optical fibers: **Lasers:** Interaction of radiation with matter, Energy density in terms of Einstein's coefficients, Laser requisites, CO_2 laser, Application of laser, Laser in eye and skin surgery, Numerical problems. **Optical Fibres:** Numerical aperture of an optical fibre, types of optical fibres, V-number, attenuation in optical fibres, types of attenuation, Point to Point communication, applications in sensors, phase modulators, Numerical problems.	
Unit –V	**9 Hrs**
Electron Ballistics & Surface Characterization Techniques Motion of charged particle in transverse $\vec{E}$ & $\vec{B}$ fields: $\vec{E}$ perpendicular to velocity, electrostatic deflection (qualitative), electron projected at an angle (qualitative), Magnetic field acting at an angle to initial velocity, Lorentz force equation, Application of crossed $\vec{E}$ & $\vec{B}$ configuration as a velocity selector, Electron & Magnetic lens, Applications in Scanning Electron Microscope, Scanning Tunnelling Electron Microscope. Numerical problems.	

Sl. No.	Lab Experiments
1	Determination of Young's modulus of the given material.
2	Determination of rigidity modulus of the given material.
3	Determination of spring constant, effective spring constants using springs in series and parallel.
4	Determination of wavelength of the given laser.
5	Determination of hall coefficient and carrier concentration of a given semiconductor.
6	Determination of the band gap of a given thermistor.
7	Determination of dielectric constant of a material using charging and discharging of the given capacitor.
8	Determination of numerical aperture, acceptance angle and fiber loss of a given optical fiber.
9	Fermi energy of a material.
10	Verification of Stefan's Law.

Course Outcomes: After completing the course, the students will be able to:-	
CO1	Understand the basic principles of oscillator, elastic properties of materials, quantum mechanics, electrical properties of metals & semiconductors, dielectric properties of materials and behavior of charged particles in electric and magnetic fields.
CO2	Apply the Physics principles to solve Engineering problems in elasticity, oscillation, applied optics, and semiconductors.
CO3	Analyze and solve complex problems using critical thinking.
CO4	Design and develop models by simulation using open-source tools and validate with real time experimentation.

Reference Books	
1	Engineering Physics, Hitendra K Malik and A K Singh, 2010, Tata McGraw Hill Publication, ISBN: 9780070671539.
2	Engineering Physics, R K Gaur and S L Gupta, 2011, DhanpatRai Publications, ISBN: 9788189928223.
3	A Textbook of Engineering Physics, M. N. Avadhanulu and P G Kshirsagar, 2019, S. Chand publications, ISBN : 978-93-528-3399-3.
4	Physics for Degree students, C.L. Arora and Dr. P. S. Hemne, revised 2010, S Chand, ISBN: 9788121933506.
5	Fundamentals of Physics- Resnick, Halliday and Walker, 9th Edition, 2011, John Wiley & Sons, ISBN: 9780470547915.
6	Introduction to Electrodynamics, David J. Griffiths, 4th Edition, 2012, Pearson publishers, ISBN.978-93-325-5044-5.

ASSESSMENT AND EVALUATION PATTERN		CIE	SEE
WEIGHTAGE		**50%**	**50%**
QUIZZES			
Quiz-I		Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II			
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)			
Test – I		Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II			
EXPERIENTIAL LEARNING (40 marks)			
Case Study-based Teaching-Learning		**10**	
Sector wise study & consolidation (Topics from the current trends in Science & Technology and augmenting the syllabus)		**20**	
Video based seminar (4-5 minutes per student)		**10**	
MAXIMUM MARKS FOR THE THRORY		**100 MARKS**	**100 MARKS**
PRACTICALS			
CIE Conduction: 25 Lab test: 05 Experiential Learning: 20 Total : 50	**SEE** Two experiments: for each Write up: 05 Set up & Conduction: 10 Substitution, Calculation & Accuracy: 05 Viva Voce: 05 Total : 50	**50**	**50**
TOTAL MARKS FOR THE COURSE		**150**	**150**

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	---	--		2	--	--	--	--	--	3
CO2	3	2	---		--	--	--	--	--	--	--	--
CO3	3	3	2	2	2	--	--	--	2	--	--	--
CO4	3	3	3	2	3	2	2	--	2	3	3	--

High-3: Medium-2: Low-1

Semester: I/II					
ELEMENTS OF ELECTRICAL ENGINEERING					
(Theory)					
Course Code	:	21EE13/23		**CIE**	:	100 Marks
Credits: L:T:P	:	2:1:0		**SEE**	:	100 Marks
Total Hours	:	30L+30T		**SEE Duration**	:	3 Hours

Unit-I	**07 Hrs**

Electrical Power Generation: Sources of energy – renewable and non-renewable, working principle of hydel, thermal and nuclear power plants through block diagrams, environmental effects and their limitations. Synchronous generator (Alternator) - Construction and Principle of operation, e.m.f equation.
Wind Power Generation: Principle of conversion, constructional details, Types – vertical and horizontal.
Solar Power Generation: Principle of conversion, Different types of PV cells, Parameters, conversion efficiency, I-V and P-V characteristics, PV modules and arrays. Standalone and grid connected plants, Advantages and disadvantages of solar plants.
Batteries: Types, Parameters, Comparison of various rechargeable batteries, Selection and Estimation of number of batteries in series-parallel combinations, Estimation of total energy stored and maximum power from Array of batteries.
Overview of **Smart Grid** through block diagrams.

Unit – II	**06 Hrs**

AC Circuits: Parameters of sinusoidal quantities, Generation of sinusoidal voltage, Voltage and current relationship in R, L and C circuits. Analysis of R-L, R-C, R-L-C Series and Parallel circuits, real power, reactive power, apparent power and Power factor.
Three-phase circuits: Generation of three phase power, balanced star (3 wire and 4 wire system) and delta loads, Phase and line relations of voltages and currents, Phase relation and phase voltages and phase currents, measurement of three phase power by two wattmeter method.

Unit –III	**06 Hrs**

Power distribution and Load calculation: Introduction to power transmission and distribution. Power rating of household appliances including PCs, laptop, printer, etc., total connected load, definition of unit used for consumption of electrical energy, tariff, calculation of electricity bill.
Electric Wiring Schemes: Casing and cap wiring, Open conduit and closed conduit systems.
Standby power supplies: DG set, Uninterrupted power supplies (explanation using Block diagram).
Safety measures: Working principle of Fuse, MCB, ELCB, merits and demerits. Electric Shock, Safety Precautions, Earthing and its types.

Unit –IV	**06 Hrs**

Transformers: Necessity of transformer, Principle of operation, Construction of core and shell type for single - phase and three - phase, losses, efficiency and regulation of 1-phase transformer. Concept of Autotransformer.
Induction Motors: General classification of electrical motors.
Three phase I.M: Principle of operation, Concept of rotating magnetic field, construction and types, slip and its significance.
Single Phase I M: Principle of operation of capacitor start-run induction motor.

Unit –V	**05 Hrs**

DC Motors: Necessity of motors, principle of operation, constructional features, Types, Torque equation, characteristics and comparison of series and shunt motors, Applications.
BLDC, PMSM and Stepper Motor: Construction, Working Principle and Applications.

Course Outcomes: After completing the course, the students will be able to :-	
CO1	Understand the fundamental concepts of electric power generation, electric machines and safety rules.
CO2	Evaluate energy consumption of different loads and electric parameters of various A.C. and D.C. machines.
CO3	Analyze the performance of renewable sources, electric machines and selection of machine for a given application.
CO4	Design rooftop solar PV system and load distribution scheme for residential applications.

Reference Books	
1	Basic Electrical Engineering, C.L. Wadhwa, 1st Edition, 2007, New Age international(P) Limited, ISBN- 10: 9788122421521.
2	Solar Photovoltaic Technology and Systems, Chetan Singh Solanki, 1st Edition, 2013, PHI Learning private limited, ISBN-13 : 978-8120347113
3	Basic Electrical Engineering, D C Kulshreshtha, Revised First Edition, 2017, Tata McGraw Hill, ISBN- 13 : 978-0071328968
4	Electric Machines, Ashfaq Hussain, 3rd Edition, 2016, Dhanpat Rai & Co. (P) Limited, ISBN-10-8177001663.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING (40 marks)		
Case Study-based Teaching-Learning	**10**	
Sector wise study & consolidation. In-depth study and delivery of outcomes in the following topics are Generation, Transmission and Distribution, E-mobility, Electrical machines, Renewable energy sources and Smart-. grid	**20**	
Video based seminar (4-5 minutes per student)	**10**	
MAXIMUM MARKS FOR THE THRORY	**100 MARKS**	**100 MARKS**
TOTAL MARKS FOR THE COURSE	**100**	**100**

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	3	2	1	1	1	1	2
CO2	3	3	2	3	2	1	1	1	2	1	1	2
CO3	3	3	1	1	2	2	2	1	1	1	1	2
CO4	3	2	3	2	2	2	2	1	3	2	2	2

High-3: Medium-2: Low-1

Semester: I / II						
ENGINEERING MECHANICS						
(Theory)						
Course Code	:	21CV14 / 24		**CIE**	:	100 Marks
Credits: L:T:P	:	2:1:0		**SEE**	:	100 Marks
Total Hours	:	30L+30T		**SEE Duration**	:	3 Hours

Unit-I	**06 Hrs**
Introduction to Engineering Mechanics: Basic concepts of force systems, particle equilibrium in 2-D; Rigid body equilibrium; System of forces, coplanar concurrent and non-concurrent forces, Resultant – Moment of forces and its application; Couples and Resultant of force system, Equilibrium of system of forces, Free body diagrams, Equations of equilibrium of coplanar systems.	
Unit – II	**05 Hrs**
Support Reactions: Types of supports, loads and beams, statically determinate and indeterminate beams, support reactions for statically determinate beams subjected to various loading combinations. Trusses: Types of trusses, support reactions for statically determinate trusses.	
Unit –III	**06 Hrs**
Centroid and Centre of Gravity: Definition, Centroid of simple figures (rectangle, triangle, semicircle, quarter circle, sector of circle) from first principle, centroid of composite sections; Centre of gravity and its implications. **Area Moment of Inertia:** Definition, Moment of inertia of plane sections (rectangle, triangle, semicircle and quarter circle) from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections.	
Unit –IV	**07 Hrs**
Simple Stresses and Strain: Hooke's law, Stress-Strain behavior of ductile and brittle material; Factor of safety, Poisson's ratio, types of stress, stress components on inclined planes, Principal Stress, Principal plane - Mohr's circle.	
Unit –V	**06 Hrs**
Kinematics: Displacement, average velocity, instantaneous velocity, speed, acceleration, average acceleration, variable acceleration, acceleration due to gravity, Newton's law of motion, rectilinear motion, curvilinear motion, super elevation, projectile motion, relative motion, motion under gravity. **Kinetics:** D'Alemberts principle and its application in plane motion and connected bodies including pulleys.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the fundamental concepts of Mechanics - Force systems, beams, cross sections and rigid bodies.
CO2	Apply the concepts of Engineering Mechanics in solving simple engineering problems.
CO3	Analyze the support reactions, assess strain and cross sectional properties.
CO4	Demonstrate the applications of mechanics to solve engineering problems.

Reference Books	
1	Engineering Mechanics - Statics and Dynamics, A.Nelson, 2017, Tata McGraw Hill Education, Publication,1st Edition, ISBN-13: 978-0070146143.
2	A Textbook of Strength of Materials: Mechanics of Solids, R.K. Bansal, 2018, Laxmi Publications, 6th Edition, ISBN-13: 978-8131808146.
3	Mechanics of Materials (SI Edition), R. C. Hibbler, 2018, Pearson Education; 9th Edition, ISBN-13: 978-9332584037.
4	A Textbook of Engineering Mechanics, R.K. Bansal and Sanjai Bansal, 2015, Laxmi Publications; 6th Edition, ISBN-13: 978-8131804094.
5	Mechanics for Engineers – Statics, Ferdinand P.Beer and E.Russel Johnston Jr, 2013, McGraw-Hill, 4th Edition, ISBN-13: 978-0070045804.
6	Engineering Mechanics - Statics and Dynamics, Irving H. Shames, 2005, Pearson Education India; 4th

ASSESSMENT AND EVALUATION PATTERN		CIE	SEE
WEIGHTAGE		**50%**	**50%**
QUIZZES			
Quiz-I		Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II			
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)			
Test – I		Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II			
EXPERIENTIAL LEARNING (40 marks)			
Case Study-based Teaching-Learning		**10**	
In-depth study and delivery of outcomes in the following topics are Material science, smart technologies, Modern equipment's, Ancient architecture in modern construction, construction in extreme environment, sustainable and green technologies.		**20**	
Video based seminar (4-5 minutes per student)		**10**	
MAXIMUM MARKS FOR THE THEORY		**100 MARKS**	**100 MARKS**
PRACTICALS			
TOTAL MARKS FOR THE COURSE		**100**	**100**

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	1	-	-	-	1	-	-	-
CO2	3	-	1	-	1	-	-	-	1	1	-	1
CO3	2	3	-	-	1	-	-	-	1	-	-	1
CO4	2	2	2	1	1	-	-	-	2	2	-	1

High-3: Medium-2: Low-1

Semester: I/II					
IDEA LAB **(Practice)**					
Course Code	:	21ME15/25	**CIE**	:	50 Marks
Credits: L: T:P	:	0:0:1	**SEE**	:	50 Marks
Total Hours	:	30P	**SEE Duration**	:	3 Hours

LABORATORY EXPERIMENTS
1. Digital Reading & Writing: Motion controlled lighting.
2. Analog Reading & Writing: Laser based security system.
3. Serial Communication & Bluetooth: Configuring Bluetooth module and building a home automation system.
4. Assembling chassis and configuring motor driver.
5. Line following robot.
6. Mobile Bluetooth controlled robot.
7. IoT based Weather Station using Blynk.
8. Google Assistant based Home Automation using IFTTT & Adafruit IO.
9. Streaming real-time data to a web page via Firebase.

PRACTICE EXPERIMENTS / DEMO	
1.	Using Serial Plotter to plot potentiometer readings.
2.	Interfacing Servo motor using PWM Techniques and performing sweep operation.
3.	Voice Controlled Robot.
4.	Robotic Arm to pick and place objects.
5.	Smart Garden.
6.	Event based emails / push notifications.

Course Outcomes	
CO1	Hands-on experience to interface various Digital and Analog sensors with Arduino.
CO2	Assembling Robotic Chassis & Arm (Mechanical and Electronic Components).
CO3	Connecting sensors and devices to various IoT Platforms.
CO4	Improved coding experience with C, C++, HTML and JavaScript.

Reference Books	
1.	Arduino Project Handbook: Volume One: Complete Guide to Creating with the Arduino by Mark Geddes [ISBN-10 0992952603, Publisher: Sketch Publishing]
2.	Exploring Arduino: Tools and Techniques for Engineering Wizardry by Jeremy Blum [ISBN-10 1119405378, Publisher: Wiley]
3.	Internet of Things with ESP8266 by Marco Schwartz [ISBN-13 9781786468024, Publisher: Packt]
4.	https://www.arduino.cc/reference/en/

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**50**	**50**

Semester: I/II					
COMPUTER AIDED ENGINEERING GRAPHICS					
(Practice)					
Course Code	:	21ME16/26	**CIE**	:	**50 Marks**
Credits: L:T:P	:	0:0:3	**SEE**	:	**50 Marks**
Total Hours	:	90 P	**SEE Duration**	:	**3 Hours**

Unit-I	**15 Hrs**
Introduction: Significance of engineering graphics, BIS conventions, drawing sheets, drawing scales, dimensioning, line conventions, material conventions. Symbolic representation of fasteners - bolts and nuts, riveted, welded, brazed and soldered joints, bars and profile sections, electrical & electronic elements and piping. **Use of Simple CAD tools:** Overview of CAD software [Menu bar, tabs -sketch, modify, dimension, annotation and commands]. **Orthographic Projections:** Principles of orthographic projections - quadrant systems, projection of points (All quadrants); Projection of lines (first angle projection); Projection of planes - inclined to HP, VP and PP (first angle projection).	

Unit – II	**15 Hrs**
Projection of Solids: Prisms, pyramids, cylinder & cone with axis inclined to HP and VP (first angle projection). (Computer Drafting)	

Unit –III	**20 Hrs**
Isometric projection: Isometric scale, Isometric Projection of regular solids and combination of two simple solids (Computer Drafting) . 3D modeling of components: Conversion of isometric view to orthographic views and sectional views, missing views in orthographic projections. (Computer Drafting)	

Unit –IV	**20 Hrs**
Development of lateral surfaces: Introduction to section planes, methods of development - parallel line method and radial line method – prism and cylinder (truncated), pyramid and cone (frustum and truncated) and transition pieces (Computer Drafting).	

Unit –V	**20 Hrs**
Engineering components Assembly of Hexagonal bolt with nut (with washer)-3D Riveted joint: - butt joint with two covering plate (chain riveting): 3D Union joint, butt muff coupling, socket and spigot joint: 3D Basic building drawing (Plan and Elevation): 2D Electrical wiring and lighting drawing: 2D Electronic PCB drawings: 2D	

Course Outcomes: After completing the course, the students will be able to :-	
CO1	Understand the convention and methods of engineering drawing
CO2	Enhance their visualization skills to develop new products
CO3	Elucidate the principles of multi-view drawings and pictorial drawings
CO4	Apply the knowledge of engineering graphics to develop respective (simple) engineering assembly drawings.

Reference Books	
1.	Textbook of Engineering Graphics by K R Gopalakrishna, Sudhir Gopalakrishna, Subhash Publishers, 40th Edition, 2018; ISBN 978-9383214204
2.	SOLIDWORKS 2020 for Designers by Sham Tickoo Purdue University, CADCIM Technologies, 18th Edition, 2019; ISBN: 978-1640570849
3.	Machine drawing by N. D. Bhatt, V. M. Panchal, Charotar Publishing House, 50th Edition, 2016; ISBN: 978-9385039232
4.	NPTEL :: Mechanical Engineering - Engineering Drawing

ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
WEIGHTAGE	**50%**	**50%**
Lab Practice		
Manual Drawing (Unit 1): Practice session	**10**	
Computer Drafting : Practice Session	**15**	
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **10**	
Test – II		
PROJECT/ASSIGNMENT/EXPERIENTIAL LEARNING	**15**	
MAXIMUM MARKS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**100**	

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	1	-	1
CO2	3	2	2	1	-	-	-	-	-	1	-	1
CO3	3	3	2	2	-	-	-	-	-	1	-	1
CO4	3	3	3	3	-	-	-	-	-	1	-	1

High-3: Medium-2: Low-1

Semester: I					
TECHNICAL ENGLISH- I **(Online English Course)**					
Course Code	:	**21HSE17**	**CIE**	:	**50 Marks**
Credits: L:T:P	:	**0:0:1**	**SEE**	:	**50 Marks**
Total Hours	:	**30P**	**SEE Duration**	:	**3 Hours**

Unit – I	**6 Hrs**
Chapter 1 & 2: Identifying main ideas and details in a reading text - Understanding places on a map - Understanding new words using Punctuation Clues - Previewing Vocabulary - Organizing, drafting, editing, and writing an email - Researching and Documenting, Listening for and visualizing directions, Listening to an advertisement - Role-play: talking about places on campus, Role-play: returning merchandise to a store - Comparing shopping in a store and online shopping - Conducting research and giving a presentation.	
Unit – II	**6 Hrs**
Chapter 3 & 4: Skimming a text using headings, subheadings, and images, identifying text organization - Reading and answering a questionnaire - Brainstorming and making notes on pros and cons, writing a paragraph using the words should and shouldn't - Listening for conversation starters, advice, instructions, complaints, Voice mail messages - Leaving voicemail messages, describing people, Changing nouns to adjectives - Using model verbs to give advice.	
Unit – III	**6 Hrs**
Chapter 5 & 6: Reading and Understanding graphs, Identifying a good summary - Reading faster: reading in phrases **-** Summarizing facts and ideas in a written text**,** Identifying narrative sequence, Recognizing and writing conclusions, Understanding pronouns and pronoun reference - Thinking critically about cultural events and celebrations **-** Recognizing polite and impolite expressions of disagreement.	
Unit – IV	**6 Hrs**
Chapter 7 & 8: Understanding chronological events, Using Organizers to organize ideas in reading text - Summarizing Events and Describing feelings, Writing a summary statement, Understanding paragraph function - Listening to work-place complaints, Job interviews, future plans, Listening for expressions used in restaurant, instruction in following a recipe - Discussing future plans, careers, and work-related issues, healthy and unhealthy eating habits and nutrition.	
Unit – V	**6 Hrs**
Chapter 9 & 10: Understanding relationships between ideas - writing a questionnaire and an opinion blog post - posting a comment - Expressing an opinion - Listening to conversations about travel plans, travel information, activities, an opinion, agreement and disagreement - Discussing travel plans, fares, transportation, sights, and activities, Using conditional forms to support an argument, Using parts of speech to classify word families.	

Course Outcomes: After completing the course, the students will be able to:-	
CO1	Understand the fundamental concepts of Academic English LSRW skills with Grammar - Articles, Pronouns, Prepositions, Nouns, Verbs and Tenses.
CO2	Use appropriate Vocabulary in real-life scenarios that students might face in professional and social situations.
CO3	Construct grammatically correct sentences, Learn basics of professional e-mail writing, Blog post.
CO4	Introduce Oneself in detail, preparing for interview, small talk, conversations, voice email messages, discussing future plans, careers, work related issues, environmental problem and travel conversations.

Reference Books	
1	McGraw Hill New Interactions – Level 1- e-Book from McGraw Hill

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
EVALUATION OF CIE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	Final Assessment will be conducted for 50 marks
Test – II		
EXPERIENTIAL LEARNING		
Communication Skills- Activity based test – Script writing, Essay Writing, Role plays. Any other activity that enhances the Communication skills. The students will be assigned with a topic by the faculty handling the batch. The students can either prepare a presentation/write essay/role play etc. for the duration (4-5 minutes per student. **Parameters for evaluation of the Presentation** a. Clarity in the presentation/ Speaking/Presentation skills. b. Concept / Subject on which the drama is enacted/ scripted.	**10**	
MAXIMUM MARKS	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	1	-	1
CO2	3	2	2	1	-	-	-	-	-	1	-	1
CO3	3	3	2	2	-	-	-	-	-	1	-	1
CO4	3	3	3	3	-	-	-	-	-	1	-	1

High-3: Medium-2: Low-1

<table>
<tr><td colspan="6" align="center">Semester: II</td></tr>
<tr><td colspan="6" align="center">TECHNICAL ENGLISH- II
(Online English Course)</td></tr>
<tr><td>Course Code</td><td>:</td><td>21HSE27</td><td>CIE</td><td>:</td><td>50 Marks</td></tr>
<tr><td>Credits: L:T:P</td><td>:</td><td>0:0:1</td><td>SEE</td><td>:</td><td>50 Marks</td></tr>
<tr><td>Total Hours</td><td>:</td><td>30P</td><td>SEE Duration</td><td>:</td><td>3 Hours</td></tr>
</table>

Unit-I	6 Hrs
Chapter 1 & 2: Describing a weather phenomenon – Using transition words and phrases to connect cause and effect – Vocabulary words related to weather and climate situations – Listening to weather forecast - Introduction yourself and others – speaking from notes and discussing study habits and body language – Assessing good study habits and Evaluating why some students may not graduate – Casual expressions for making new friends – Distinguish between Can and can't – Identifying the meaning and importance of sign – Words related to learning from history.	

Unit – II	6 Hrs
Chapter 3 & 4: Identifying and Expressing opinions, Using arguments and examples to support an opinion, Creating an outline or mind map – Vocabulary on words related to food, healthy and unhealthy eating habits – Using modal verbs such as should, must and have to – Identifying paragraph, main text and supporting ideas – Drafting, editing, reviewing and finalizing the text and Blogging – Speaking about food shopping and recipes.	

Unit –III	6 Hrs
Chapter 5 & 6: Verbs and expression used to explain home maintenance – Comparing reduced and unreduced pronunciation – Identfying True or false information – Using idioms and discourse markers. Expression for apologizing - Identifying and practicing stressed words and reduced forms - Giving and receiving apologies – Vocabulary words related to homes through time, ancestry, home and family – Recognizing punctuation and phrase clues.	

Unit –IV	6 Hrs
Chapter 7 & 8: Conducting a interview – Using a graphic organizer: Problem – Solution chart – Discussing the benefits of a healthy lifestyle - Vocabulary words on health and stress issues and fitness issues - Describing symptoms – Summarizing a story plot – Vocabulary words and phrases about TV and Social Media – Using reducing pronunciation.	

Unit –V	6 Hrs
Chapter 9 & 10: Role-playing – Preparing a 30 second speech – Expression of like and Dislikes – Reporting survey results – Conducting a review – Identifying and practicing stresses words and reduced forms – Identifying speaker attitudes - Understanding left-out words and reference - Understanding literal meaning and reference - Interpreting and rewording quotes - Identifying negative prefixes.	

Course Outcomes: After completing the course, the students will be able to:-	
CO1	Understand the fundamental concepts of Academic English LSRW skills with Grammar - Articles, Pronouns, Prepositions, Nouns, Verbs and Tenses
CO2	Use appropriate Vocabulary in real-life scenarios that students might face in professional and social situations.
CO3	Construct grammatically correct sentences, Learn basics of professional e-mail writing, Blog post.
CO4	Introduce Oneself in detail, preparing for interview, small talk, conversations, voice email messages, discussing future plans, careers, work related issues, environmental problem and travel conversations.

Reference Books	
1	McGraw Hill New Interactions – Level 1 – e-Book from McGraw Hill

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	Final Assessment will be conducted for 50 marks
Test – II		
EXPERIENTIAL LEARNING	**10**	
Communication Skills- Activity based test – Script writing, Essay Writing, Role plays. Any other activity that enhances the Communication skills. The students will be assigned with a topic by the faculty handling the batch. The students can either prepare a presentation/write essay/role play etc. for the duration (4-5 minutes per student. **Parameters for evaluation of the Presentation** a. Clarity in the presentation/ Speaking/Presentation skills. b. Concept / Subject on which the drama is enacted/ scripted.		
MAXIMUM MARKS	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

CO-PO Mapping											
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	1	-	1
CO2	3	2	2	1	-	-	-	-	-	1	-	1
CO3	3	3	2	2	-	-	-	-	-	1	-	1
CO4	3	3	3	3	-	-	-	-	-	1	-	1

High-3: Medium-2 : Low-1

Semester : I / II					
INDIAN KNOWLEDGE SYSTEMS					
Course Code	:	21HSI18/28		**CIE**	:	50 Marks
Credits: L:T:P	:	1: 0: 0		**SEE**	:	50 Marks
Total Hours	:	15L		**SEE Duration**	:	02 Hours

Unit-I	**03 Hrs**
Introduction to Indian Knowledge Systems (IKS): Historical Background, Indian Traditional Knowledge Systems, Nature, Philosophy, Character scope and importance, kinds of traditional knowledge, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge.	
Unit – II	**03 Hrs**
Protection of Traditional Knowledge: The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	
Unit -III	**03 Hrs**
Traditional Knowledge in Humanities and Sciences: Chemistry, Physics, Mathematics, Art, Astronomy, Astrology, Crafts and Trade in ancient India and other such areas.	
Unit –IV	**03 Hrs**
Traditional Knowledge in Professional domain: Production, Construction, Medicine, Agriculture, Engineering Sciences, Aviation, Architecture and other domains.	
Unit –V	**03 Hrs**
Indian Knowledge systems and Contemporary topics: Traditional Knowledge and Contemporary world, Traditional knowledge system and IT Revolution, Management of biodiversity, United Nations Sustainable development goals.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Provide an overview on the concept of Indian Knowledge System and its importance.
CO2	Appreciate the need and importance of protecting traditional knowledge.
CO3	Recognize the relevance of Traditional knowledge in different domains.
CO4	Establish the significance of Indian Knowledge systems in contemporary world.

Reference Books	
1	Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230,
2	Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334,

Suggested Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/
3. http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63 (Centre of Excellence for Indian Knowledge System, IIT Kharagpur)
4. https://www.wipo.int/pressroom/en/briefs/tk_ip.html
5. https://unctad.org/system/files/official-document/ditcted10_en.pdf
6. http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf
7. https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwE

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz will be conducted for 10 Marks adding up to 20 marks. Final quiz marks will be reduced to **10 Marks**	*****
Quiz-II		
THEORY COURSE - (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 25 Marks adding up to 50 marks. Final test marks will be reduced to **20 Marks**	*****
Test – II		
EXPERIENTIAL LEARNING	**20**	*****
Case Study-based Teaching-Learning	--	*****
Sector wise study & consolidation (viz., Engg. Semiconductor Design, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ ITeS)	--	
Video based seminar (4-5 minutes per student)	--	
Maximum Marks for the Theory	**50 Marks**	**50 Marks**
Practicals	--	--
Total Marks for the Course	**50**	**50**

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	3	-	-	-	1
CO2	-	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	2	2	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	2	-	-	-	-	-

High-3 : Medium-2 : Low-1

<table>
<tr><td colspan="5" align="center">**Semester: I/II**</td></tr>
<tr><td colspan="5" align="center">**ENGINEERING CHEMISTRY**
(Theory and Practice)</td></tr>
<tr><td>**Course Code**</td><td>:</td><td>21CH12/22</td><td>**CIE**</td><td>:</td><td>**150 Marks**</td></tr>
<tr><td>**Credits: L:T:P**</td><td>:</td><td>3:0:1</td><td>**SEE**</td><td>:</td><td>**150 Marks**</td></tr>
<tr><td>**Total Hours**</td><td>:</td><td>45L + 30P</td><td>**SEE Duration**</td><td>:</td><td>**3 Hours**</td></tr>
</table>

Unit-I	**09 Hrs**

Water Technology and Management

Introduction, sources and impurities, Potable water, meaning and specifications (as per WHO standards), Hardness of water, types, determination of hardness using EDTA titration, numerical problems on hardness of water. Determination of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), Numericals on BOD and COD. Membrane technology: Desalination of sea water by reverse osmosis using Polysulfone membrane, preparation of polysulfone membrane by NIPS method. Waste water management case studies (Primary, secondary and tertiary treatments). Toxic effects of heavy metals in water: Mercury, Cadmium, Lead, Chromium and Arsenic.

Unit – II	**10 Hrs**

Energy Technology

Chemical Fuels: Introduction, Knocking in IC engines, octane number, cetane number, power alcohol, unleaded petrol and biodiesel, Rocket fuels and propellants.

Electrochemical devices: Concept of electrochemistry, types of electrodes, construction and working of calomel and glass electrodes. Determination of pH using glass electrode.

Battery technology: Components, construction and working of Li-ion battery (Li-CoO$_2$).

Fuel cell: Introduction, construction and working of Methanol-Oxygen fuel cell.

Green fuel: Hydrogen-production (Photo catalytic water splitting), storage and applications in fuel cells.

Solar Energy: Introduction, photovoltaic cells, construction and working of Dye sensitized solar cells.

Unit –III	**09 Hrs**

Corrosion science and Engineering

Corrosion: Introduction, electrochemical theory of corrosion, factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal and nature of corrosion product (PB Ratio), pH, conductivity and temperature. Common types of corrosion - differential aeration (pitting and water line), differential metal and stress corrosion.

Corrosion control: Introduction, types, inorganic coatings-Phosphating and anodizing. Metallic coatings-galvanization and tinning (hot dipping method), Electroplating and Electroless plating-principle, process of gold plating, chrome plating, electroless plating of copper and its application in fabrication of PCBs.

Unit –IV	**08 Hrs**

Chemistry of Nanomaterials

Introduction, size dependent properties (Surface area, Optical and Catalytic properties), classification of nanomaterials, Synthesis of nano-materials (Solution combustion and Sol-gel methods).

Carbon nanotubes: Introduction, types, synthesis by modified CVD method, functionalization and applications.

Graphene-Synthesis (Modified Hummer's method), functionalization and applications.

Nano-Toxicology and safety measures. Green Chemistry: Introduction-Basic principles.

Unit –V	**09 Hrs**

Polymers for engineering applications

Introduction to polymers, Glass transition temperature (Tg), factors affecting Tg. Thermo plastic polymers: Polycarbonate, polyether sulfones, preparation and specific applications in industries. Thermosetting polymers: Epoxy resin synthesis, properties and applications.

Synthesis and applications of functional polymers: Conducting polymers (Synthesis of PANI), photoconductive polymers (PVK), electrochromic polymers (PDOT), electro-active polymers (PVDF) and Self-healing polymers (Silicone rubbers).

Toxicity of polymers: Micro plastics and leaching of polymers.

Biodegradable polymers: Introduction and their requirements. Synthesis and properties of Poly lactic acid. Applications of biodegradable polymers in the medical industry.

LIST OF LABORATORY EXPERIMENTS

1. Introduction to Volumetric analysis.
2. Evaluation of quality of water in terms of total hardness by Complexometric method.
3. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.
4. Estimation of copper in Brass.
5. Estimation of FAS using standard $K_2Cr_2O_7$ solution by Potentiometric method.
6. Evaluation of acid content in soft drinks by using pH sensors.
7. Colorimetric estimation of copper.
8. Conductometric estimation of acid mixture.
9. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer.
10. Estimation of amount of sodium by Flame photometry.
11. Computational determination of molecular/electronic parameters of small conjugated molecules.
12. Electroplating of copper on metallic objects.

Course Outcomes: After completing the course, the students will be able to :-	
CO1	Explain the principles of chemistry in Engineering & Technology.
CO2	Apply the knowledge of chemistry in solving socio-economic and environmental issues.
CO3	Identify and analyse engineering problems to achieve practical solutions through knowledge of chemistry
CO4	Develop solutions for chemistry problems associated with technologies and real life.

Reference Books	
1	Engineering Chemistry, O.G.Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint 2017. ISBN: 978-0070146105.
2	Engineering Chemistry, S. S Dhara, 2013, S. Chand Publications, 4th Edition, ISBN: 812-1997658.
3	Engineering Chemistry, S Satyanarayana and H C Shashidhara, 2011, Himalaya Publishing House, Edition-, ISBN-9789350514986.
4	Fundamentals of Analytical chemistry, Douglas A. Skoog et.al., 2004, Thomson Asia pte Ltd, Eighth edition-ISBN: 981-243-513-1.
e-Book	
1	Smart Polymers and Their Applications-2nd Edition– Elsevier, Editor - Maria Rosa Aguilar Julio San Roman ISBN: 9780081024171. https://www.elsevier.com/books/smart-polymers-and-their-applications/aguilar/978-0-08-102416-4.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING (40 marks)		
Case Study-based Teaching-Learning	**10**	
In-depth study and delivery of outcomes in the following topics: Green chemistry, Nanotechnology and its applications, Corrosion science and engineering, Polymer and its industrial applications, Natural resource management, Renewable energy, Food chemistry.	**20**	
Video based seminar (4-5 minutes per student)	**10**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**
PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

PRACTICALS sub-table:

CIE	SEE
Conduction: 25 Lab Test: 05 Experiential Learning: 20 Total : 50	Conduction: 40 Viva-Voce: 10 Total : 50

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	2	2	1	-	1	1	1
CO3	1	2	-	2	-	-	-	-	-	-	-	2
CO4	-	-	1	-	-	1	1	-	-	-	-	2

High-3: Medium-2: Low-1

Semester: I/II						
PROGRAMMING IN C **(Theory and Practice)**						
Course Code	**:**	21CS13/23		**CIE**	**:**	150 Marks
Credits: L:T:P	**:**	3:0:1		**SEE**	**:**	150 Marks
Total Hours	**:**	45L+30P		**SEE Duration**	**:**	3Hours + 3Hours

Unit-I	**8 Hrs**

Logical Reasoning and Algorithmic Problem Solving

Skill development – Examples related to Arithmetical Reasoning and Analytical Reasoning.

Fundamentals of algorithms, flowcharts. Algorithmic Problem Solving: Arithmetic and Algebraic problems, Sorting and Searching problems, Games.

Introduction to Computer Concepts

Introduction to Computer Hardware, Software and its Types.

Unit – II	**10 Hrs**

Introduction to C programming:

Programming paradigms, Basic structure of C program, Process of compiling and running a C program, Features of C language, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Pre-processor directives.

Handling Input and Output operations and operators:

Formatted input/output functions, Unformatted input/output functions with programming examples using all functions.

Operators:

Introduction to operator set, Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and Decrement operators, Conditional operators, Bit-wise operators, Special operators.

Expressions: Arithmetic expressions, evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity.

Unit –III	**10 Hrs**

Programming Constructs:

Decision Making and Branching

Decision making with 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, The '*?:*' operator, The '*goto'* statement.

Decision making and looping: The 'for','while','do-while' statements with examples, Jumps in loops**.**

Arrays:

Introduction to Arrays, Types of arrays, Declaration arrays, Initializing dimensional arrays (One Dimensional and Multidimensional Array) with examples.

String Operations:

Introduction, Declaration and Initializing String Variables using arrays, String operations and functions with examples.

Unit –IV	**10 Hrs**

Functions:

Need for Functions, Types of functions (User Defined and Built –In), working with functions, Definition, declaration and its scope, Category of functions Storage classes (Automatic, Static, Extern, Register).

Recursion: Introduction, Example programs (Factorial, Fibonacci Series, Ackerman function merge sort or quick sort and other examples).

Pointers: Introduction, Benefits of using pointers, Declaration and Initialization of pointers, Obtaining a value of a variable, Typecasting of a pointer, Arithmetic Operations using pointers, pointers and arrays, pointers and strings, pointers and functions.

Unit –V	**7 Hrs**

Structures and Unions:

Introduction, Structure definition, declaring structure variables, accessing structure members, Structure initialization, Copying and comparing structure variables, Arrays of structure, Arrays within structures, Structure within structures, Structures and functions.

Introduction to Unions: Comparison of Structure and Unions.

Course Outcomes: After completing the course, the students will be able to:-	
CO 1	Describe the fundamental computer concepts and syntax of C programming.
CO 2	Apply logical skills to design and develop algorithms/flow charts to solve real-world problems.
CO 3	Analyze the logic of the program and output obtained using different sets of input.
CO 4	Design and develop programs using appropriate data structures and functions in C language.

Reference Books	
1.	Programming in C, P. Dey, M. Ghosh, 2011, 2nd Edition, Oxford University press, ISBN (13): 9780198065289.
2.	Algorithmic Problem Solving, Roland Backhouse, 2011, Wiley, ISBN: 978-0-470-68453-5
3.	The C Programming Language, Kernighan B.W and Dennis M. Ritchie, 2015, 2nd Edition, Prentice Hall, ISBN (13): 9780131103627.
4.	Turbo C: The Complete Reference, H. Schildt, 2000, 4th Edition, Mcgraw Hill Education, ISBN-13: 9780070411838.
5.	Rasberry pi: https://www.raspberrypi.org/documentation/
6.	Nvidia: https://www.nvidia.com/en-us/
7.	Ardunio: https://www.arduino.cc/en/Tutorial/BuiltInExamples
8.	Scratch software: https://scratch.mit.edu/

Laboratory Component
PART A
Implement the following programs using cc/gcc compiler

Practice Programs:

i. Familiarization with programming environment: Concept of creating, naming and saving the program file in gedit/vi editor, Concept of compilation and execution, Concept of debugging in GDB environment.

ii. Implementation and execution of simple programs to understand working of:
- Formatted input and output functions- printf() and scanf().
- Escape sequences in C.
- Using formula in a C program for specific computation: For example: computing area of circle, converting Celsius to Fahrenheit, area of a triangle, converting distance in centimeters to inches, etc.
- Preprocessor directives (#include, #define).

iii. Execution of erroneous C programs to understand debugging and correcting the errors like:
- Syntax / compiler errors.
- Run-time errors.
- Linker errors.
- Logical errors.
- Semantical errors.

iv. Implementation and execution of simple programs to understand working of operators like:
- Unary.
- Arithmetic.
- Logical.
- Relational.
- Conditional.
- Bitwise.

Lab Programs:

1. Develop a C program to compute the roots of the equation $ax^2 + bx + c = 0$.
2. Develop a C program that reads N integer numbers and arrange them in ascending or descending order using selection sort and bubble sort technique.
3. Develop a C program for Matrix multiplication.
4. Develop a C program to search an element using Binary search and linear search techniques.

5. Using functions develop a C program to perform the following tasks by parameter passing to read a string from the user and print appropriate message for palindrome or not palindrome.
6. Develop a C program to compute average marks of 'n' students (Name, Roll_No, Test Marks) and search a particular record based on 'Roll_No'.
7. Develop a C program using pointers to function to find given two strings are equal or not.
8. Develop a C program using recursion, to determine GCD , LCM of two numbers and to perform binary to decimal conversion.

PART B
- Design and development of a working model using any of the following combination of hardware and software.
- Develop a model that helps the user to monitor weather, health condition, environment parameters, etc. using Arduino board.
- Develop a simple Robot that can assist the user to perform simple activities home sanitization, lifting things etc. using Raspberry pi.
- Hardware interfacing (**Ardunio Board, Finch, Lego WeDo 2.0**) with scratch to design various models to solve simple problems.
- Develop applications using Nvidia Jetson Kit.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING (40 marks)		
Case Study-based Teaching-Learning.	**10**	
Project Based learning.	**20**	
Video based seminar (4-5 minutes per student).	**10**	
MAXIMUM MARKS FOR THE THRORY	**100 MARKS**	**100 MARKS**
PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	2	-	-	-	-	-	-	1
CO2	2	3	3	3	3	-	-	-	-	-	-	3
CO3	3	3	3	2	3	-	-	-	1	1	1	-
CO4	2	3	3	3	3	-	-	-	-	-	-	2

High-3: Medium-2 : Low-1

Semester: I/II					
ELEMENTS OF MECHANICAL ENGINEERING					
(Theory)					
Course Code	:	21ME14/24	**CIE**	:	100 Marks
Credits: L:T:P	:	2:1:0	**SEE**	:	100 Marks
Total Hours	:	30L+30T	**SEE Duration**	:	3 Hours

Unit-I	**06 Hrs**
Engineering Materials: Introduction & Classification, Metals (Ferrous and Nonferrous), Polymers (Thermoplastics, Thermosets, Elastomers), Ceramics and Composites. **Material Properties & applications:** Physical, Mechanical, Optical, Electrical and Electronics, Thermal, Chemical Properties. Applications: Aerospace, Automotive, Electronic & Biomedical.	
Unit – II	**06 Hrs**
Lathe and Lathe operations: Classification, specifications of a lathe. Lathe operations (Turning, Taper Turning, drilling, boring, knurling, and thread cutting). Introduction to CNC Machines. **Joining processes & Non-destructive testing** Introduction to metal joining process-permanent & temporary joints, Soldering & welding, types and applications, accessories consumables and safety, Welding defects and causes, Non-Destructive testing: Liquid penetrate testing, Magnetic particle testing, Ultrasonic testing, Eddy current testing.	
Unit –III	**06 Hrs**
Steam and its properties, property charts. **Steam turbines**: Classification and working. **Hydraulic Turbines:** Classification of hydraulic turbines, working of Pelton, Francis and Kaplan turbines; comparison between impulse and reaction turbines. **Gas Turbines:** Working of Gas Turbines (Brayton cycle). **Refrigeration:** Refrigeration effect, working principle of Vapour Compression refrigeration systems, ton of refrigeration, COP, refrigerants and their properties.	
Unit –IV	**06 Hrs**
Mechanical and Electrical Drives **Mechanical Drives:** Classification of IC Engines, Working of 4-S direct injection engines, Performance characteristics, Classification of gears, velocity ratio for simple and compound gear trains. **Electrical Drives:** History, Well to Wheel analysis, Electric vehicles, Configurations, EV/ICEV comparison, Performance, Traction Motor Characteristics, Concept of Hybrid Electric Drive Trains, Classification of hybrid electric vehicles.	
Unit –V	**06 Hrs**
Mechatronics Introduction: Evolution of Mechatronic system, measurement & control system, basic elements of control system, Applications-water level controller, washing machine, Engine management system (EMS), Anti-lock Braking System (ABS).	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the knowledge of various properties of important engineering materials.
CO2	Distinguish prime movers and classify them based on their working fluids, classify & explain IC engines, analyse and compute performance parameters of IC engines and demonstrate the Principle and application of Refrigeration.
CO3	Elucidate the principles of lathe machine tools, their operations, joining processes and Non-destructive testing in various engineering applications.
CO4	Apply the knowledge of Electrical drives & Mechatronics systems and its applications.

Reference Books	
1	Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, 18th Edition. ISBN 5551234002884
2	Material Science & Engineering- William D Callister, 2 / 10th Edition, ISBN 978-1-119-45520-2.
3	Welding Technology (PB), Khanna O P, Dhanpat Rai publication, 4th Edition, ISBN 9383182555.
4	Electric and Hybrid Vehicles, Design Fundamentals – Iqbal Husain, CRC Press, 2nd Edition, 2010. ISBN – 13-978-1439811757.
5	Modern Electric, Hybrid Electric & Fuel Cell Vehicles, Fundamentals, Theory and Design - Mehrdad Ehsani, CRC Press, 1st Edition, 2005. ISBN – 13- 978-0849331541.
6	Mechatronics – Electronic control systems in Mechanical and Electrical Engineering, William Bolton, Pearson, 6th Edition, ISBN: 978-1-292-07668-3, 2015.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
WEIGHTAGE	50%	50%
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-I		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING (40 marks)		
Fabrication of FRP and characterization	10	
Fabrication of Machine component	20	
Electrical or electronic based component demonstration	10	
MAXIMUM MARKS FOR THE THRORY	100 MARKS	100 MARKS
TOTAL MARKS FOR THE COURSE	100	100

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	1	-	-	1	-	1
CO2	3	2	2	1	2	1	-	2	2	1	-	1
CO3	3	3	2	2	-	1	2	-	-	1	-	1
CO4	3	3	3	3	1	-	1	2	2	1	-	1

High-3: Medium-2: Low-1

SEMESTER – I/II						
ELEMENTS OF ELECTRONICS ENGINEERING						
(Theory)						
Course Code	:	21EC15/25		**CIE**	:	100 Marks
Credits: L: T: P	:	2:1:0		**SEE**	:	100 Marks
Total Hours	:	30L+30T		**SEE Duration**	:	3 Hours

UNIT-I	**07 Hrs**
SEMICONDUCTOR DIODES AND APPLICATIONS:	
P-N junction Diode, Parameters, Characteristics, Full wave Bridge rectifier, Capacitor filter, Zener diode as a voltage regulator, Block Diagram of a DC Power supply, working of photo diode and LED	

UNIT-II	**07 Hrs**
BJT AND APPLICATIONS:	
BJT operation and characteristics, Voltage Divider Biasing, BJT as an amplifier and as a switch.	
FEEDBACK AMPLIFIERS:	
Basic Principles and advantages of Negative Feedback.	

UNIT-III	**05 Hrs**
MOSFET:	
Difference between BJT & MOSFET, Construction, Operation, Characteristics of Enhancement type MOSFET, MOSFET as an amplifier and as a switch, CMOS inverter, CMOS NAND, CMOS NOR: Circuit and operation.	
(Case study- domain specific: online mode)	
COMMUNICATION SYSTEM:	
Block diagram of a general communication system, Need for modulation and types of modulation.	

UNIT-IV	**06 Hrs**
DIGITAL ELECTRONIC FUNDAMENTALS:	
Difference between analog and digital signals, Boolean Algebra and Simplification using Boolean theorems and postulates, K-map.	
DIGITAL ELECTRONIC CIRCUITS:	
Basic and Universal Gates, Half adder, Full adder, Multiplexer, De-multiplexer, Encoder, Decoder.	
CONTROLLERS: Overview of microcontrollers and block diagram, serial and parallel interfaces.	
Case study: Connection of sensors and actuators to Aurdino.	
(Case study- domain specific: online mode)	

UNIT-V	**05 Hrs**
OPERATIONAL AMPLIFIERS AND APPLICATIONS:	
Introduction to Op-Amp, Op-Amp parameters: Gain, Bandwidth, Input & Output impedances, CMRR, PSRR, Slew Rate, Input Offset voltage, Applications: Inverting amplifier, Non-Inverting Amplifier, Voltage Follower, Summer, Difference amplifier, Integrator, Differentiator and Comparator with equations, Pin Configuration and parameters of 741 Op-Amp., Schmitt trigger, Instrumentation amplifier.	
(Case study- domain specific: online mode)	

Course Outcomes: After completing the course, the students will be able to:-	
CO1	Analyze the operation and the characteristics of the Electronic devices for various applications.
CO2	Apply and analyze circuits for applications of various Electronic systems.
CO3	Demonstrate the different building blocks of Electronics systems.
CO4	Evaluate the performance of the electronic circuits to meet given specifications using modern IT tools.

	Reference Books
1.	Electronic Devices and Circuit Theory by Robert L Boylestad, Louis Nashelsky, 10th Edition, 2009, Prentice Hall India publication, ISBN: 978-317-2700-3.
2.	Electronic Devices and Circuits by David A. Bell, 5th Edition, 2008, Oxford University Press, ISBN:9780195693409.
3.	Basic Electronics by D P Kothari,I J Nagrath, 2nd Edition, 2017, MCGraw Higher Ed, ISBN: 9789352606467.
4.	Digital Logic and Computer Design by Morris Mano, 54th Edition, 2007, Prentice Hall India publication, ISBN: 978-81-317-1450-8.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
WEIGHTAGE	50%	50%
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE : (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING (40 marks)		
Case Study-based Teaching-Learning	10	
Sector wise study & consolidation (viz., Engg. Semiconductor Design, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ITeS)	20	
Video based seminar (4-5 minutes per student)	10	
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS
PRACTICALS		
TOTAL MARKS FOR THE COURSE	100	100

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	2	1	-	-	-	-	-
CO2	3	3	2	1	3	2	1	1	2	-	-	2
CO3	3	3	2	2	3	3	2	2	3	2	3	3
CO4	3	2	-	-	3	3	2	2	3	2	3	1

High-3: Medium-2: Low-1

YOGA PRACTICE						
Course Code	:	21HSY16/26		**CIE**	:	**50 Marks**
Credits: L:T:P	:	0:0:1		**SEE**	:	**50 Marks**
Total Hours	:	30P		**SEE Duration**	:	**2 Hours**

Unit-I	**07 Hrs**
Introduction to Yoga Definition and Meaning of Yoga, Aims and Objectives, Historical development of Yoga, Eight stages of Yoga, Relevance of Yoga in modern age and scope.	
Unit – II	**07 Hrs**
Starting Practice –Swasa Kriya, Marjalaswasa, Swanaswasa, Urasandhi chalane, Greeva sandhi chalane, Kati chalane, Super Brain yoga. **Suryanamaskara/Pragya Yoga**: With Mantras & Breathing pattern. **Standing Asanas:** Trikonasana, Veerabhadrasana, Vrikshasana, Tadasana, Tiryak Tadasana, Sarvangapushti, Utkatasana.	
Unit –III	**08 Hrs**
Sitting Asanas: Baddhakonasana, Bharadwajasana, Mandukasana, Ushtrasana, SuptaVeerasana, Vakrasana, Gomukhasana, Janushirasana, Dhanurasana, Shashankasana. **Lying Asanas:** Pawanamuktasana, Sarvangasana, Naukasana, Halasana, Chakrasana, Bhujangasana, Shalabhasana, Dhanurasana, Yoga Nidra.	
Unit –IV	**08 Hrs**
Relaxative/ Meditative Asanas: Shavasana, Balasana, Makarasana, Sukhasana, Padmasana, Vajrasana. **Pranayama**: Mantra, Breathing – Chest, Abdominal & Yogic, Puraka, Rechaka and Kumbhaka, Anulom-Vilom, Nadishodhan, Suryabhedan , Chadrabhedan, Bhastrika, Bhramri, Sheetali, Shitkari and Kapalabhati.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand and practice yoga.
CO2	Analyze the health impact.
CO3	Identify the remedial measures if there are any health issues.
CO4	Develop concentration for better performance.

Reference Books	
1	Light on Yoga, B.K.S. Iyengar, 2017, Harper Collins Publishers, ISBN : 9780008267919.
2	Light on Pranayama, B.K.S. Iyengar, 2013, Harper Collins Publishers, ISBN: 978-8172235413.
3	Asana Pranayama Mudra Bandha, Swami Satyananda Saraswathi, 12th Edition, 2002, Published by Yoga Publications Trust, Bihar School of Yoga, ISBN:9788186336144.
4	Yoga Nidra, Swami Satyananda Saraswathi, 2009, Published by Yoga Publications Trust, ISBN: 9788185787121.

ASSESSMENT AND EVALUATION PATTERN CIE-50 MARKS		
Activity book- **10** marks		
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
Test – I	Demonstration of Asanas is evaluated for 10 marks adding up to **20 MARKS.**	
Test – II		
ASSESSMENT AND EVALUATION PATTERN SEE-50 MARKS		
Demonstration of Asanas and Pranayama	**30 marks**	
Viva voce	**20 marks**	
Total	**50 marks**	

CO-PO Mapping											
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	2	-	-	-	-	-	2	1	-	-
CO2	-	1	-	1	-	-	-	-	-	1	-	1
CO3	-	-	2	1	-	-	-	-	-	1	-	1
CO4	2	3	3	-	1	1	-	-	-	-	-	2

High-3: Medium-2 : Low-1

Innovative Clubs of RVCE

#	Club	Description
1	Ashwa Racing	Ashwa Mobility Foundation (AMF) is a student R&D platform that designs and fabricates Formula theme race cars and future mobility solutions to tackle urban transportation problems.
2	Astra Robitics	Team involved in the design, fabrication and building applications specific robots
3	Coding Club	To facilitate students the skills, confidence, and opportunity to change their world using coding and help them become successful in GSoC, ACM-icpc, and other recognized coding competitions.
4	Entrepreurship Development Cell	E-Cell is a student run body that aims to promote entrepreneurship by conducting workshops, speaker sessions and discussion on business and its aspects. We possess a mentor board to help startups grow.
5	Frequency Club	Team aims at contributing in both software and hardware domains mainly focusing on Artiicial Intelligence, Machine Learning and it's advances.
6	Garuda	Design and Development of supermileage urban concept electric car. Indigenous developmen of E-mobility products.
7	Jatayu	Build a low cost Unmanned Aerial Vehicle capable of Autonomous Navigation, Obstacle Avoidance, Object Detection, Localization, Classification and Air Drop of a package of optimum weight.
8	Solar Car	Build a roadworthy solar electric vehicle in under to build a green and sustainable environment
9	Team Antariksh	Team Antariksh is a Space Technology Student Club whose goal is to understand, disseminate and apply the engineering skills for innovation in the field of Space technology. designing Nano-Satellite payload for ISRO PS4 Orbital platform, RVSAT-I along with developing experimental rockets of various attitde.
10	Team Chimera	Building a Formula Electric Car through Research and Development in E-Mobility, Electrifying Formula R acing.
11	Helios Racing	Team involved in design manufacturing and testing of All Terrain Vehicles and other supportive tasks for he functioning of the team . Participating in BAJA competitions organized by SAE in India and the USA.
12	Team Hydra	Developing autonomous underwater vehicles and use it for various real world applications such as water purification, solid waste detection and disposal etc.
13	Team Krushi	Develop low cost equipments, which help farmers in cultivating and harvesting the crops. Use new technology applications to reduce the labour time hand cost for farmers. Aims at developing implants for Tractors.
14	Team Vyoma	Design, fabrication and testing of radio controlled aircrafts and research on various types of unnamed aerial vehicles.
15	Team Dhruva	Organizing activities like quizzes based on astronomy Stargazing and telescope handling sessions. Construction of a standard observatory. working on small projects with organizations like ICTS. IIA, Aries etc.
16	Ham Club	To popularize Amateur Radio as a hobby among students, alongside exploring technical innovations n the communications domain. Intended to provide human capital for service to the nation at times of natural claimatics.

NCC

NSS

"Not me but you"
"Education through
Community Service &
Community Service through education"

Cultural Activity Teams

1. AALAP (Music club)
2. DEBSIC (Debating society)
3. CARV (Dramatics club)
4. Footprints (Dance club)
5. QUIZCORP (Quizzing society)
6. Rotaract (Social welfare club)
7. RAAG (Youth club)
8. EVOKE (Fashion team)
9. f/6.3 (Photography club)
10. CARV ACCESS (Film-making club)

VISION

Leadership in Technical Education, Interdisciplinary Research & Innovation, with a focus on Sustainable and Inclusive Technology

MISSION

⇨ To deliver outcome based Quality education, emphasizing on experiential learning with state of the art infrastructure.

⇨ To create a conducive environment for interdisciplinary research and innovation.

⇨ To develop professionals through holistic education focusing on indiidual growth, discipline, integrity, ethics and social sensitivity.

⇨ To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.

⇨ To focus on technologies that are sustainable and inclusive, benefitting all sections of the society.

Rashtreeya Sikshana Samithi Trust

RV COLLEGE OF ENGINEERING®

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