First year Engineering
Course Plan 2019-20 Even – Semester
(Physics group)

INSTITUTE VISION

To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society.

INSTITUTE MISSION

To continuously strive for the overall development of students by educating them in a state-of-the-art-infrastructure, by retaining the best practices, people and inspire them to imbibe real time problem solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals.

CONTENTS

STUDENT HELP DESK

S. No.	Purpose	Contact Person	
		Faculty	Instructor
1	Attestations	Dr. S. N. Topannavar	--
2	Exam forms signature	Dr. M.S. Hanagadakar	--
4	Online submission of exam form/revaluation form to VTU	Mr.S.I.Shivamoggimath/ Mr. Shashikant Walki	Mr. G. B. Dodagoudar
5	Students' Counseling & Discussion with parents	Dr. M.S.Hanagadakar Mr.V.M.Bhumannavar	--
6	Extra-Curricular & Co- Curricular Activities	Mr. S. L. Patil	Mrs. S.S. Kankanwadi Mr. G. B. Dodagoudar
7	Time table & I.A. Test Coordinator	Mr.S.I.Shivamoggimath	Mrs. S.S. Kankanwadi Mr. G. B. Dodagoudar
8	Robo Vidya Coordinator	Mr. S. A. Patil	
9	Department Library Coordinator	Mr. S.J.Walki	Mrs. S.S. Kankanwadi Mr. G. B. Dodagoudar
10	Dispensary	Dr. Arun. G. Bullannavar Cell No.9449141549	
11	First Year Information	HOD First Year Cell No.9945082054 E-mail ID-hod.1yr@hsit.ac.in	

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineeringsolutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leaderin diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with theengineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.

Department of First Year Engineering was established in the year 1996 and is housed in a total area of **900 Sq. Mtrs.**

DEPARTMENTAL RESOURCES
FACULTY POSITION

S.N.	Category	No. in position	Average experience
1	Teaching faculty	2	11.4
2	Technical supporting staff	02	15
3	Helper	02	12

MAJOR LABORATORIES

MAJOR LABORATORIES

S.N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs. In Lakhs)	Sign
1.	Engg. Physics Lab	200	6,72,306.40	
2	Engineering Graphics Lab	66	13,98,481.30	
3	Basic Electrical Engineering lab	106	1,00,000.00	

Total Investment in the Department **Rs. 21, 70,781.70**

TEACHING FACULTY DETAILS

S.N.	Name	Designation	Qualification	Specialization	Teaching Exp. (In yrs.)	Phone No.
1.	Dr. S. N. Topannavar	Asso. Pro	M.Tech .Ph.D	Thermal Engg.	20.0	9482440235
2.	Mr.V.M.Bhumannavar	Asst.Prof.	M.Sc(Ph.D)	Spectroscopy	12.0	9448526988
3.	Mr. M. M. Nagarmunnoli	Asst.Prof.	M.Tech	Structures	4.9	8123613186
4.	Mr. S. A. Patil	Asst.Prof.	M.Sc	Mathematics	7.0	9945800869
5.	Mr. S.I. Shivamoggimath	Asst.Prof.	M.Sc	Mathematics	5.0	8105149433
6.	Mr. P. M. Murari	Asst.Prof.	M.Tech	Power Systems	8.0	9739733021
7.	Mr. Y. P. Yanigimath	Asst.Prof.	M.Tech	VLSI and Embedded Systems	14.0	9341449466
8.	Mr. A. U. Nasti	Asst.Prof.	M.Tech	Digital Electronics	10.0	9538223362
9.	Mrs. H. R. Zinage	Asst.Prof.	M.Tech	Power Systems	19.0	9480849335
10.	Mr. D. N. Inamdar	Asst.Prof.	M.Tech	Tool Engineering	18.0	9591208980
11.	Mr. T. S. Vandali	Asst.Prof.	M.Tech	Machine Design	8.0	9686235904

CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2019-20 (Even)

Date	Events
10-02-2020	**Commencement of IV/VI/VIII Semester Classes**
10-02-2020 to 20-02-2020	**II Semester Induction Program**
15-02-2020	Annual Sports Meet
29-02-2020	Techno-Vision 2020
14-03-2020	EDP Activities
21-03-2020 to 24-03-2020	**First CIE of II/IV/VI/VIII Semester**
28-03-2020	Feedback 1, Submission of Feedback-1 report to office
28-03-2020	HSIT SAMBHRAMA-2020
11-04-2020	Technical Activities under Professional Bodies
18-04-2020	HSIT Quest - 2020
27-04-2020 to 29-02-2020	**Second CIE of II/IV/VI/VIII Sem.**
30-04-2020	Feedback-2, Submission of Feedback-2 report to office
26-05-2020 to 28-05-2020	**Third CIE of II/IV/VI/VIII Sem.**
29-05-2020	Project Exhibition of VIII Semester
29-05-2020 & 30-05-2020	Lab Internal Assessment of II/IV/VI Semester
03-06-2020 to 11-06-2020	SEE of VIII Semester (Theory)
01-06-2020	Last Working Day of IV/VI/VIII Semester
03-06-2020 to 13-06-2020	Practical Exams of II/IV/VI Semester
15-06-2020 to 20-06-2020	Project Viva-Voce of VIII Semester
15-06-2020 to 20-07-2020	SEE of II/IV/VI Semester (Theory)

February-2020

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

21- **Maha Shivaratri** , 22- **Mahadasoha**

March-2020

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	25	24	25	26	27	28
29	30	31				

25- **Chandraman Ugadi**

April-2020

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

06-**Mahaveer Jayanti,** 10-**Good Friday,**
14- **Dr. B. R. Ambedkar Jayanti**

May-2020

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

01- **Labours Day,** 25- **Qutub-E-Ramazan**

June -2020

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

4th International Conference 2020- 2nd week of July, Graduation Day 2020- 3rd week of July

Dr. Shilpa Shrigiri
IQAC Co-ordinator

Nidasoshi Pin-591236 Dist. Belgaum

10/2/20
Dr. S. C. Kamate
Principal
Hirasugar Institute of Technology
NIDASOSHI 591 236

COURSE PLAN

Subject Title	**Advanced Calculus and Numerical Methods**		
Subject Code	18MAT21	**IA Marks**	40
Number of Lecture Hrs / Week	04	**Exam Marks**	60
Total Number of Lecture Hrs	50	**Exam Hours**	03
		CREDITS – 04	

FACULTY DETAILS:		
Name: 1) Prof. S L Patil 2) Prof. S S Thabaj 3) Prof. S A Patil 4) Prof. S I Shivamoggimath	**Designation** 1) Asst.Prof. 2) Asst.Prof. 3) Asst.Prof. 4) Asst.Prof.	**Experience:** 1) 11 years 2) 08 years 3) 08 years 4) 07 years
No. of times course taught 1) 11 (including present) 2) 08 3) 08 4) 06	**Specialization:** Mathematics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	First Year Engineering	I	Calculus and Linear Algebra

2.0 Course Objectives

This course viz., Advanced Calculus and Numerical Methods aims to prepare the students:

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

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

	Refined Course Outcome	Cognitive Level	Pos
C109.1	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.	L3	1,2,4,12
C109.2	Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.	L3	1,2,4,12
C1O9.3	Construct a variety of partial differential equations and solution by exact methods/ method of separation of variables.	L3	1,2,4,12
C1O9.4	Explain the applications of infinite series and obtain series solution of ordinary differential equations.	L3	1,2,4,12
C1O9.5	Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.	L3	1,2,4,12

COURSE PLAN

4.0 Course Content

Module – 1

Vector Calculus:

Vector Differentiation:

Scalar and vector fields. Gradient, directional derivatives; 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. **(10Hrs)**

Module – 2

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 LCR circuits. **(10 Hrs)**

Module – 3

Partial Differential equations:

Formulation of PDE's by elimination of arbitrary constants and functions. Solution of non- homogeneous PDE by direct integration. Homogeneous PDE's 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. **(10 Hrs)**

Module – 4

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 solution:

Series solution of Bessel's differential equation leading to $P_n(x)$ Legendre polynomials. Rodrigue's formula (without proof), problems. **(10 Hrs)**

Module –5

Numerical Methods:

Finite differences. Interpolation/extrapolation using Newton's forward and backward differences formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Solution of polynomial and transcendental equations- Newton's 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. **(10 Hrs)**

COURSE PLAN

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	Common to all	Common to all Engineering subjects	Electromagnetic fields, gravitational fields, fluid flow, fluid dynamics, Free Vibrations. Forced Vibrations, Time, Latitude, Longitude, Altitude etc.

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Vector calculus is used in electromagnetic fields, gravitational fields, and fluid flow. Vector integration is used in Electromagnetic field, Gravitational field, fluid flow.
02	Ordinary differential equations serve as Mathematical models for many real word problems, Engineering, Physics, Economics, Biology etc
03	Partial differential equations are used in Heat, Sound, Diffusion, Electrostatics , Electrodynamics, Quantum Mechanics etc
04	In finite series is used in harmonic analysis, analysis of current flow and sound waves
05	Numerical Methods are used in all fields of engineering and the physical sciences, life sciences, social sciences, medicine, business and even the arts have adopted elements of scientific computations.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Infinite Series

8.0 Books Used and Recommended to Students

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. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers,7th Ed., 2010.
2. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010
3. H. K. Dass and Er. RajnishVerma: "Higher Engineerig Mathematics", S. Chand publishing, 1st edition, 2011.
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" , 6th Edition, 2. McGraw-Hill Book Co., New York, 1995.
5. James Stewart: "Calculus- Early Transcendentals", Cengage Learning India Private Ltd., 2017.
6. Srimanta Pal & Subobh C Bhunnia: "Engineering Mathematics", Oxford University Press, 3rd Reprint, 2016.
7. Gupta C.B., Singh S.R. and Mukesh Kumar: "Engineering Mathematics for I & II ", McGraw-Hill Education (India) Pvt. Ltd., 2015.

Additional Study material & e-Books

1.CRC Standard Mathematical Tables and Formulae, 32nd Edition
2.A Student's Guide to the Study, Practice, and Tools of Modern Mathematics- Bindner, Donald
3 .P.N.Wartikar & J.N.Wartikar -Applied Mathematics (Volume I & II) Pune Vidyarthi Griha Prakashan, 7thEdition 1994.

4. Peter V.O'Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition, 2011.
5. Glyn James – Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2010.

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://wwww.khanacademy.org/
3. (MOOCs)
4.http://academicearth.org/
5.VTU EDUSAT PROGRAMME-20

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	+ Plus Magazine	https://plus.maths.org/issue44.
2	Mathematics Magazine	www.mathematicsmagazine.com

11.0 Examination Note

Internal Assessment: 40 Marks
Theoretical aspects as well as relevant sketches should be drawn neatly.

Scheme of Evaluation for Internal Assessment (40 Marks)

(a) Internal Assessment test in the same pattern as that of the main examination: 30 Marks.
(b) Assignments: 10 Marks

SCHEME OF EXAMINATION:

Question paper pattern:

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

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

COURSE PLAN

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Scalar and vector fields	20
	2	Gradient, directional derivatives	
	3	Curl and divergence-physical interpretation	
	4	Solenoidal and Irrotational vector fields	
	5	Illustrative problems	
	6	Line integrals	
	7	Green Theorem	
	8	Gauss Theorem	
	9	Stokes Theorem	
	10	Applications to work done by a force and flux	
2	11	Definition of ODE	20
	12	Second order linear ODE's with constant coefficients	
	13	Inverse differential operators	
	14	Problems	
	15	Method of variation of parameters	
	16	Problems	
	17	Cauchy's homogeneous equations	
	18	Legendre homogeneous equations	
	19	Problems	
	20	Applications to oscillations of a spring and LCR circuits.	
3	21	Formation of PDE by elimination of arbitrary constants	20
	22	Formation of PDE by elimination of arbitrary functions	
	23	Solution Non- homogeneous PDE by Direct integration	
	24	Problems	
	25	Solution homogeneous PDE involving derivative w.r.t one independent variable.	
	26	Solution of Lagrange's linear PDE	
	27	Derivation of one dimensional heat equation.	
	28	Derivation of one dimensional wave equation	
	29	Solutions by the method of separation of variables.	
	30	Problems.	
4	31	Series of positive terms	20
	32	Convergence and divergence	
	33	Cauchy's root test	
	34	Problems	
	35	D'Alembert's ratio test (without proof)- Illustrative examples	
	36	Series solution of Bessel's differential equation leading to $P_n(x)$	
	37	Legendre polynomials	
	38	Problems	
	39	Rodrigue's formula (without proof), problems	
	40	Problems	

COURSE PLAN

5	41	Finite differences: Forward & backward differences	20
	42	Newton's forward and backward interpolation formulae	
	43	Problems	
	44	Divided differences- Newton's divided difference formula	
	45	Problems	
	46	Lagrange's interpolation & inverse interpolation formula	
	47	Problems	
	48	Numerical integration: Simpson's one third rule	
	49	Simpson's three eighth rule	
	50	Weddle's rule (without proof) Problems	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment-1: University Questions on Vector Calculus	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity.	Book 1, of the reference list. Website of the Reference list
2	Assignment-2: University Questions on Differential equations higher order	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment-3: University Questions on Partial Differential equations	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment-4: University Questions on Infinite series	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity	Book 1, 2 of the reference list. Website of the Reference list
5	Assignment-5: University Questions on Numerical methods	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity	Book 1, 2 of the reference list. Website of the Reference list

COURSE PLAN

14.0 QUESTION BANK

Module-1:

1) Find div F & curl F if $F = \square (x^3 + y^3 + z^3\text{-}3xyz)$
2) If $\emptyset = x^2 + y^2 + z^2$ and $\vec{F}=x^2\vec{i}+y^2\vec{j}+z^2\vec{k}$,then find grad$\emptyset$,div$\vec{F}$,curl$\vec{F}$
3) Find the value of the constants a,b &c such that the vector field,
   $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$ is irrotational and hence find a scalar
4) If $u = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ & v= $yz\hat{i} + xz\hat{j} + yx\hat{k}$ then prove that $\vec{u} \times \vec{v}$ is a Solenoidal vector
5) Prove that $div(\emptyset\vec{A}) = \emptyset(div\,\vec{A}) + grad\,\emptyset \cdot \vec{A}$
6) Prove that $curl(grad\emptyset) = 0$
7) Prove that div curl F=$\nabla . \nabla \times F = 0$
8) If $u = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ & v= $yz\hat{i} + xz\hat{j} + yx\hat{k}$ then prove that $\vec{u} \times \vec{v}$ is a Solenoidal vector
9) If $\vec{v} = \vec{w} \times \vec{r}$, prove that curl $\vec{v} = 2\vec{w}$ where $\vec{w}$ is a constant vector
10) Verify the Greens theorem $\oint_c (xy + y^2)dx + x^2dy$ where c is the closed curve of the region bounded by
    $y = x$ and $y = x^2$
11) Find the area between the parabola $y^2 = 4x$ and $x^2 = 4y$ with the help of Greens theorem in a plane.
12) Verify the Stroke's theorem for the vector function $\vec{F} = 2xyi + (x^2 - y^2)j$ over the circle $x^2 + y^2 = 1, z = 0$
13) Verify the Gauss divergence theorem for $\vec{F} = 4xzi - y^2j + yzk$ over the unit cube.
14) Evaluate $\int_c xy\,dx + xy^2dy$. by Stroke's theorem where c is the square in xy-plane with (1, 0),
    (-1, 0), (0,1) & (0, -1)

Module-2:

1) Solve by the method of variation of parameters $\frac{d^2y}{dx^2} + a^2y = secax$
2) Solve by the method of variation of parameters $y'' - 6y' + 9y = e^{3x}/x^2$
3) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = e^x sinx$
4) Solve $\frac{d^2y}{dx^2} + y = \frac{1}{1+sinx}$
5) Solve $x\frac{d^2y}{dx^2} - 2\frac{y}{x} = \frac{x+1}{x2}$.
6) Solve $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + 8y = 65cos(logx)$
7) Solve $x^3\frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} + 2y = 10(\frac{x+1}{x})$.

COURSE PLAN

8) Solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=logx\,sin(logx)$

9) Solve $(2x+3)^2\frac{d^2y}{dx^2}-(2x+3)\frac{dy}{dx}-12y=6x$

10) Solve $(1+x)^2\frac{d^2y}{dx^2}+(1+x)\frac{dy}{dx}+y=sin[2log(1+x)]$.

11) Solve: $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+5y=-2coshx.\,Also\,find\,y\,when\,y=0,\frac{dy}{dx}=1\,at\,x=0.$

12) Solve:$\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=e^{-x}+sin2x.$

13) Solve: $(D^2-4D+3)\,y=\sin3x\cos2x.$

14) Solve: $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=e^{2x}-cos2x$.

15) Solve: $\frac{d^2y}{dx^2}+-4y=cosh(2x-1)+3^x.$

16) Solve: $(D^3-D)y=2x+1+4\cos x+2e^x.$

17) Solve: $(D^4-1)y=e^x\cos x.$

18) Solve: $(D^2-4D+4)y=8x^2e^{2x}\sin2x$

19) Solve: $(D^2+a^2)y=\tan ax.$

20) Solve: $\frac{dx}{dt}+y=sint,\frac{dy}{dx}+x=cost;\,given\,that\,x=2\,\&\,y=0\,when\,t=0.$

21) Solve: $(D-1)x+Dy=2t+1,\ ;(2D+1)x+2Dy=t$

22) A body weighing 10 kg is hung from a spring. A pull of 20 kg. wt. will stretch the spring to 10 cm. The body is pulled down to 20 cm below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position at time t sec., the maximum velocity and the period of oscillation.

23) A spring of negligible weight which stretches 1 inch under tension of 2 lb is fixed at one end and is attached to a weight of w lb at the other. It is found that resonance occurs when an axial periodic force 2 cos 2t lb acts on the weight. Show that when the free vibrations have died out, the forced vibrations are given by x = ct sin 2t, and find the values of w and c.

24) In an LCR circuit, the charge q on a plate of a condenser is given by $L\frac{d^2q}{dt^2}+R\frac{dq}{dt}+\frac{q}{C}=E\sin pt$. The circuit is tuned to resonance so that $p^2=\frac{1}{LC}$. If initially the current i and the charge q be zero, show that, for small values of R/L, the current in the circuit at time t is given by (Et/2L) sin pt.

25) An uncharged condenser of capacity C is charged by applying an e.m.f. $\frac{Esint}{\sqrt{LC}}$ through leads of self inductance L and negligible resistance. Prove that at any time t, the charge on one of the plates is $\frac{EC}{2}\left\{sin\frac{t}{\sqrt{LC}}-\frac{t}{\sqrt{LC}}\cos\frac{t}{\sqrt{LC}}\right\}$

COURSE PLAN

Module-3:

1) Find the differential equation of all planes which are at constant distance from the origin.
2) Find the differential equation of all spheres whose center lies on the plane z=0.
3) Solve $(x^2-yz)p+(y^2-zx)q=z^2-xy$
4) Solve the equation $x(y-z)p+y(z-x)q=z(x-y)$
5) Solve the equation by direct integration $\partial^3z/\partial x\partial y+18xy^2+\sin(2x-y)=0$.
6) Solve $\partial^2z/\partial x\partial y=x/y+a$.
7) Form the PDE of z= yf(x)+xg(y) where f &g are arbitrary functions.
8) Form the PDE by eliminating function F from the equation $F(x+y+z, xy+z^2)=0$
9) Form the PDE by eliminating the arbitrary function from $f(x^2+y^2, z-xy)=0$.
10) Form the PDE by eliminating the arbitrary function from $z=y^2+2f\left(\frac{1}{x+\log y}\right)$
11) Form the PDE from the equation $f(x+y+z, x^2+y^2-z^2)=0$

Module-4:

1) Test for convergence the series $\frac{1}{4.\,7.\,10}+\frac{4}{7.\,10.\,13}+\frac{9}{10.\,13.\,16}+\cdots\infty$.
2) Test the convergence the series $\sum_{n=1}^{\infty}\frac{1}{\sqrt{n}+\sqrt{n+1}}$
3) Test the series $\frac{1}{1.\,3.\,5}+\frac{2}{3.\,5.\,7}+\frac{3}{5.\,7.\,9}+\cdots\infty$
4) Test the series $\sum_{n=1}^{\infty}[\sqrt{(n^2+1)}-n]$
5) Test for convergence the series $\frac{1}{2\sqrt{1}}+\frac{x^2}{3\sqrt{2}}+\frac{x^4}{4\sqrt{3}}+\frac{x^6}{5\sqrt{4}}+\cdots\infty$
6) Test for convergence the series $1+\frac{2}{5}x+\frac{6}{9}x^2+\frac{14}{17}x^3+\cdots+\frac{2^n-2}{2^n+1}x^{n-1}+\cdots(x>0)$
7) Discuss the convergence the series i) $\sum_{n=1}^{\infty}\frac{n}{(n^n)^2}$ ii) $1+\frac{2!}{2^2}+\frac{3!}{3^3}+\frac{4!}{4^4}+\cdots\infty$
8) S.T. i) $J_{1/2}=\sqrt{2/\pi x}\,\sin x$, ii) $J_{-1/2}=\sqrt{2/\pi x}\,\cos x$.
9) Express $f(x)=x^4+3x^3-x^2+5x-2$ in terms of Legendary's polynomials.
10) Obtain the series solution of Bessel's differential equation in the form $y=AJn(x)+BJn(x)$
11) Establish the Rodrigue's formula for Legendre polynomials. S.T. i) $Pn(1)=1$, ii) $Pn(-1)=(-1)^n$
12) Express $f(x)=x^3+2x^2-x-3$ in terms of Legendre polynomials

COURSE PLAN

Module-5:

1) Find the real root of the equation $x\log_{10}x = 1.2$ by Regula-Falsi method correct to four decimal places.
2) Find by Newton's method, the real root of the equation $3x = \cos x + 1$.
3) Using the Newton's Raphson method, find a root of the following equations correct to the three decimal
4) Places. i) $3\sin x - 2x + 5 = 0$ near 3, ii) $x \sin x + \cos x = 0$ which is near $x = \pi$
5) Find by Newton's method, the root of the equation $\cos x = x e^x$.
6) Use Newton-Raphson method to find a real root of the equation $\log x - \cos x = 0$
7) By applying Weddle's Rule evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by considering 7 ordinates. Hence find the value of $\log_e 2$
8) Evaluate $\int_0^1 \frac{1}{1+x} dx$, by using Simpson 1/3 rd rule, considering seven ordinates. Hence deduce the value of $\log_e 2$.
9) Find the interpolating formula that approximates to the function described by the following table

x	0	1	2	5
y	2	3	12	147

10) Find 'y' when x= 0.26 using appropriate interpolation formula to the following data,

X	0.10	0.15	0.20	0.25	0.30
Y	0.1003	0.1511	0.2027	0.2553	0.3093

11) If y(5)=150 , y(7)=392 , y(11)=1492 , y(13)=2366 ,y(17) = 5202 then find y(9) by using Lagrange's Formula
12) Apply Lagrange's Inverse interpolation formula to find a root of the equation f(x)=0 given that
$f(30) = -30$, $f(34) = -13$, $f(38) = 3$, $f(42) = 18$.
13) Use Newton's divided difference formula to find f(4) given

x	0	2	3	6
y	- 4	2	14	158

14) The following table gives the distances in nautical miles of the visible horizon for the given heights in feet above the earth's surface

x:height	100	150	200	250	300	350	400
y:distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the values of y when x=218 feet and 410 feet

15) From the following table, estimate the number of students who obtained marks between 40 & 45

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

16) In the table below the value of y are conjugative terms of a series of which 23.6 are the 6^{th} term. Find The first & tenth terms of the series

x	3	4	5	6	7	8	9
y	4.8	8.7	14.5	23.6	36.2	52.8	73.9

COURSE PLAN

17) Given the values

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

Find f(15) and f(19)

18) Use Newton's divided difference formula to find f(x) given the data

x	0	2	3	6
f(x)	-4	2	14	158

19) Given the values

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

Evaluate f (9) using divided difference formula for unequal intervals.

20) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3 rd rule taking four equal strips

21) If y(1) =3,y(3) = 9, (4) = 30,y(6) =132, Find Lagrange's interpolation formula & hence find y at x=5.

22) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using

i) Simpson's 1/3 rd rule , ii) Simpson's 3/8th rule, iii) Weddle's rule compare with its actual value.

23) Use Simpson's 1/3 rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates.

24) Using Simpson's 3/8th rule , evaluate $\int_0^{0.3} \sqrt{1-8x^3}\, dx$ by taking 7 ordinates.

25) Integrate numerically $\int_0^{\frac{\pi}{2}} \sqrt{cos\theta}\, d\theta$

16.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
July 2017	-	07	08	13	28	49	22	85.75
July 2018-19	10	29	26	22	27	0	10	86.72

Prepared by	Checked by		
Prof. S. L. Patil Prof. S. S. Thabaj Prof. S. A. Patil Prof. S. I. Shivamoggimath	Prof. S. L. Patil	HOD	Principal

(4)

Subject Title	**ENGINEERING PHYSICS**		
Subject Code	18PHY22	**IA Marks**	40
Number of Lecture Hrs / Week	05(3+2)	**Exam Marks**	60
Total Number of Lecture Hrs	50	**Exam Hours**	03
		CREDITS – 04	

FACULTY DETAILS:		
Name:¥sÀgÉÆV.M.Bhumannavar	**Designation:** Asst. Professor	**Experience:** 1) 14.5 Years
No. of times course taught: 19	**Specialization:** Spectroscopy	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	First year (Common to all)	I/II	Fundamentals of Physics

2.0 Course Objectives

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

1. To make the students understand and interpret in experimental section manually.
2. Learn the basic concepts in Physics which are very much essential in understanding and solving engineering related challenges.
3. Gain the knowledge of newer concepts in modern physics for the better appreciation of modern technology
4. To acquire the knowledge of basic fundamental science.
5. To inculcate understanding of the theory and applications of fundamental in experiments with the theoretical knowledge.
6. To familiarize the students with Indian Standards units and measurements of the fundamental values.
7. To impart knowledge of mechanics and some of basic expressions using in its applications.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and use modeling software's to generate

	Course Outcome	Cognitive Level	POs
C102.1	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.	L1,L2,L3	1,2,3,8,12
C102.2	Understand the different moduli of elasticity of materials and its bending moments.	L1,L2,L3	1,2,3,8,12
C102.3	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.	L1,L2,L3	1,2,3,8,12
C102.4	Apprehend theoretical background of laser, construction and working of different types of laser and its applications in different fields.	L1,L2,L3	1,2,3,8,12

C102.5	Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.	L1,L2,L3	1,2,3,8,12
Total Hours of instruction			**50**

4.0 Course Content

Course syllabus

MODULE-I :

Oscillations and Waves

Free Oscillations: Definition of SHM, derivation of equation for SHM, Mechanical and electrical 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 ofoscillations.

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 shockwaves.

Numerical problems

(RBT Levels L1, L2, L3)10 Hours

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'sratio.

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 ofoscillation.

Numerical problems

(RBT Levels L1, L2, L3)10 Hours

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 CO2 and semiconductor Lasers.
Application of Lasers in Defense (Laser range finder) and Engineering(Datastorage)
Numericalproblems
(RBT Levels L1, L2, L3)

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 ofthe expression for Fermi energy, Success ofQFET.

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-Mossottiequation(Derivation), mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers.
Numerical problems

(RBT Levels L1, L2, L3)

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	Higher Semester	Statics and Dynamics Strength of Materials Thermodynamics Materials and Metallurgy Machine design Fluid Mechanics Hydraulics and	Basic fundamentals

		Pneumatics Mechatronics Robotics	

6.0 Relevance to Real World

SL.No	Real World Mapping
01	The concepts which are commonly observed in mechanical engineering courses such as elastic and plastic theory of solids are well described using Physics.
02	Basic fundamentals related to fluids and their behavior
03	Flow of fluids - through pipes or around cars, ships and airplanes
04	Design of mechanical assemblies where parts are moving, like in an engine
05	How a structure deforms, like a car in a crash
06	Production and consumption of mechanical energy
07	Flow of heat energy, like in a engine, refrigerator or power plant
08	How sound and vibrations are created and behave
09	Using math & computers to design and simulate all the above

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Module I-Module V
02	NPTEL	Engg. Physics Videos

8.0 Books Used and Recommended to Students

Text Books/Reference Books:

1 Engineering Physics-Gaur and Gupta-DhanpatRai Publications-2017
2 Shock waves made simple- Chintoo S Kumar, K Takayama and KPJReddy: Willey India Pvt. Ltd. New Delhi2014
3 Engineering Physics-Gaur and Gupta-DhanpatRai Publications-2017
4 Introduction to Mechanics — MK Verma: 2nd Ed, University Press(India) Pvt Ltd, Hyderabad 2009
5 A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand & Company Ltd, New Delhi
6 Introduction to Electrodynamics- David Griffiths: 4th Ed, Cambridge University Press 2017
7 A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand & Company Ltd, New Delhi
8 Concepts of Modern Physics-Arthur Beiser: 6th Ed;Tata McGraw Hill EduPvt Ltd- New Delhi 2006
9 Lasers and Non Linear Optics – BB laud, 3rd Ed, New Age
10 International Publishers 2011
11 Concepts of Modern Physics-Arthur Beiser: 6th Ed;Tata McGraw Hill EduPvt Ltd- New Delhi 2006
12 Solid State Physics-S O Pillai, 8th Ed- New Age International
13 Publishers-2018

Additional Study material & e-Books

1. Laser Fundamentals- William T. Silfvast

2. Nano The Next Revolution- Mohan SundaraRajan

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

- https://bookspar.com/
- https://neptl.ac.in
- https://www.khanacademy.org/science/physics
- https://www.physicsgalaxy.com
- https://freevideolectures.com/Subject/Physics
- http://www.nptelvideos.in/
- https://www.physics.org/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	International Journal of Engineering Science	https://www.journals.elsevier.com/international-journal-of-engineering-science
2	International Journal of Engineering Trends and Technology	http://ijettjournal.org/

11.0 Examination Note

Internal Assessment: 40 Marks

Theoretical aspects as well as relevant sketches should be drawn neatly.

Scheme of Evaluation for Internal Assessment (40 Marks)

(a) Internal Assessment test in the same pattern as that of the main examination: 30 Marks.
(b) Assignments: 10 Marks

SCHEME OF EXAMINATION:

Question paper pattern:

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

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	**Free Oscillations**:Definition of SHM, derivation of equation for SHM	20
	2	Mechanical and electrical simple harmonic oscillators (mass suspended to spring oscillator),	
	3	complex notation and phasor representation of simple harmonic motion	
	4	Equation of motion for free oscillations, Natural frequency ofoscillations.	
	5	**Damped and forced oscillations**: Theory of damped oscillations: over damping, critical & under damping, quality factor.	
	6	Theory of forced oscillations and resonance, Sharpness of resonance. One example for mechanical resonance.	

	7	**Shock waves**: Mach number, Properties of Shock waves, control volume.	
	8	Laws of conservation of mass, energy and momentum.	
	9	Construction and working of Reddy shock tube, applications of shockwaves.	
	10	Numerical problems	
2	11	**Elasticity:** Concept of elasticity, plasticity, stress, strain tensile stress, shear stress, compressive stress	20
	12	strain hardening and strain softening, failure (fracture/fatigue)	
	13	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.	
	14	Relation between Y, n and K, Limits of Poisson'sratio.	
	15	**Bending of beams**: Neutral surface and neutral plane	
	16	Derivation of expression for bending moment.Bending moment of a beam with circular and rectangular cross section.	
	17	Single cantilever, derivation of expression for young's'modulus	
	18	**Torsion of cylinder**: Expression for couple per unit twist of a solid cylinder (Derivation),	
	19	Torsional pendulum-Expression for period ofoscillation.	
	20	Numerical problems	
3	21	**Maxwell's equations:** Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static),Gauss' divergence theorem and Stokes' theorem.	20
	22	Description of laws of electrostatics,magnetism and Faraday's laws of EMI.	
	23	Current density & equation of Continuity; displacement current (with derivation)	
	24	Maxwell's equations in vacuum	
	25	**EM Waves**: The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations),	
	26	Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves(Qualitative)	
	27	**Optical fibers:** Propagation mechanism, angle of acceptance. Numerical aperture.	
	28	Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and Mention of expression for attenuation coefficient.	
	29	Discussion of block diagram of point to point communication. Merits and demerits	
	30	Numerical problems	
4	31	**Quantum mechanics:** Introduction to Quantum mechanics, Wave nature of particles,	20
	32	Heisenberg's uncertainty principle and applications (non confinement of electron in the nucleus),	
	33	Schrodinger time independent wave equation,	
	34	Significance of Wave function, Normalization,	
	35	Particle in a box, Energy eigen values of a particle in a box and probability densities	

	36	**Lasers**: Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density).	
	37	Requisites of a Laser system. Conditions for laser action.	
	38	Principle, Construction and working of CO2 and semiconductor Lasers.	
	39	Application of Lasers in Defense (Laser range finder) and Engineering(Datastorage)	
	40	Numericalproblems	
5	41	**Quantum Free electron theory of metals:** Review of classical free electron theory, mention of failures.	20
	42	Assumptions of Quantum Free electron theory, Mention of expression for density of states,	
	43	Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level,	
	44	Derivation ofthe expression for Fermi energy, Success ofQFET.	
	45	**Physics of Semiconductor**: Fermi level in intrinsic semiconductors,	
	46	Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression),	
	47	Conductivity of semiconductors(derivation), Hall effect,Expression for Hall coefficient(derivation)	
	48	**Dielectric materials:** polar and non-polar dielectrics, internal fields in a solid, Clausius- Mossotti equation(Derivation),	
	49	mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers.	
	50	Numerical problems	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Section of Modern physics and quantum mechanics.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity.Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Electrical conductivity of metals and semiconductors.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment 3: University Questions on Optical fibers and Lasers.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4:	Students study the	Module	8	Individual	Book 1, 2 of

	University Questions on crystal structures.	Topics and write the Answers. Get practice to solve university questions.	4 of the syllabus		Activity. Printed solution expected.	the reference list. Website of the Reference list
5	Assignment 5: University Questions on Shock waves and nano science.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
6	Mini Project Rivets based for the students groups	Students study the Rivets applications from Real World Example view. Gain Knowledge of Rivets Applications.	Syllabus with Real World Mapping	12	Group Activity. Student Group need to perform Project and do a brief Report	All Books / paper Resources / Study Material. All Internet / Web resources.

14.0 QUESTION BANK

Module: 1

Oscillations and Waves

1. What is SHM? Derive the equation of SHM.
2. Explain Mechanical and electrical simple harmonic oscillators.
3. Explain theory of damped oscillations.
4. Explain theory of forced oscillations and resonance with one example.
5. What is Mach number? Define subsonic and supersonic with Mach number and give example.
6. What are Shock waves? Explain the experimental method of producing shock waves and measuring its Mach number using Reddy's shock tube.
7. Define Mach number, ultrasonic, subsonic waves, supersonic waves and Mach angle.
8. The distance between the two pressure sensors in a shock tube is 150 mm. The time taken by a shock wave to travel this distance is 0.3 ms. If the velocity of sound under the same condition is 340 ms^{-1}. Find the Mach number of the shock wave.

Module: 2

Elastic properties of materials

1. Explain Hooke's law with the help of figure.
2. Derive the Relation between Y, n and K.
3. Derive the relation between Y, η and σ
4. Derive the relation between K, Y and σ
5. Derive the expression for bending moment.
6. Derive the expression of bending moment of a beam with circular cross section.
7. Derive the expression of rectangular cross section.
8. Derive the expression for Young's' modulus.
9. Derive the expression for couple per unit twist of a solid cylinder.

10. Derive the expression for period of oscillation of torsional pendulum.

Module: 3

Maxwell's equations, EM waves and Optical fibers

1. Derive wave equation in terms of electric field using Maxwell's equations.
2. Explain the transverse nature of electromagnetic waves.
3. Explain briefly Gauss flux theorem in electrostatics and magnetism.
4. Describe the principle on which optical fiber works.
5. With a neat diagram explain numerical aperture and ray propagation in an optical fiber.
6. Obtain an expression for N.A. and arrive at the condition for ray propagation through the fiber.
7. Explain the different types of optical fibers.
8. Discuss the attenuation mechanism in an optical fiber.
9. Describe point to point communication system using optical fibers with the help of block diagram.
10. Mention advantages and disadvantages of optical fiber communication over the conventional methods of communication.

Module: 4

Quantum Mechanics and Lasers

1. State de Broglie hypothesis. Show that the de Broglie wavelength for an electron accelerated by a potential difference V volt is $\lambda=1.226/\sqrt{v}$ nm for non-relativistic case.
2. What are matter waves? Mention their properties.
3. Explain Heisenberg's Uncertainty Principle.
4. Show that a free electron can't exist within the nucleus of an atom.
5. Set up time independent one dimensional Schrodinger's equation.
6. What is a wave function? Give its physical significance and properties.
7. What is a normalization of a wave function?
8. Find Eigen values and Eigen functions for a particle in one dimensional infinite potential well.
9. Assuming the time independent Schrodinger wave equation, discuss the solutions for energy of a particle in one dimensional infinite potential well.
10. Solve the Schrodinger wave equation for the allowed energy values in the case of particle in a box.
11. Obtain the time independent Schrodinger wave equation for a particle in one dimensional potential well of infinite height and discuss the solutions.
12. Obtain the Schrodinger wave equation for a free particle and discuss its solutions.
13. What is laser? Explain the terms a) Induced absorption b) Spontaneous emission c) Stimulated emission. d) Metastable state and e) Population inversion.
14. Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's coefficients.
15. Discuss the conditions to be met by an active system for laser action.
16. Describe the requisites of a laser system.
17. Describe construction and working of a CO_2 laser.

18. Describe the construction and working of a semiconductor laser.
19. Write a note on industrial applications of lasers.
20. Describe construction & working of semiconductor laser along with the applications.
21. Describe the technique of measurement of pollutants in atmosphere using a laser beam.
22. Explain in brief laser used as range finder.
23. Explain in brief laser used as data storage.

Module: 5

Material science

1. Explain any three drawbacks of classical free-electron theory and success of Quantum theory.
2. Describe how quantum free electron theory has been successful in overcoming the failures of classical free electron theory.
3. Mention assumptions of quantum free electron theory.
4. Define Fermi factor. Discuss the probability of occupation of various energy states by electrons at T=0 K, and T >0 K, on the basis of Fermi factor.
5. Derive the expression for Fermi energy of metal at 0 K temperature.
6. Derive the relation between Fermi energy and energy gap for an intrinsic semiconductor.
7. Derive the expression for electrical conductivity of semiconductors.
8. What is Hall Effect? Obtain expression for Hall voltage in terms of Hall coefficients.
9. What are dielectrics? Arrive at an expression for internal field in the case of solids and liquids.
10. Explain in brief the various types of polarization.
11. Derive Clausius - Mossotti equation?
12. Describe solid, liquid and gaseous dielectrics with one example each.

15.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
June/ July 2019	0	2	4	14	38	0	8	5	94.57

Prepared by	Checked by		
Sri. V.M.Bhumannavar	Sri.V.M.Bhumannavar	HOD	Principal

Subject Title	BASIC ELECTRICAL ENGINEERING		
Subject Code	18ELE23	CIE Marks	40
Teaching hours/week(L:T:P)	02:02:0	SEE Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
			CREDITS – 03

FACULTY DETAILS:		
Name: Shri.Mahesh P. Yanagimath	**Designation:** Assistant Professor	**Experience: 14 Years**
No. of times course taught(including present): 01		**Specialization:** VLSI

1.0 Prerequisite Subjects:

Sl. No	Basics required	Class	Subject
01	Basic knowledge of voltage, current, resistor, capacitor and inductor.	PUC I/II	Physics I/II
02	Algebraic equations and its simplification	PUC I/II	Mathematics
03	AC Fundamentals	PUC-II	Physics

2.0 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 behavior 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 processing devices and earthing.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	Pos
C105.1	Analyze DC circuits; explain the generation of AC and its fundamentals.	L1, L2, L3, L4	1,2,12
C105.2	Analyze single phase and three phase AC circuits.	L1, L2, L3, L4	1,2,3
C105.3	Explain the construction and working of single phase transformer, concepts of electrical wiring, circuit protecting devices and earthing.	L1, L2, L3, L4	1,2,3,6,9
C105.4	Explain the principle of operation and construction of DC machines.	L1, L2, L3, L4	1,2,3
C105.5	Explain the principle of operation and construction of three phase synchronous generator & induction motors.	L1, L2, L3, L4	1,2,3
	Total Hours of instruction	40	

4.0 Course Content

MODULE-1

D. C. Circuits: Ohm's Law and Kirchhoff's Law, 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, R-C, 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, 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 dc generators. Expression for induced emf, Types of DC 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)

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	III	Electric Circuit Analysis	Series parallel circuits, Network reduction, KVL equations KCL equations.AC circuits and R-L-C Resonant circuits
02	III	Transformers and Generators	Basics of Generator, Types of Generators, Synchronous Generator, Principle of Transformer and types Efficiency of Transformer
03	IV	Electric Motors	Working principle of DC motor, Types of DC motors and Induction motor principle and types. Three phase induction motor.

6.0 Relevance to Real World

SL.No	Real World Mapping
1.	Calculating Current in the circuit, Sizing of Fuses
2.	Electrical Earthing methods and maintenance
3.	Wiring of simple two way and three way switch
4.	Determining power factor of the load and designing a power factor improvement device
5.	Choosing appropriate machines for a particular applications.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
1	Demo (Using Models)	Topic: Battery, Ac generator, working of motor and transformer

8.0 Books Used and Recommended to Students

Text Books:

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. Chand Publications.

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.

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

- http://nptel.vtu.ac.in/econtent/BS.php
- https://www.electrical4u.com
- http://m.noteboy.in/vtuflies/machine%20drawing.pdf
- https://www.edx.org/school/iitbombayx?utm_source=bing&utm_medium=cpc&utm_term=iit-bombay&utm_campaign=partner-iit-bombay
- http://www.vlab.co.in/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	Journal of Electrical Engg.	http://www.jee.ro
2	Electrical4U	http://www.electrical4u.com

11.0 Examination Note

- 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.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture	% of Portion
I	1.	**D. C. Circuits:** ohm's law and kirchhoff's law	20
	2.	Analysis of series, parallel and series-parallel circuits excited by independent voltage sources.	
	3.	Power and Energy.	
	4.	**A.C. Fundamentals:** Generation of sinusoidal voltage	
	5.	Frequency of generated voltage	
	6.	Definition and numerical values of average value	
	7.	Root Mean Square value, form factor and peak factor of sinusoidally varying voltage and current	
	8.	Phasor representation of alternating quantities.	
II	9.	**Single Phase Circuits:** Analysis, with phasor diagram of circuits with R, L, C, R-L for series and parallel configurations.	20
	10.	Analysis, with phasor diagram of circuits with R-C, R-L-C for series and parallel configurations.	
	11.	Real power, reactive power, apparent power.	
	12.	Power factor.	
	13.	**Three Phase Circuits:** Advantages of 3-phase power	
	14.	Three-phase balanced circuits	
	15.	Voltage and current relations in star and delta connections.	

	16.	Measurement of three phase power using two wattmeter method.	
III	17.	**Single Phase Transformers:** Necessity of transformer, principle of operation	20
	18.	Types and construction of transformers. Emf equation, losses	
	19.	Variation of losses with respect to load, efficiency	
	20.	Condition for maximum efficiency.	
	21.	**Domestic Wiring:** Service mains, meter board and distribution board. Brief discussion on concealed conduit wiring.	
	22.	Two-way and three-way control.	
	23.	Elementary discussion on circuit protective devices: Fuse and Miniature circuit Breaker (MCB's), electric shock, precautions against shock.	
	24.	**Earthing**: pipe and Plate earthing.	
IV	25.	**DC Generators:** Principle of operation,	20
	26.	Construction of dc generators. Expression for induced emf	
	27.	Types of DC generators	
	28.	Relation between induced emf and terminal voltage.	
	29.	**DC Motors:** principle of operation, Back emf	
	30.	Torque equation, Types of dc motors	
	31.	Characteristics of dc motors (shunt and series motors only)	
	32.	Applications.	
V	33.	**Three Phase Synchronous Generators:** Principle of operation, Constructional details,	20
	34.	Synchronous speed, Frequency of generated voltage	
	35.	Emf equation, Concept of winding factor (excluding the derivation and calculation of distribution and pitch factors)	
	36.	Three Phase Induction Motors: Principle of operation	
	37.	Generation of rotating magnetic field	
	38.	Construction and working of three-phase induction motor	
	39.	Slip and its significance.	
	40.	Necessity of starter, star-delta starter.	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Modules 1	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1	2	Individual Submission in the standard format is expected	Book 1, 2 of the reference list. Class Notes
2	Assignment 2: University Questions on Modules 2	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2	4	Individual Submission in the standard format is expected	Book 1, 2 of the reference list. Class Notes
3	Assignment 3: University Questions on Modules 3	Students study the Topics and write the Answers. Get practice to solve university questions	Module 3	6	Individual Submission in the standard format is expected	Book 1, 2 of the reference list. Class Notes
4	Assignment 4: University Questions on Modules 4	Students study the Topics and write the Answers. Get practice to solve university	Module 4	8	Individual Submission in the standard format is expected	Book 1, 2 of the reference list. Class Notes

		questions				
5	Assignment 5: University Questions on Modules 5	Students study the Topics and write the Answers. Get practice to solve university questions	Module 5	10	Individual Submission in the standard format is expected	Book 1, 2 of the reference list. Class Notes

14.0 QUESTION BANK

MODULE-1

DC circuits

1. Explain ohms law and state its limitations. Also define resistivity of material.
2. How the voltage and current is divided in series, parallel and series-parallel circuits? Also state the advantages & limitations of these circuits.
3. Find current through all the branches of the network shown in fig5.below.
4. For the circuit shown in fig.6 Calculate, a) equivalent resistance between the supply terminals b) Current supplied by the source c) Power consumed by the 16 ohm resistor.

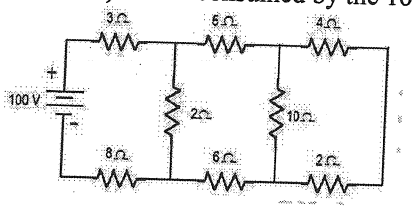


Fig.5

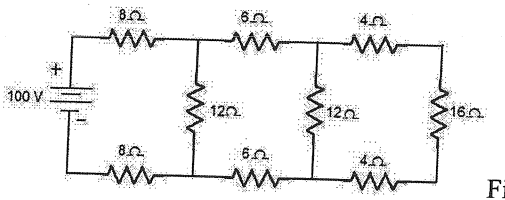


Fig.6

5. In the circuit shown in Fig7, determine the current through the 2 ohm resistor and the total current delivered by the battery. Use Kirchhoff's laws.
6. In the network shown in fig 8, find the current delivered by the battery.

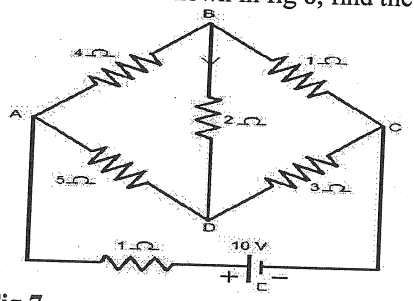


Fig.7

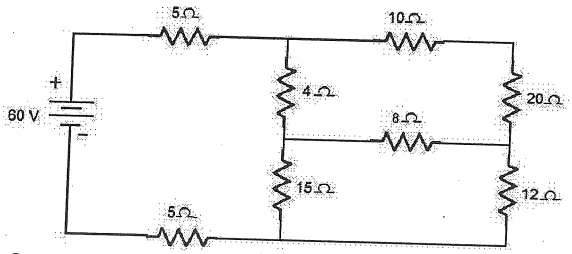


Fig.8

7. Find the unknown resistor R where power consumed by the network is 16W for the network shown in fig.9.
8. Find the currents I_1, I_2 and I_3 for the circuit shown in Fig.10. Also find potential difference between a and b.
9. Determine the potential difference between x and y. for the circuit shown in fig.11.

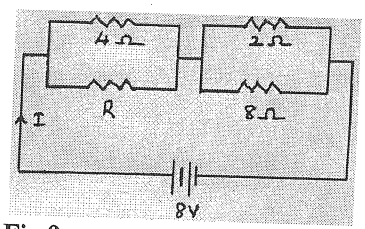


Fig.9

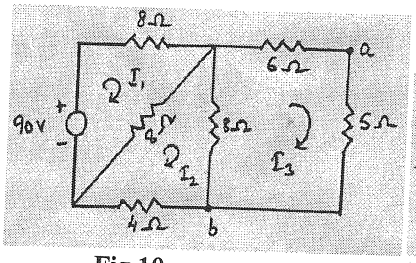


Fig.10

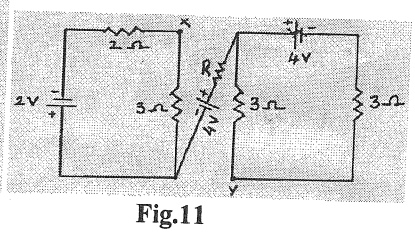
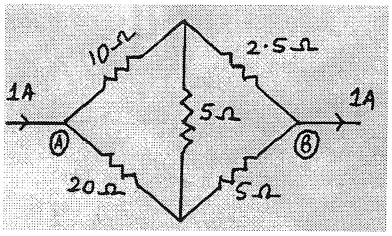


Fig.11

10. Find the currents in all the resistors of the network shown in the fig. Also find the potential at *A* w.r.t. that at *B*.



11. A resistance *R* is in series with a parallel combination of two resistances of 12 Ω and 8 Ω. The total power dissipation in the circuit is 70 W when the supply voltage is 20 V. Find *R*.
12. A current of 20 A flows through two ammeters *A* and *B* in series. The p.d. across *A* is 0.2 V and that across B is 0.3 V. Find how the same current will divide between *A* and *B* when they are in parallel.

AC Fundamentals

13. Define/Explain the following terms w.r.t alternating quantities: a) Phase & phase difference and b) Frequency and period.
14. Define and hence specify/find the instantaneous value, peak value, RMS value, average value, form factor and peak factor of a signal of the form $a(t)=Am\cos(\omega t+\theta)$.
15. What are the advantages of ac over dc?
16. With a neat schematic, explain the principle of generation of alternating voltage.
17. Explain the generation of single phase AC induced emf with sinusoidal diagram..
18. The equation for an AC voltage is given as V= 0.04sin(200t+60')V. Determine the frequency, the angular frequency, instantaneous voltage when t= 160μs. What is the time represented by 60' phase angle.

MODULE -2

Single Phase Circuits

1. Show that the average power consumed in a pure capacitor and in a pure inductor is zero.
2. Define power factor, explain its significance and establish the phase relationship between voltage and current in series and parallel combinations of a) *RL* circuit, b) *RC* circuit and c) *RLC* circuits (for different cases). Sketch the phasor diagrams and impedance diagrams in all the cases.
3. Explain the terms 'reactance' and 'impedance' with suitable examples.
4. Define reactive power and overall power and obtain expressions for them. Bring out their significance. Specify their units.
5. A coil when connected to 200V, 50Hz supply takes a current of 10A and dissipates 1200W. Find the resistance & reactance of the coil. Find also the real power, reactive power and overall power. Sketch the phasor diagram.
6. A coil of 50Ω and 0.5H is connected across 200V, 50Hz supply. Find a) Inductive reactance, b) Circuit impedance, c) Supply current, d) Power factor, e) Phase angle, f) Voltages across *R* & *L* and g) Active, reactive and overall (apparent) power. Obtain expressions for voltage and current. Also sketch the complete phasor and vector diagrams.
7. A capacitor of 15μF is connected in series with a non-inductive resistance of 100Ω across a 100V, 50Hz supply. Find a) Capacitive reactance, b) Impedance, c) Current, d) Power factor, e) Phase angle, f) Voltages across *R* & *C* and g) Power dissipated. Obtain expressions for voltage and current. Also sketch the phasor diagrams.
8. An *RLC* series circuit has the following data. *R*=25Ω; *L*=150mH; *C*=20μF; 250V 50Hz supply. Determine the supply current and the various voltage drops. Represent them in a phasor diagram.
9. A choke is connected in series with a non-inductive resistor across a 250V, 50Hz supply. It draws a current of 5A. The voltage across the coil and the non-inductive resistance are 125V & 200V respectively. Find: a) *R, X, Z & Y,* b) Power loss in the coil, and c) Total power supplied. Sketch the phasor and impedance diagrams.
10. Two impedances *Z*1 =(150-j157)Ω & *Z*2 = (100+j100)Ω are connected in parallel across a 200V, 50Hz supply. Find a) Branch currents, b) Total current and c) Complex power, and d) Total power. Sketch the complete phasor and admittance diagrams.
11. An ac generator with an internal impedance of (3+j2.4) Ω is connected to load impedance consisting of two impedances (12+j10) Ω & (16-j12) Ω in parallel. If the supply voltage is 100V, determine a) the current in each branch, b) the power in each branch
12. Show that in a pure inductor the current lags behind the voltage by 90'. Also draw the voltage and current waveforms.

Three Phase Circuits:

13. With a schematic, explain the principle of generation of 3-phase emf. What are the characteristics of balanced supply? When is a load said to be balanced? Establish the relationship between the phase & line currents and

voltages in a 3 phase delta. In the case of balanced supply and load, (a) are the phase voltages equal? (b) are the line currents equal? Justify your answers. Sketch the complete phasor diagrams in every case.

14. Explain the concept of 'phase sequence'. Establish the relationship between the phase & line currents and voltages in a 3Φ star with 3-wire and 4-wire systems. In the case of balanced supply and balanced load, (a) are the line voltages equal? (b) are the phase currents equal? Justify your answers. Sketch the complete phasor diagrams in every case.
15. Show with a relevant phasor diagram how 3-phase power can be measured by two wattmeters.
16. Two wattmeters are used to measure the power in a 3Φ balanced system. What is the power factor when a) both the meters read equal, b) one meter reads twice the other, c) one meter reads zero and d) one meter reads negative?
17. What are the advantages of a 3Φ system over a single-phase system?
18. Three coils each of impedance $20\angle 60^0\ \Omega$ are connected in star across a 400V, 3Φ, 50Hz supply. Find the reading on each of the two wattmeters connected to measure the power input. If the same impedances were connected in delta across the same supply, find the corresponding readings of the wattmeters. Find the reactive power and the apparent power.
19. A balanced 3□ star connected load of 150kw takes a leading current of 100A with a line voltage of 1100V, 50Hz. Find the circuit constants of the load per phase.
20. A 400V, delta connected 75 HP induction motor operates at 85% efficiency at 0.8pf. Find the readings of the wattmeters connected to measure power by the two-wattmeter method.
21. Prove or disprove: 'With a star connected load, the sum of the line currents is zero' implies `supply is balanced'.

MODULE-3

Single Phase Transformers

1. Explain the construction & principle of operation of 1Φ transformer. Derive the emf equation of a transformer.
2. Show that EMF/turn for primary & secondary are same. Show that the emf ratio is the reciprocal of the current ratio.
3. What are the losses in a transformer? On what factors do they depend? How are losses reduced in a transformer by construction?
4. Explain with neat sketches the core and shell type transformers.
5. Define and explain the terms *efficiency* and *regulation* of a transformer.
6. A 125kVA transformer has a primary voltage of 2000V at 60Hz with 182 & 40 turns on primary and secondary respectively. Neglecting the losses calculate a) no load secondary emf b) full load primary & secondary currents and c) flux in the core.
7. A 25kVA transformer has an efficiency of 97% both at FL and at half load at 0.8pf. Determine a) full load iron & copper loss, b) efficiency at 75% FL and c) max efficiency.
8. A 25kVA, 2200/250V transformer has an iron loss of 600W & full load copper loss of 1000W. Calculate efficiencies at i) full load ii) 75% load iii) 50% load iv) 25% load at upf & 0.8pf lag, v) losses at max. Efficiency vi) load for max. Efficiency and vii) max. efficiency at upf.
9. The iron and full load copper losses in a 40kVA, 1Φ transformer are 450W & 850W respectively. Find i) efficiency at full load, 0.8pf lag ii) max efficiency and iii) load at which the maximum efficiency occurs.
10. A 50kVA transformer has an efficiency of 98% at full load 0.8pf and 97% at half load 0.9pf. Determine the full load iron and copper losses. Find the load at which max. efficiency occurs as also the maximum efficiency.
11. Give reasons for the following: a) Core loss in a transformer remains almost constant, b) A regulation close to zero is desirable in a transformer, and c) A laminated steel core is used in a transformer.
12. The regulation of a transformer is negative.' What does this signify? When can such a situation occur?
13. List different types of loss in a transformer and explain each one in brief.

Domestic Wiring

14. What are the different types of wiring? Mention their features and applications.
15. Explain with wiring diagrams the working of 2-way and 3-way control of a lamp.
16. Explain why appliances are earthed. With neat sketches, explain plate, pipe and rod earthing.
17. Why are fuses used in electrical appliances?

MODULE-4

DC Generators:

1. Explain the principle of operation of a dc generator.
2. With a neat sketch explain the construction of a dc generator.
3. Derive the emf equation of a dc generator.
4. Explain the different types of de generators & mention their applications.
5. A 4 pole, wave-wound dc generator has 50 slots and 24 conductors / slot. The flux/pole is 10mWb. Determine the

induced emf in the armature if it is rotating at 600 rpm. Solve the same problem if the machine is lap-wound.

6. A 6 pole, wave-wound DC generator has 70 conductors & 12mWb flux/pole. Determine the speed of the armature if the induced emf is 400V. What will be the speed when it is lap wound and generating 400V? Armature reaction weakens the field by 3%.
7. A dc shunt generator supplies a load of 10kW at 250V. Calculate the induced emf if the armature resistance is 0.5 Ω and shunt field resistance is 100Ω.
8. A shunt generator has an induced emf of 254V. When the machine is loaded the terminal voltage falls to 240V. Find the load current if the armature resistance and field resistance are 0.04 Ω & 24 Ω respectively. Brush contact drop is 1.5V/brush.
9. A dc long shunt compound generator delivers a load current of 200A at 500V. The resistance of armature, series field and shunt field are 0.03 Ω, 0.015 Ω & 15 Ω respectively. Calculate the emf induced in the armature. Assume a brush drop of 1V per brush.
10. Solve Problem 9 for a short shunt compound generator.
11. Explain the principle of operation of a dc motor.
12. Explain the significance of back emf of a dc motor. Derive an expression for the back emf.
13. Derive the torque equation of a dc motor.
14. Explain the different types of dc motors. Mention their applications.
15. Sketch and explain the following characteristics for series, shunt, compound motors.
Torque vs. Armature current, and Speed vs. Armature current.
16. What are the purposes to be served by a dc motor starter? With a neat sketch explain the working of a 3-point starter.
17. A 20kW, 200V dc shunt generator has a armature and field resistances of 0.05 Ω and 150 Ω respectively.
18. Determine the total current and power developed when working as a motor taking 20kW power.
19. A 250V dc series motor has an armature resistance of 0.05 Ω and field resistance of 0.02 Ω. It runs at 900rpm taking 30A. Determine its speed when it takes a current of 25A.
20. A dc shunt motor runs at 950 rpm on 200V with 40A armature current. Its armature resistance is 0.8 Ω. What resistance is required to be connected in the armature circuit to reduce the speed to 725 rpm without changing the armature current?
21. A 12 pole, 3Φ alternator is coupled to an engine running at 500rpm. It supplies an induction motor which has a full load speed of 1440rpm. Find the percentage slip and the number of poles of the motor.

MODULE-5

Three Phase Synchronous Generators:

1. Explain the constructional features and principle of operation of a 3-phase alternator.
2. From basic principles, arrive at an expression for the emf/phase induced in an alternator.
3. With sketches explain the constructional features of salient pole and non-salient pole alternators. Where are the two types used?
4. Calculate the induced emf/phase in a 4 pole, 3Φ, 50Hz star connected alternator with 72 slots and 15 conductors per slot. The flux/pole is 0.06Wb. Assume the winding factor to be 0.95, full pitch winding & sinusoidal distribution of flux.
5. Determine the phase & line values of the induced emf in a 4 pole, 3Φ, 50Hz star connected alternator with 36 slots and 30 conductors per slot. The flux/pole is 50mWb. Assume the winding factor to be 0.95. What is the line emf if connected in delta?
6. A 20 pole, 3Φ, 50Hz star connected stator winding has 180 slots on the stator. Each slot consists of 8 conductors. The flux/pole is 25mWb and is sinusoidally distributed. The coils are full-pitched. Calculate i) speed, ii) generated emf/phase and iii) line emf.
7. With usual notations, derive the relation $f=PN/120$.
8. Derive the emf equation of synchronous generator.
9. Describe the constructional features of synchronous generator with suitable diagram.

Three Phase Induction Motors:

10. How is a rotating magnetic field produced in the air gap of a 3Φ induction motor?
11. Explain the principle of operation and constructional features of a 3Φ induction motor.
12. Define and explain slip in an induction motor.
13. What are squirrel cage and wound-rotor induction motors? What are their relative advantages and disadvantages?

Mention their applications.

14. Why does an induction motor require a starter? With a neat diagram explain the principle of operation of a star-delta starter.
15. A 3Φ, 8 pole, 60Hz induction motor has a slip of 3% at full load. Find the synchronous speed and the frequency of rotor current at full load.
16. Explain the concept of rotating magnetic field and show that resultant flux remains same at different instants of time.

15.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
June 2019	0	0	0	4	13	0	3	71.52
Dec 2018	1	4	7	6	10	0	3	95.10

Prepared By	Checked By		
Shri. Mahesh P. Yanagimath	Smt. H R Zinage	HOD	Principal

Subject Title	Elements Of Civil Engineering & Mechanics		
Subject Code	18CIV14/24	IA Marks	40
Number of Lecture Hrs / Week	4	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
		CREDITS – 03	

FACULTY DETAILS:		
Name: Manjeetkumar Nagarmunnoli	**Designation:** Asst. Professor.	**Experience:** 8 yrs
No. of times course taught : 8		**Specialization:** Structural Engineering

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	First year (Common to all)	I/II	Elements of Civil Engineering & Mechanics

2.0 Course Objectives

1. Explain the Scope of different field of Civil Engineering and Role of Civil Engineer in the Infrastructural Development.
2. Describe the basic concepts of idealization, Principle of Physical Independence of forces, Principle of superposition of forces, Principle of transmissibility of forces.
3. Explain the system of coplanar concurrent & non-concurrent force system, moment and couple, Varignon's principle of moments
4. Explain the equilibrium of forces, Lami's theorem and equations of equilibrium to solve the Numerical problems. Understand the concept of friction (Static & Dynamic), Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose to solve the numerical.
5. Explain the types of supports, statically determinate and indeterminate beams, support reactions for beams subjected to point load, UDL and UVL
6. Analysis of simple trusses.
7. Centroid and Moment of Inertia of rectangular, circular and triangular areas from method of integration; Moment of inertia of composite areas.
8. Understand the concept of Dynamics –Kinematics- Laws of motion, rectilinear motion, curvilinear motion, super elevation and projectile motion. Kinetics – Application of D'Alembert's principal in plane motion and connected bodies including pulleys.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and use modeling software's to generate

	Course Outcome	Cognitive Level	POs
C103.1	Describing the basics of civil engineering, its scope of study, knowledge about roads, bridges and dams. Understanding the action of forces, moments and other loads on systems of rigid bodies.	L1	1,11,12
C103.2	Understanding the concept of equilibrium and friction- Static and Dynamic.	L2	1,2,11,1
C103.3	Analyzing and Interpreting the reactive forces and the effects those develop as a result of external loads on beams and trusses.	L2	1,2,11,1 2
C103.4	Finding the centroid and moment of inertia of composite, plane and curved figures.	L2,L4	1,2,11,1
C103.5	Describing the basics of kinematics and kinetics, different types of motions. Analyzing the motion of the body	L1,L4	1,2,11,1 2
	Total Hours of instruction	40	

4.0 Course Content

Course Syllabus

Module -1

Introduction to Civil Engineering &Engineering Mechanics

Introduction to Civil Engineering,

Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.

Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural Development, Effect of the infrastructural facilities on socio-economic development of a country.

Introduction to Engineering Mechanics:

Basic idealizations - Particle, Continuum and Rigid body; Force and its characteristics, types of forces, Classification of force systems; Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces; Newton's laws of motion. Resolution and composition of forces. Definition of Resultant; Composition of coplanar -concurrent force system, Parallelogram Law of forces, Principle of resolved parts. Non Concurrent Force System: Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Couple, Moment of a couple, Characteristics of a force.

Module -2

Equilibrium of Forces

Free Body diagrams, Lami's theorem, and Equations of Equilibrium, Equilibrium of Concurrent and Non-concurrent Coplanar Force systems.

Friction

Definitions: Types of friction, Laws of static friction, Limiting friction, Concept of Static and Dynamic Friction: Numerical problems on motion of single and connected blocks on inclined planes. Ladder and Wedge friction, Rope and pulley systems.

Module -3

Support Reaction

Types of Loads and Supports, statically determinate and indeterminate beams, support reactions in beams, numerical problems on support reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed loads and uniformly varying loads and moments.

Analysis of Trusses

Types of trusses, analysis of statically determinate trusses using the method of joints and sections.

Module -4

Centroid

Centroid of basic geometrical figures from first principle, centroid for composite/built-up sections Numerical problems

Moment of Inertia

Introduction to the concept, Radius of gyration, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of basic planar figures from first principle, computing moment of Inertia for Engineering composite sections, Numerical problems.

Concept of Product of Inertia(No problems)

Module -5

Kinematics:

Definitions – Displacement – Average velocity – Instantaneous velocity – Speed – Acceleration - Average acceleration – Variable acceleration – Acceleration due to gravity – Newton's Laws of Motion, Rectilinear Motion–Numerical problems. Curvilinear Motion – Super elevation – Projectile Motion – Relative motion – Numerical problems. Motion under gravity – Numerical problems.

Kinetics : D'Alembert's principle and its applications in the plane motion and connected bodies including pulleys.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	Higher branches	Theory subjects	Basic fundamentals

6.0 Relevance to Real World

Sl.No	Real World Mapping
01	Basic Elements of Construction And Engineering Fields

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Module I-Module V
02	NPTEL	Fundamental of civil and mechanics Videos

8.0 Books Used and Recommended to Students

Text Books

1. R.C. Hibbler, Engineering Mechanics, Principles of Statics and Dynamics, Pearson Press.
2. Bansal R. K., A text book of Engineering Mechanics, Laxmi Publications.
3. S.S. Bhavikatti, "Elements of Civil Engineering", New Age International Publisher, New Delhi, 4th edition 2009.

Reference Books

1. S.Timoshenko, D.H.Young and J.V.Rao, "Engineering Mechanics", TATA McGraw- Hill Book Company, New Delhi
2. Beer FP and Johnston ER, "Mechanics for Engineers- Dynamics and Statics", 3rd SI Metric edition, Tata McGraw Hill. - 2008
3. Shames IH, "Engineering Mechanics – Statics & Dynamics", PHI – 2009

Additional Study material & e-Books

1. Elements of Civil Engineering and Engineering Mechanics – Sawant and Nitsure

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

- https://bookspar.com/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Journal of engineering and technology	https://www.journals.elsevier.com/engineering-science-and-technology
2	International Journal of Solids and Structures	http://www.sciencedirect.com/science/journal/00207683

11.0 Examination Note

Internal Assessment: 40 Marks

Theoretical aspects as well as relevant sketches should be drawn neatly.

Scheme of Evaluation for Internal Assessment (40 Marks)

(a) Internal Assessment test in the same pattern as that of the main examination : 30 Marks.
(b) Assignments: 10 Marks

SCHEME OF EXAMINATION:

Question paper pattern:

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

Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
		PART - A	
1	1	**Introduction to Civil Engineering**, Scope of different field of Civil Engineering	20%
	2	Surveying, Building Materials, Construction Technology, Geotechnical Engineering.	
	3	Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering	
	4	**Types of infrastructure**, Role of Civil Engineer in the Infrastructural Development.	
	5	Effect of the infrastructural facilities on socio-economic development of a country.	
	6	**Introduction to Engineering mechanics**: Basic idealizations - Particle, Continuum, Rigid body and Point force. Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces	
	7	Newton's laws of motion, Definition of force, Introduction to SI units	
	8	Numerical problems on moment of forces and couples, on equivalent force - couple system.	
2	9	**Composition of forces** - Definition of Resultant	40%
	10	Composition of coplanar - concurrent force system, Principle of resolved parts	
	11	Numerical problems on composition of coplanar concurrent force systems.	
	12	Composition of coplanar.	
	13	Non-concurrent force system	
	14	Varignon's principle of moments	
	15	Numerical problems on composition of coplanar	
	16	Numerical problems on composition of non-concurrent force systems.	
	17	**Friction** - Types of friction	
	18	Laws of static friction, Limiting friction, Angle of friction, angle of repose, numerical Problem	
3	19	**Equilibrium of forces** -Types of supports	60%
	20	statically determinate beams	
	21	Numerical problems on support reactions for statically determinate beams	
	22	Numerical problems on support reactions for statically determinate beams	
	23	Analysis of Trusses (Method of joints and method of sections).	
	24	Analysis of Trusses (Method of joints and method of sections).	
	25	**Equilibrium of forces** - Definition of Equilibrant	
	26	Conditions of static equilibrium for different force systems.	
	27	Lami's theorem	
	28	Numerical problems on equilibrium of coplanar	
4	29	**Centroid of plane figures**- Introduction	80%
	30	Locating the centroid of triangle, semicircle	
	31	Quadrant of a circle and sector of a circle using method of integration	
	32	Centroid of simple built up sections	
	33	Numerical problems	
	34	Numerical problems	
	35	**Moment of inertia of an area, polar moment of inertia**- Introduction	
	36	Radius of gyration, Perpendicular axis theorem and Parallel axis theorem	
	37	Moment of Inertia of rectangular, circular	

	38	Triangular areas from method of integration, Moment of inertia of composite Areas, Numerical problems	
5	39	**Kinematics** Definitions – Displacement – Average velocity – Instantaneous velocity – Speed – Acceleration - Average acceleration – Variable acceleration	100%
	40	Newton's Laws of Motion, Rectilinear Motion–Numerical problems	
	41	Curvilinear Motion	
	42	Super elevation	
	43	Projectile Motion	
	44	Relative motion	
	45	Motion under gravity	
	46	Newton's Laws of Motion, Rectilinear Motion–Numerical problems	
	47	Numerical Problems on Relative motion	
	48	Numerical Problems on Curvilinear Motion	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Section of Introduction to Civil Engineering, Scope of different fields of Civil Engineering	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Concurrent Force System: Composition of forces - Definition of Resultant; Composition of coplanar - concurrent force system, Parallelogram Law of forces.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment 3: University Questions on Equilibrium of Concurrent and Non-concurrent Forces Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem;	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4: Centroids Introduction to the concept, centroid of line and area, centroid of basic geometrical figures.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
5	Assignment 5: University Questions on Definitions Displacement Average velocity Instantaneous	Students study the Topics and write the Answers. Get practice to solve university	Module 5 of the syllabus	10	Individual Activity. Printed solution	Book 1, 2 of the reference list. Website of the

	velocitySpeed Acceleration Average acceleration – Variable acceleration.	questions.			expected.	Reference list
6	Mini Project Rivets based for the students groups	Students study the Rivets applications from Real World Example view. Gain Knowledge of Rivets Applications.	Syllabus with Real World Mapping	12	Group Activity. Student Group need to perform Project and do a brief Report	All Books / paper Resources / Study Material. All Internet / Web resources.

QUESTION BANK

MODULE I
INTRODUCTION TO CIVIL ENGINEERING AND ENGINEERING MECHANICS

1. Briefly explain the role of civil engineers in the infrastructural development.
2. In the triangle ABC, a force at 'A' produces a clockwise moment of 90KN-m at B and an anticlockwise moment of 45KN-m at C. Find the magnitude and direction of the force.
3. 3Explain the following with neat sketches
4. Write short notes on i) Shoulders. i i) Kerbs
5. Discuss briefly the impact of civil engineering infrastructural developments on the national economy and environment?

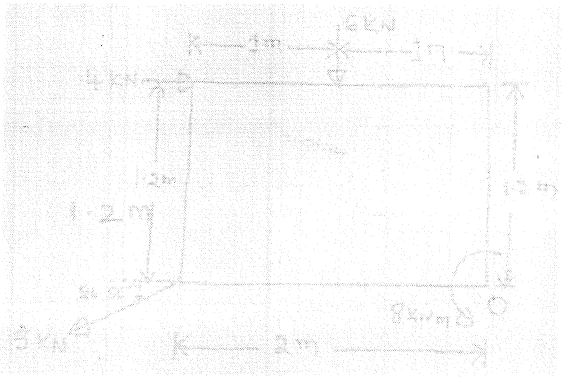
i) Structural engineering ii) Transportation Engineering. Write a note on the role of civil engineer in infrastructural development.

6A force of 200N is acting on a block as shown in fig. Find the component of force along the horizontal and vertical axis.

7. State and explain principle of transmissibility of a force.
8. State the Newton's three laws of t h e motion
9. Define force and state its characteristics

COPLANAR CONCURRENT AND NON CONCURRENT FORCE SYSTEM

1. Four co-planar forces forces acting at a point are shown in fig Q3 (a) . One of the forces is unknown and its magnitude is shown by 'P'. The resultant has a magnitude of 500N and is acting along the x-axis . Determine the unknown force 'P' and its inclination with x-axis.
2. State and prove Varignon's theorem of moment
3. State and prove parallelogram law of forces.
4. Determine the magnitude, direction of the resultant force for the force system as shown in fig. Locate the resultant force with respect to point D. 26KN force is the resultant of the forces, one of which is as shown in fig. Determine the other force.
5. Explain the principle of r e s o l v e d parts.
6. A truck is to be pulled along a straight road as shown in fig.
7. Determine the magnitude, direction of the resultant force for the force system shown in fig. Determine the X intercepts of the resultant force with respect to the point O.



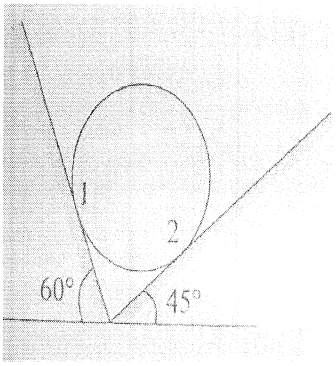
8. State and prove Varignon's theorem
9. The 26kN force is the resultant of two forces, one of which is shown in fig. Determine the other force
10. Determine the resultant force acting on the structure at point O both in magnitude and direction for the system of forces shown in fig.
11. Two forces F1 and F2 act upon a body. If the magnitude of their resultant is equal to that of F1 and direction perpendicular to F1, then find the magnitude and direction of force F2. Take F1 = 20 N
12. Determine the forces P, F and T required to keep the frame in equilibrium

MODULE II

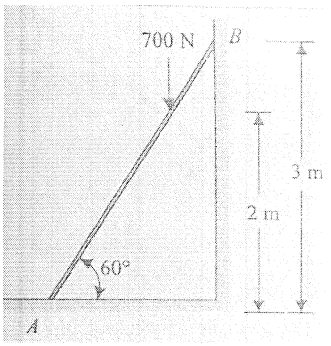
EQUILIBRIUM OF FORCES AND FRICTION

1. Determine the reactions at contact points for spheres A, B and C as shown in Fig. it is given that $W_A = W_B = 4$ kN, $d_A = d_B = 500$mm, $d_C = 800$mm
2. For the beam with loading shown in Fig. determine the reactions at the supports
3. State and prove Lami's theorem
4. A ladder of length 4m weighing 200N is placed against a vertical wall as shown in fig. The coefficient of friction between wall and the ladder is 0.2 and that between the floor and the ladder is 0.3. the ladder in addition to its own weight has to support a man weighing 600N at a distance of 3m from A. Calculate the minimum horizontal force to be applied at A to prevent Slipping. **(Dec2014 /Jan 2015)**
5. State laws of friction.
6. Two cylinders A and B rest in a channel as shown in fig. A has a diameter of 100mm and weighs 20 kN, B has diameter of 180 mm and weighs 50kN. The channel is 180mm wide at bottom with one side vertical and the other side at 60^0 inclinations. Find the reactions

at contact points.
7. A 200 N sphere is resting in at rough as shown in fig. determine the reactions developed at contact surfaces. Assume all contact surfaces are smooth.

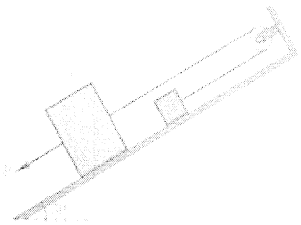


8. A ladder weighing 100N is to be kept in the position shown in figure. Resting on a smooth floor and leaning on a smooth wall. Determine the horizontal force required at floor level to prevent it from

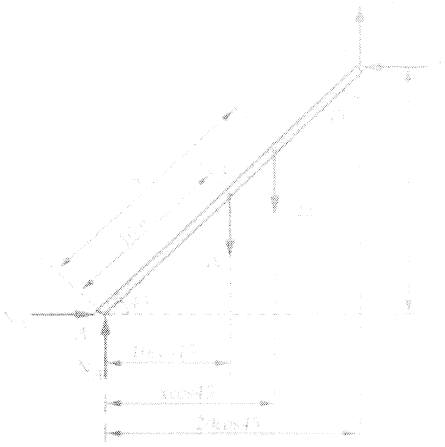


Slipping when a man weighing 700 N is at 2 m above floor level.

9. Determine the force P required to cause motion of blocks to impend. Take the weight of A as 90N and weight of as 45 N. Take the coefficient of friction for all contract surfaces as 0.25 as in figure. Consider the pulley being frictionless.

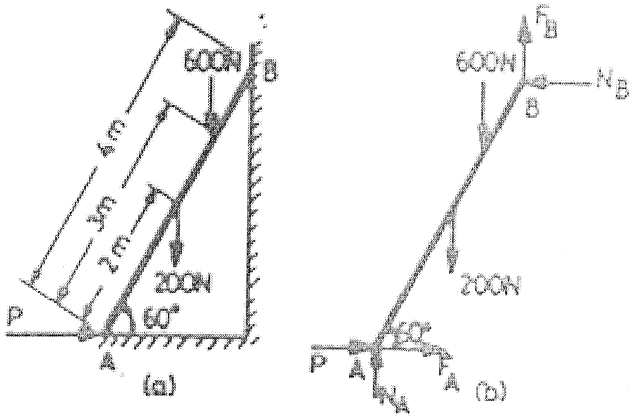


10. A uniform ladder of length 20m, rests against a vertical wall which it makes an angle of 45^0, the coefficient of friction between the ladder and the wall and ground respectively being 1/3 and ½. If a man, whose weight is one half of the ladder, ascends the ladder, how high will he be, when the ladder slips?



11. State the laws of static friction.

12. A ladder of length 4m weighing 200N is placed against a vertical wall as shown in fig. The coefficient of friction between wall and the ladder is 0.2 and that between the floor and the ladder is 0.3. the ladder in addition to its own weight has to support a man weighing 600N at a distance of 3m from A. Calculate the minimum horizontal force to be applied at A to prevent Slipping. **(June/July 2013, June 2012)**

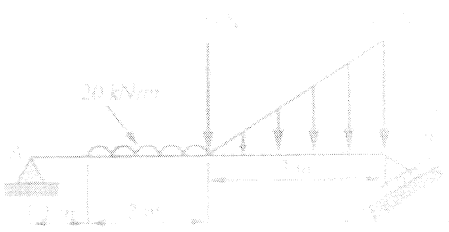


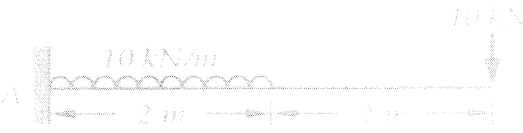
20. A block weighing 800 N rests on an inclined plane at 12^O to the horizontal. If the coefficient of friction is 0.4. find the force required to pull the body up the plane, when the line of the force is (i) parallel to the plane (ii) horizontal

MODULE III
SUPPORT REACTIONS

1. Determine the position of 10 N loads on the beam such that reactions at the supports are equal for the beam loaded as shown in fig.
2. Determine the reactions at the supports for the beam loaded as shown in fig.
3. Determine the reactions at the ends of the beam AB and CD as shown in fig. Neglect the self weight of the beams.
4. A beam ABCDE has a flexible link as shown in fig. determine the support reaction at A,D and E.

Find reactions for a cantilever beam shown in the figure.



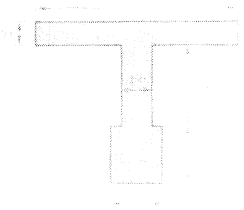


5. Explain Different types of supports? A ladder 5m in length is resting against a smooth vertical wall and a rough

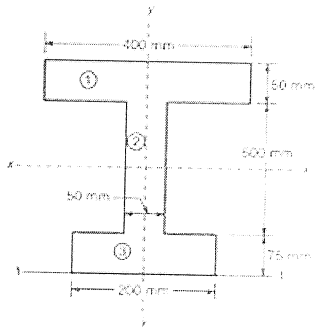
horizontal floor. The ladder makes an angle of 60^0 with the horizontal. When a man of weight 800N is at the top of the rung, what is the coefficient of friction required at the bottom o the ladder and the floor such that the ladder does not slip? Take the weight of the ladder as 200N.

MODULE IV
CENTROID AND MOMENT OF INERTIA

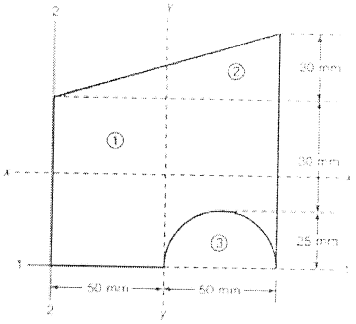
1. Determine the centroid of semi-circular lamina of radius 'R' by method of integration.
2. Determine the moment of inertia of the section shown in fig about its centroidal axes. Calculate the least radius of gyration for the section as well.
3. State and prove parallel axis theorem
4. Derive an expression for moment of inertia of a triangle with respect to horizontal centroidal axis. Determine the centroid of a triangle by method of integration
5. Determine the centroid of the lamina shown in fig. wrt O.
6. Find the centroid of the shaded area shown in fig, obtained by cutting a semicircle of diameter 100mm from the quadrant of a circle of radius 100mm.
7. Locate the centroid of quadrant of a circular lamina from first principle.
8. The cross section of the prestressed concrete beam is as shown in the fig. Calculate the moment of inertia of this section about the centroidal axes parallel to the top edge and perpendicular to the plane of cross section. Also determine the radius ofgyration.



9. Find the moment of inertia along the horizontal and vertical axis passing through the centroid of a section shown in fig.



10. Find the least radius of gyration about X-axis and Y-axis shown in fig.



MODULE V
KINEMATICS

1. What is centrifugal force? What is super elevation?
2. Determine the position at which the ball is thrown up the plane will strike the inclined plane as shown in fig. the initial velocity 30m/s and angle of projection is $Tan^{-1}(4/3)$ with horizontal. A stone is dropped from the top of the tower 50m high. At the same time another stone is thrown up from the tower with a velocity of 25m/sec. At what distance from the top and after how much time the two stones cross e a c h other?
3. What is projectile? Define the following terms briefly i) Angle of projection ii) Horizontal range iii) Vertical height iv) Time of fight
4. A burglar's car starts at an acceleration of 2m/s2. A police vigilant party came after 5s and continued to chase the burglar's car with a uniform velocity of 20m/s. find the time taken in which the police van will overtake the car.

Prepared by		
Manjeet Nagarmunnoli	HOD	Principal

Subject Title	ENGINEERING GRAPHICS & DESIGN(EGD)		
Subject Code	18EGD15/25	IA Marks	40
Number of Lecture Hrs / Week	02 L+ 04 P	Exam Marks	60
Total Number of Lecture Hrs	60	Exam Hours	03
			CREDITS – 03

FACULTY DETAILS:		
Name: Prof. D.N. INAMDAR.	Designation: Asst .Professor	Experience:20.5Years
No. of times course taught:13	Specialization: Tool Design	

FACULTY DETAILS:		
Name: Prof. T S VANDALI	Designation: Asst .Professor	Experience: 19 Years
No. of times course taught: 07	Specialization: Machine Design	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	High School	8, 9,10th Std.	Geometry
02	PU Science	I and II year	Trigonometry, Mathematical Curves and Analytical Geometry.

2.0 Course Objectives

CLO1: To expose the students to standards and conventions followed in preparation of engineering drawings.
CLO2: To make them understand the concepts of orthographic and isometric projections.
CLO3: Develop the ability of conveying the engineering information through drawings.
CLO4: To make them understand the relevance of engineering drawing to different engineering domains.
CLO5: To develop the ability of producing engineering drawings using drawing instruments.
CLO6: To enable them to use computer aided drafting packages for the generation of

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and use modeling software's to generate

	Course Outcome	Cognitive Level	Pos
CO1	Prepare engineering drawings as per BIS conventions mentioned in the relevant	U	PO1, PO5,
CO2	Produce computer generated drawings using CAD software.	U	PO1, PO5,
CO3	Use the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings..	U	PO1, PO5,
CO4	Develop isometric drawings of simple objects reading the orthographic projections	U	PO1, PO5,
CO5	Convert pictorial and isometric views of simple objects to orthographic views.	U	PO1, PO5,
	Total Hours of instruction	60	

4.0 Course Content

INTRODUCTION TO COMPUTER AIDED SKETCHING
Review of graphic interface of the software. Review of basic sketching commands and navigational commands.(02**Hours)**

MODULE – 1

Introduction to Computer Aided Sketching:
Introduction, Drawing Instruments and their uses, relevant BIS conventions and standards.Lettering, line conventions, dimensioning, material conventions, and free hand practicing.Computer screen, layout of the software, standard tool bar / menu and description of most commonly used tool bars, and navigational tools.
Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of rawing sheet size and scale.
Commands and creation of Lines, coordinate points, axes, poly-lines, square, rectangle,polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend,break, chamfer, fillet, curves, constraints viz., tangency, parallelism, inclination and perpendicularity. **05 Hours**

MODULE-II

Orthographic projections of points, straight lines and planes:
Introduction, Definitions - Planes of projection, reference line and conventions employed.First angle and Third angle projection.Projections of points in all the four quadrants.Projections of straight lines (located in first quadrant/first angle only), true and apparent lengths, true and apparent inclinations to reference planes (No application problems and midpoint problems).
Orthographic projections of plane surfaces (First angle projection only): Projections of regular plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle-in simple positions inclined to both the planes; planes in different positions by change of position method only. (No problems on punched plates and composite plates). **12 Hours**

MODULE – III

Projections of solids:
Introduction, definitions – projections of right regular tetrahedron, hexahedron (cube),prisms, yramids, and cones with axis inclined to both the planes. (Solids resting on HP only and no problems on ctahedrons, and freely suspended solids.) **16 Hours**

MODULE IV

Development of Lateral Surfaces of Solids:
Introduction to section planes and sectional views.Development of lateral surfaces of right regular prisms, cylinders, pyramids, and cones resting with base on HP only. Development of their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).

12 Hours

MODULE-V

Isometric Projection (using isometric scale only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, and spheres. Isometric projection of combination of two simple solids. Conversion of given isometric/ pictorial views to orthographic views of simple objects. **15 Hours**

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Drawings, Part Modeling
02	V/VI	Design of Machine Elements I/II	Fasteners, Keys and Joints, Rivets and Assembly drawings

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Industrial drawings and design of various components
02	Model creation for analysis
03	Development of a software applications

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Lettering, Line, Methods of dimensioning
02	NPTEL	Assembly Application

8.0 Books Used and Recommended to Students

Text Books

1) **Engineering Drawing** – N.D. Bhatt & V.M. Panchal, 48th edition, 2005- Charotar Publishing House, Gujarat.
2) **Engineering Graphics** – K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
3) **Computer Aided Engineering Drawing-** by Dr. M H Annaiah, Dr C N Chandrappa and Dr. B Sudheer Premkumar, Fifth edition, New Age International Publishers.

Reference Books

1. **Computer Aided Engineering Drawing** – S. Trymbaka Murthy, – I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
2. **Engineering Drawing**-by N.S.Parthasarathy & Vela Murali, Oxford University Press, 2015
3. **Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production**- Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi.
4. **A Primer on Computer Aided Engineering Drawing**-2006, Published by VTU, Belgaum.
5. **Publications of Bureau of Indian Standards**

a) **IS 10711 – 2001:** Technical products documentation – Size and lay out of drawing sheets.
b) **IS 9609 (Parts 0 & 1)** – 2001: Technical products documentation – Lettering.
c) **IS 10714 (Part 20)** – 2001 & SP 46 – 2003: Lines for technical drawings.
d) **IS 11669 – 1986 & SP 46 – 2003**: Dimensioning of Technical Drawings.
e) **IS 15021 (Parts 1 to 4) – 2001**: Technical drawings – Projection Methods.

Additional Study material & e-Books

COMPUTER AIDED ENGINEERING DRAWING BY N.H.Ramaiah and Rajshekar. NEW AGE International publication 2008-09

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

1) https://hareeshang.wordpress.com/tutorials/caed/
2) http://m.noteboy.in/vtuflies/machine%20drawing.pdf
3) https://www.edx.org/school/iitbombayx?utm_source=bing&utm_medium=cpc&utm_term=iit-bombay&utm_campaign=partner-iit-bombay
4) http://www.vlab.co.in/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	Journal of Aircraft	http://arc.aiaa.org/loi/ja
2	International Journal of Solids and Structures	http://www.sciencedirect.com/science/journal/00207683
3	Journal of Manufacturing Science and Engineering	http://manufacturingscience.asmedigitalcollection.asme.org/issue.aspx?journalid=125&issueid=27340
4	American Fastener Journal	http://www.fastenerjournal.com/

11.0 Examination Note

Internal Assessment: 40 Marks
Sketches shall be in sketch books and drawing shall through use of software on A3/A4 sheets. Sketch book and all the drawing printouts shall be submitted.

Scheme of Evaluation for Internal Assessment (40 Marks)
(a) Class work (Sketching and Computer Aided Engineering drawing printouts in A4/A3 size sheets): 24Marks.
(b) InternalAssessmenttestinthesamepatternasthatofthemainexamination(BetterofthetwoTests):16Marks.

SCHEME OF EXAMINATION:
Two questions to be set from Module-II, One question from each Module-IV ,One compulsory question from Module-III
Student has to answer one question each from Module-II and Module IV and V , One compulsory question from Module-III

Module-II 1x25 = 25Marks
Module-II 1x25 = 25Marks OR
Module-II 1x25 = 25Marks
Module-III 1x45 = 45Marks
Module-IV 1x30 = 30Marks OR
Module-V 1x30 = 30Marks
Total = **100Marks**

INSTRUCTION FOR COMPUTER AIDED ENGINEERING DRAWING (18EGD15/25) EXAMINATION

1. No restriction of timing for sketching/ computerization of solutions. The total duration is 3 hours.
2. It is desirable to do sketching of all the solutions before computerization.
3. Drawing instruments may be used for sketching.

12.0 Course Delivery Plan

Module No.	Si No.	Content of Lecture	%of Portion
I	1	**Introduction to Computer Aided Sketching:** Introduction, Drawing Instruments and their uses, relevant BIS conventions and standards. Lettering, line conventions, dimensioning, material conventions, and free hand practicing.	05
	2	Computer screen, layout of the software, standard tool bar / menu and description of most commonly used tool bars, and navigational tools.	
	3	Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment.Selection of drawing sheet size and scale.	
	4	Commands and creation of Lines, coordinate points, axes, poly-lines, square, rectangle,polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend,break, chamfer, fillet, curves, constraints viz., tangency, parallelism, inclination and perpendicularity.	
II	5	**Orthographic projections of points, straight lines and planes:**	12

		Introduction, Definitions - Planes of projection, reference line and conventions employed.	
	6	First angle and Third angle projection.	
		Projections of points in all the four quadrants.	
	7	Projections of straight lines (located in first quadrant/first angle only), true and apparent lengths,	
	8	true and apparent inclinations to reference planes (No application problems and midpoint problems).	
	9	Orthographic projections of plane surfaces (First angle projection only):	
	10	Projections of regular plane surfaces–triangle, square,	
	11	rectangle, pentagon, hexagon and circle-in simple positions inclined to both the planes;	
	12	planes in different positions by change of position method only. (No problems on punched plates and composite plates)	
III	13	Projections of solids: Introduction,	16
	14	definitions – projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, and cones with axis inclined to both the planes. (Solids resting on HP only and no problems on octahedrons, and freely suspended solids.)	
	15	Position of solids with reference to planes of projections considering its base, face, axis, base edge, face edge, base corner etc.	
	16	Tips to draw projection of solids with an example with change of position of method	
	17	Lab session on sketching and computer aided drafting on projection of solids	
	18	Projection of triangular, square and rectangular pyramids-variety of problems will be solved	
	19	Projection of pentagonal, hexagonal pyramids – variety of problems will be solved.	
	20	Lab session on sketching and computer aided drafting on projection of solids on triangular, square, pentagonal and hexagonal pyramids	
	21	Problems on Projection of cones and cylinders	
	22	Problems on projection of prisms – square, pentagonal, hexagonal prisms	
	23	Solution of problems from VTU question papers	
	24	Solution of problems from VTU question papers	
IV	25	**Development of Lateral Surfaces of Solids:** Introduction to section planes and sectional views.	12
	26	Development of lateral surfaces of right regular prisms,	
	27	Development of lateral surfaces of right cylinders, pyramids,	
	28	Development of lateral surfaces of cones resting with base on HP only.	
	29	Development of their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).	
V	30	**Isometric Projection (using isometric scale only)** Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric	15
	31	projection of hexahedron(cube), right regular prisms, pyramids, cylinders,	

		cones, spheres.	
	31	Isometric projection of combination of two simple solids. Conversion of given	
	32	Isometric/ pictorial views to orthographic views of simple objects.	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

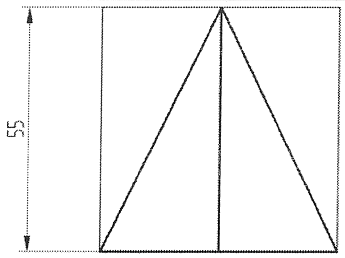
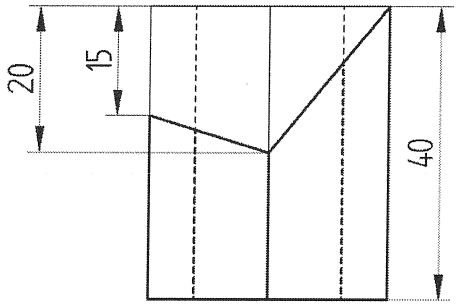
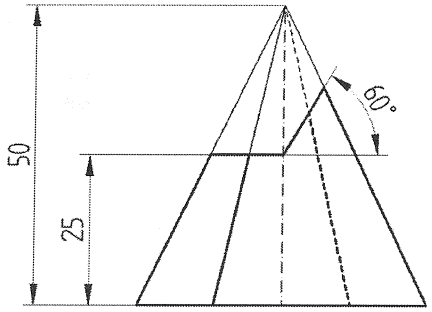
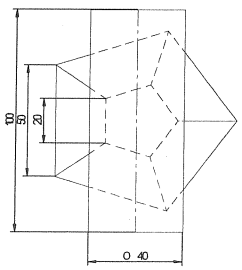
Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Projection of Points	Students study the Topics and write the Answers. Get practice to solve university questions.	Module II of the syllabus	2	Individual Activity. Printed solution expected.	Book 1, of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Projection of lines	Students study the Topics and write the Answers. Get practice to solve university questions.	Module II of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, of the reference list. Website of the Reference list
3	Assignment 3: University Questions on PROJECTION OF PLANES .	Students study the Topics and write the Answers. Get practice to solve university questions.	Module-II of the syllabus	6	Individual Activity. Printed solution expected.	Book 1, of the reference list. Website of the Reference list
4	Assignment 4: University Questions ON PROJECTIONS OF PLANES	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit II of the syllabus	8	Individual Activity. Printed solution expected.	Book 1, of the reference list. Website of the Reference list
5	Assignment 5: University Questions on PROJECTION OF SOLIDS	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit III, of the syllabus	10	Individual Activity. Printed solution expected.	Book 1, of the reference list. Website of the Reference list
6	Assignment 6 University Questions on PROJECTIONS ON Developments	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit IV, of the syllabus	12	Individual Activity. Printed solution expected.	Book 1, of the reference list. Website of the Reference list
7	Assignment 6 University Questions on Isometric Projections	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit IV, of the syllabus	14	Individual Activity. Printed solution expected.	Book 1, of the reference list. Website of the Reference list

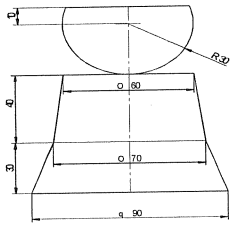
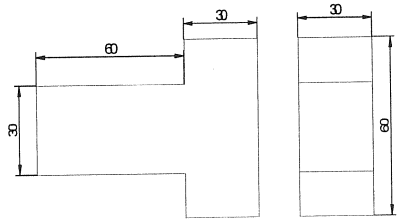
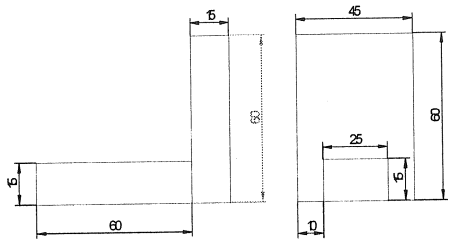
14.0 Assignment Questions

Assignment No	Questions	Marks
I	1) A point 30mm above XY line is the front view of two points A& B. The top view of A is 40 mm behind VP & the top view of B is 45 mm front of VP draw the projection of the points & state the quadrants in which the points are situated. 2) A point A is 30mm in front of VP and 40 mm above HP. Another point B is 20 mm behind VP & 35 mm below hp The horizontal distance between the points measured parallel to XY	15

	line is 60mm. Draw the three projections of the points. Join their front and top views. 3) A point P is on HP and 30 mm in front of VP. Another point Q is on VP and below HP. The line joining their front views makes an angle of 30° to XY line while the line joining their top views makes an angle of 45° with XY line. Find the distance of the point Q from HP. 4) Draw the projections of the following points on the same XY line, keeping convenient distance between each projector. Name the Quadrants in which they lie. P – 20 mm above HP & 35mm infront of VP. Q – 30mm above HP & 40mm behind VP. R – 40mm above HP & on VP. S – 35mm below HP & 30mm infront of VP. 5) Draw the projections of the following points on the same XY line, keeping convenient distance between each projector. Name the Quadrants in which they lie. M - 30mm below HP & 25mm behind VP N - 35mm below HP & 30mm in front of VP P – On HP & 30mm infront of VP Q – On HP & 35mm behind VP. 6) State the Quadrant in which the following points are located. Assume any distances. A - Front view below XY & Top view above XY line B - Front and top views are below XY line. C - Front and top views are above XY line. D - Front view above XY & Top view below XY line. 7) Draw the projections of thfollowing points on the same XY line, keeping convenient distance between each projector. Also state the quadrants in which they lie. P - 25mm above HP & 35mm in front of VP Q - 30mm above HP & 40mm in front of VP R - 40mm above HP & on VP S - 35mm below HP & 30mm in front of VP. 8) A point is lying on VP, 10mm below HP & 30mm behind/in front/from LPP. Draw its projections and name the side view.	15 10 10 10 10 10 10
II	1. A line AB has its end A 20 mm above the HP and 30 mm in front of the VP. The other end B is 60 mm above the HP and 45mm in front of VP. The distance between end projectors is 70 mm. Draw its projections. Determine the true length and apparent inclinations. 2. The top view pq of a straight line is 70 mm and makes an angle of 60 with XY line. The end Q is 10 mm infront of VP and 30 mm above the HP. The difference between the distances of P and Q above the HP is 45 mm. Draw the projections. Determine its true length and true inclinations with HP and VP. 3. A line has its end A 10 mm above Hp and 15 mm infront of VP. The end B is 55 mm above HP and line is inclined at 30 to HP and 35 to VP. The distance between the end projectors is 50 mm. Draw the projections of the line. Determine the true length of the line and its inclinations with VP. 4. A straight line PQ inclined at 40° to VP has pq = 60mmand p'q'=50mm. The end P is both in HP and VP, and 40 mm to the right of left profile plane. a) Draw the projections of the straight line PQ b) Draw the true length and true inclination with HP. c) Draw the profile view of the straight line. d) Find the position of the end Q with HP and VP. 5. Draw the projections of line PQ and find the true length and inclinations when the line is inclined at 30° to the HP and 45° to the VP. The line is having one of its end 15mm above HP and 20mm in front of VP. The distance between the end projectors on the XY line is 60mm. 6. A straight line PQ 80mm long appears to a length of 50mm and inclined at 30° to xy line in its side view. Draw its projection when its end point P is 15mm above HP and 60mm in front of VP. Point Q is nearer to VP than P. 7. Draw the projections of a line PQ and find its apparent lengths, true length and true inclination with HP when the line PQ has its end P 25mm above HP and 20mm in front of VP. The distance between the end projectors of the line when measured parallel to the line of intersection of the HP & VP is 60mm. The end Q is 50mm above the HP and the line is inclined at 30° to the VP.	15 15 15 15 15 15 15
III	1 . An equilateral triangular lamina of 25mm side lies with one of its edges on HP such that the	24

	surface of the lamina is inclined to HP at 60°. The edge on which it rests is inclined to VP at 60°. Draw the projections. 2. Anequilateral triangular lamina of 25mm side lies on one of its sides on HP. The lamina makes 45° with HP and one of its medians is inclined at 40° to VP. Draw its projections. 3. A triangular lamina o f25mm sides rests on one of its corners on VP such that median passing through the corner on which it rests is inclined to HP at 30° and draw its projections. 4. A triangular plane figure of sides 25mm is resting onHP with one of its corners, such that the surface of the lamina makes an angle of 60° with HP. If the side opposite to the corner on which the lamina rests makes an angle of 30° with VP, draw the top and front views in this position. 5 A triangular plane lamina of sides 25mm is resting on HP with one of its corners touching it, such that the side opposite to the corner on which it rests is 15mm above HP and makes an angle of 30° with VP. Draw the top and front views in this position. Also determine the inclination of the lamina to the reference plane. 6. A pentagonal lamina having edges 25mm is placed on one of its corners on HP such that the perpendicular bisector of the edge passing through the corner on which the lamina rests is inclined at 30 to HP and 45 VP. Draw the top and front views of the lamina. 7. A hexagonal lamina of 30mm sides rests on HP with one of its corners touching VP and surface inclined at 45 to it. One of its edges is inclined to HP at 30 . Draw the front and top views of the lamina in its final position.	24 24 24 24 24
IV	1. A square prism 35mm sides of base and 60mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40 and to VP at 30 . 2. A pentagonal prism 25mm sides of the base and 60mm axis length rests on HP on one of its edges of the base. Draw the projections of the prisms when the axis is inclined to HP at 40 and VP at 30 3. A hexagonal prism 25mm sides of base and 50mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests makes equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40 and appears to be inclined to VP at 45 . 4. A hexagonal prism 25mm sides of base and 50mm axis length is suspended freely from a corner of its base. Draw the projections of the prism when the axis appears to be inclined to VP at 45 . 5. A square pyramid 35mm sides of base and 60mm axis length rests on HP on one of its edges of the base. Draw the projections of the pyramid when the axis is inclined to HP at 45 and VP at 30 . 6. A hexahedron of 30mm sides is resting on one of its corners on HP such that one of its solid diagonals is perpendicular to VP. Draw the projections of the solid. 7. A cone of base Φ 40mm axis length 50mm is resting on HP on a point on the circumference of its base such that its apex is at 40mm above the HP and its top view of the axis is inclined at 60 to VP. Draw the top and front views of the solid. Also, determine the inclinations of the axis when the base is nearer to the observer.	24 24 24 24 24 24 24
V	1. A square prism of base side 40mm and axis length 65mm is resting on HP on its base with all the vertical faces being equally inclined to VP. It is cut by an inclined plane 600 to HP and perpendicular to VP and is passing through a point on the axis at distance 15mm form the top face. Draw the development of the lower portion of the prism. 2.A Square prism of base side 35mm & height 55mm rests with its base on HP and two faces equally inclined to VP. Draw the development of lateral surfaces of the retained portions of the cut prism shown by dark lines in the figure.	24 24

		24
	3. A pentagonal prism of base sides 30mm and axis length 60mm rests with its base on HP and an edge of the base inclined at 45° to VP. It is cut by plane perpendicular to VP, inclined at 40° to HP and passing through a point on axis, at distance of 30mm from the base. Develop the remaining surfaces of the truncated prism.	
	4. A pentagonal prism of base sides 20 mm and height 40 mm is resting with its base on HP with a base edge parallel to VP. The prism is cut as shown in the following front view. Draw the development of lateral surface of prism.	24
		
	5. A rectangular pyramid, side of base 25 mm × 40 mm and height 50mm has one of the sides of the base inclined at 30° to VP. Draw the development of the lateral surface of the cut pyramid, whose front view shown below.	24
		
VI	1. Isometric projection of hexahedron (cube), right regular prisms, pyramids with illustrative examples.	24
	2. Isometric projection of cylinders, cones, spheres, cut spheres with illustrative examples.	24
	3. Isometric projection of combination of solids – two solids and three solids with illustrative examples from VTU question bank .	24
	4. Lab session on sketching and computer aided drafting of above combination of solids.	24
	5. The following fig shows the top view of the cylinder which is centrally mounted on a frustumof pentagonal pyramid of 60 mm height. Draw the isometric projection of the combination of solids	
		24
	6. Following fig shows the front view of the combination of solids consisting a cut sphere	

	and frustums of a cone and a square pyramid. Draw the isometric projections of the combination of solids.	24
		
	8 . Following fig shown the front and side views of the solid. Draw the isometric projection of the solid.	24
		
	9 .Following fig shows the front and side views of the solid. Draw the isometric projection of the solid	24
		
		24

15.0 QUESTION BANK

Module-II

1. Draw the projections of the following points on the same XY line taking convenient distance between each projector. Name the quadrants in which they lie. A-30 mm above HP and 35 mm in front of VP, B- 35 mm above HP and 40 mm behind VP, C- 40 mm above HP and on VP, D- 35 mm below HP and 30 mm in front of VP.
2. A point P is 30 mm in front of VP, 40 mm above HP and 50 mm from RPP. Draw its projections.
3. A point P is 45 mm above HP, 60 mm behind VP and 30 mm from RPP. Draw the three principal views and state the quadrant in which it lies.
4. Draw all three principal views of a point P lying 60 mm below HP, 70 mm in front of VP and 40mm from RPP and state the quadrant in which it lies.
5. Draw the projection of the point G which is in I quadrant such that it is equidistant from HP and VP. The point is 35 mm from RPP. Determine its distance from HP and VP.
6. A line AB has its end A 20 mm above HP and 30 mm in front of VP. The other end B is 60 mm above HP. The distance between end projectors is 70 mm. Draw its projections and determine the true length and apparent inclinations.
7. The point B of the line AB is on horizontal plane, the top view of the line makes an angle of 30 deg with the X-Y line being 80 mm. The point A is on vertical plane and 50 mm above the HP. Draw the top and front views of the line and obtain the true length of the line and also find the inclinations of the line with both planes.
8. The line AB 100 mm line measures 80 mm in the front view and 70 mm in the top view. The midpoint M of the line is 40 mm from both HP and VP. Draw its projections and find its inclinations.
9. Draw the projection of the line PQ and find its true length and inclination, when the line is inclined at 30 deg to the HP and 45 deg to VP. The line is having one of its end 15 mm above HP and 20 mm in front of VP. The distance between the end projectors on the X-Y line is 60 mm.

10. Two lines AB and AC make an angle of 120 deg between them in their front view and top view of a triangular lamina ABC. AB is parallel to both HP and VP. Determine the real angle between the sides of the triangle AB and AC.
11. A straight road going uphill from point A, due east to another point B, is 4 km long and has a slope of 15 deg. Another straight road from B due 30 deg east of north to a point C is also 4 km long but is on ground level. Determine the length and the slope of a straight road joining the points A and C. Scale; 10 mm = 0.4 km.
12. An object O is placed 1.2 m above the ground and the center of room 4.2 m x 3.6 m x 3.6 m high. Determine graphically its distance from one of the corners between the roof and the two adjacent walls. Scale; 10 mm = 0.5 m

Module - II

1. An isosceles triangular plate of negligible thickness has a base 25 mm long and altitude 35 mm. It is so placed on HP such that in the front view it is seen as an equilateral triangle of 25 mm sides that is parallel to VP is inclined at 45 deg to HP. Draw its top and front views. Also determine the inclination of the plate with the reference plane.
2. A square plate of 30 mm sides rests on HP such that one of its diagonals is inclined at 30 deg to HP and 45 deg to VP. Draw its projections.
3. A mirror 30 mm x 40 mm is inclined to the wall such that its front view is a square of 30 mm side. The longer side of the mirror appears perpendicular to both HP and VP. Find the inclinations of the mirror with the wall.
4. A pentagonal lamina having edge 25 mm is placed on one of its corners on HP such that the perpendicular bisector of the edge passing through the corner on which the lamina rests is inclined at 30 deg to HP and 45 deg to VP. Draw the top and front views of the lamina.
5. A pentagonal lamina of sides 25 mm is having a side both on HP and VP. The surface of the lamina is inclined at an angle of 60 deg to HP. Draw the top and front view of the lamina.
6. A pentagonal lamina having edges 25 mm is placed on one of its corners on VP such that the surface makes an angle of 30 deg with VP and perpendicular bisector of the edge passing through the corner on which it rests makes an inclination to HP at 45 deg. Draw the top and front views of the lamina.
7. A hexagonal lamina of 30 mm sides rests on HP with one of its corners touching VP and surface inclined at 45 deg to it. One of its edges is inclined to HP at 30 deg. Draw the front and top views of the lamina in its final position.
8. A regular hexagonal lamina of sides 25 mm is lying in such a way that one of its sides on HP, while the side opposite to the side on which it rests is on VP. If the lamina makes 60 deg to HP, draw its projections.
9. A hexagonal lamina of sides 25 mm rests on one of its sides on VP. The lamina makes 45 deg to VP and the side on which it rests makes an angle of 45 deg to HP. Draw its projections.
10. A hexagonal lamina of sides 25 mm rests on one of its corners on HP. The lamina makes 45 deg to HP and the diagonal passing through the corner on which it rests appears to be inclined at 30 deg to VP. Draw its projections.
11. A circular lamina of 50 mm diameter rests on HP such that one of its diameters is inclined at 30 deg to VP and 45 deg to HP. Draw its projections.
12. A circular lamina inclined to VP appears in the front view as an ellipse of major axis 30 mm and minor axis 15 mm. The major axis is parallel to both HP and VP. One end of the minor axis is in both HP and VP. Draw its projections and determine the inclinations of the lamina with the VP.
13. An equilateral triangular lamina of 25 mm sides lies on one of its sides on HP. The lamina makes 45 deg with HP and one of its medians is inclined at 45 deg to VP. Draw its projections.

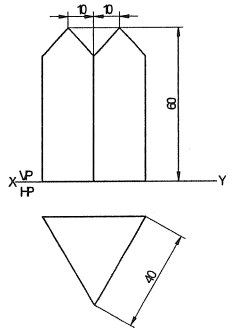
Module - III

1. A square prism 35 mm sides of base and 60 mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40 deg and to VP at 30 deg.
2. A pentagonal prism 25 mm sides of base and 50 mm axis length rests on HP on one of its corners of the base such that two base edges containing the corner on which it rests makes equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40 deg and to VP at 30 deg.
3. A pentagonal prism 25 mm sides of base and 50 mm axis length rests on HP on one of its edges of the base. Draw the projections of the prism when the axis is inclined to HP at 40 deg and VP at 30 deg.
4. A hexagonal prism 25 mm sides of base and 50 mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40 deg and to VP at 30 deg.
5. A pentagonal prism 25 mm sides of base and 50 mm axis length is suspended freely from the corner of the base. Draw the projections of the prism when the axis is appears to be inclined to VP at 45 deg.
6. A square pyramid 35 sides of base and 65 mm axis length rests on HP on one of its edges of the base which is inclined to VP at 30 deg. Draw the projections of the pyramid when the axis is inclined to HP at 45 deg.
7. A square pyramid 35 mm sides of base and 60 mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the pyramid when the axis of the pyramid is inclined to HP at 40 deg and to VP at 30 deg.

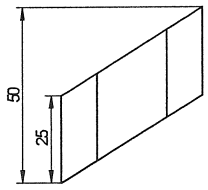
8. A pentagonal pyramid 25 mm sides of base and 50 mm axis length rests on HP on one of its edges of the base. Draw the projections of the pyramid when the axis is inclined to HP at 45 deg and VP at 30 deg.
9. A hexagonal pyramid 25 mm sides of base and 50 mm axis length rests on HP on one of its edges of the base which is inclined to VP at 30 deg. Draw the projections of the pyramid when the axis is inclined to HP at 45 deg.
10. A pentagonal pyramid 25 mm sides of base and 50 mm axis length is suspended freely from the corner of its base. Draw the projections of the pyramid when the axis appears to be inclined to VP at 45 deg.

Module - IV

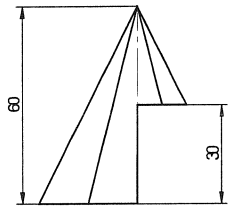
1. Draw the development of truncated portion of lateral faces of pentagonal prism of 20 mm sides of base and 50 mm height standing vertically with one of its rectangular faces parallel to VP and nearer to it so as to produce one piece development. The inclined face of the truncated prism is 30 deg to its axis an passes through the right extreme corner of the top face of the prism.
2. A triangular prism with one of its rectangular faces parallel to VP and nearer to it is cut as shown in the fig. Draw the development of the retained portions of the prism which are shown in dark lines.



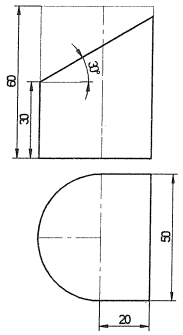
3. A hexagonal prism of base side 20 mm and height 50 mm is resting on HP on its base, such that one of its base edge is parallel to VP. The prism is cut in this position as shown in the following front view. Draw the development of the lateral surface of the prism.



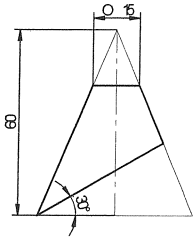
4. The inside of the hopper of the floor mill is to be lined with thin sheet. The top and bottom of the hopper are regular pentagon with each side equal to 30 mm and 22.5 mm respectively. The height of the hopper is 30 mm. Draw the shape of the sheet to which it is to be cut so as to fit into the hopper.
5. A square pyramid of side of base 45 mm, altitude 70 mm is resting with its base on HP with two sides of the base parallel to VP. The pyramid is cut by section plane which is perpendicular to VP and inclined at 40 deg to the HP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surfaces of the truncated pyramid.
6. The hexagonal pyramid of 30 mm base sides with a side of the base parallel to VP. Draw the development of the lateral surfaces of the retained portions of the pyramid cut by two perpendicular planes shown by dark lines in the fig.



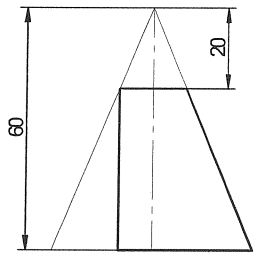
7. A pipe made of using half tubular (circular) with a half square in shape is cut as shown in the following in the fig. Draw the development of the lateral surface of the object.



8. Draw the development of the lateral surface of the cone whose front view is shown in the following fig.

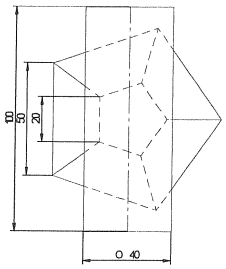


9. A funnel is to be made of sheet metal. A funnel tapers from 40 mm to 20 mm diameter to a height of 20 mm and from 20 mm to 15 mm diameter for the next 20 mm height. The bottom of the funnel is beveled off to a plane inclined at 45 deg to the axis. Draw the development of the funnel.
10. Draw the development of lateral surface of the cut cone whose front view is shown in the fig.

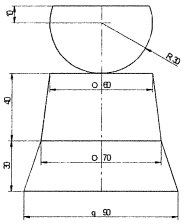


Module - V

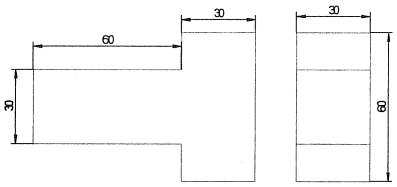
1. A hemisphere of 40 mm diameter is supported co-axially on the vertex of a cone of base diameter 60 mm and axis length 50 mm. The flat circular face of the hemi-sphere is facing upside. Draw the isometric projection of the combination of solids.
2. Draw the isometric projection of rectangular prism of 60 x 80 x 20 mm thick Para mounting a tetrahedron of side 45 mm such that the axis of the solids is collinear and at least one of the edges of the solids are parallel to VP.
3. A cone of base diameter 40 mm and height 50 mm rests centrally over a frustum of a pentagonal pyramid of base side 45 mm and top side 35 mm and height 55 mm. Draw the isometric projections of the solids.
4. The following fig shows the top view of the cylinder which is centrally mounted on a frustumof pentagonal pyramid of 60 mm height. Draw the isometric projection of the combination of solids.



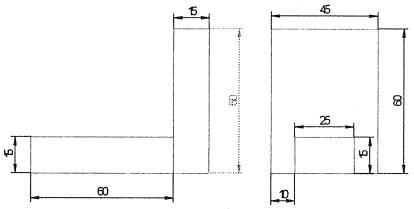
5. Following fig shows the front view of the combination of solids consisting a cut sphere and frustums of a cone and a square pyramid. Draw the isometric projections of the combination of solids.



6. A sphere of diameter 30 mm rests on the frustum of a hexagonal pyramid base 30 mm, top face 18 mm and the height 50 mm such that the axes coincide. Draw the isometric projection of the combination of the solids.
7. Following fig shown the front and side views of the solid. Draw the isometric projection of the solid.



8. Following fig shows the front and side views of the solid. Draw the isometric projection of the solid



9. A sphere of diameter 40 mm is placed centrally on the flat face of the hemisphere dia 60 mm. Draw the isometric projection of the combination.
10. Three rectangular slabs (l x b x h) 100 mm x 60 mm x 20 mm, 100 mm x 40 mm x 20 mm and 100 mm x 20 mm x 20 mm are placed one above the other in the descending order of their width b such that their longer axes are coplanar. Draw the isometric projection of the combination.

16.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
July 2019-20									

Prepared by	Checked by		
Prof.T S VANDALIi	Prof.D.N.Inamadar	HOD	Principal

Subject Title	**ENGINEERING PHYSICS LAB**		
Subject Code	18PHYL26	**IA Marks**	40
Number of Lecture Hrs / Week	02 L	**Exam Marks**	60
Total Number of Lecture Hrs	24	**Exam Hours**	03
		CREDITS – 02	

FACULTY DETAILS:		
Name: .Prof.V.M.Bhumannavar	**Designation:** Asst.Professor	**Experience:** 14.5 Year
No. of times course taught: 19	**Specialization:** Spectroscopy	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	First year (Common to all)	I	Fundamentals of Physics

2.0 Course Objectives

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

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
3. Design of circuits using new technology and latest components and to develop practical
4. Applications of engineering materials and use of principle in the right way to implement the modern technology.
5. To realize experimentally, the mechanical, electrical and thermal properties of materials, concept of waves and oscillations
6. Design simple circuits and hence study the characteristics of semiconductor devices

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and use modeling software's to generate

	Course Outcome	Cognitive Level	POs
C107.1	Develop skills to impart practical knowledge in real time solution.	L1	1,2,3,9
C107.2	Explain principle, concept, working and application of new technology and comparison of results with theoretical calculations.	L1	1,2,3,9
C107.3	Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the	L1	1,2,3,9
Total Hours of instruction			**50**

4.0 Course Content

Expt. No.	Lecture No.	Content of Lecture	% of Portion
1	1	Determination of spring constants in Series and Parallel combination	7.14
2	2	Determination of Magnetic field intensity at the center of a circular coil carrying current(by deflection method)	7.14

3	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)	7.14
4	4	Young's modulus of a beam by Single Cantilever experiment (breadth and thickness of the beam to be given)	7.14
5	5	Radius of curvature of plano convex lens using Newton's rings(wavelength of light to be given)	7.14
6	6	Study Series and parallel LCR resonance and hence Calculate inductance, band width and quality factor using series LCR Resonance	7.14
7	7	Determine Acceptance angle and Numerical aperture of an optical fiber	7.14
8	8	Determine Wavelength of semiconductor laser using Laser diffraction by calculating grating constant.	7.14
9	9	Estimation of Fermi Energy of Copper	7.14
10	10	Study of input and output Transistor characteristics and hence calculate input resistance, α and β.	7.14
11	11	Draw photodiode characteristics and calculate power responsivity	7.14
12	12	Calculation of Dielectric constant by RC charging and Discharging	7.14

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	Higher branches	Theory subjects	Basic fundamentals

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Physics in day today life.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Module I-Module V
02	NPTEL	Engg. Physics Videos

8.0 Books Used and Recommended to Students

Text Books

1. Engineering Physics, Wiley precise Text, Book series – 2014, Wiley India Private Ltd.,New Delhi.
2. Engineering Physics, Prof. S. P. Basavaraju – 2010, Subhas Stores, Bangalore – 2
3. Text Book of Engineering Physics, Dr. M.N. Avadhanulu, Dr. P.G.Kshirsagar,2012 S Chand Publishing, New Delhi.
4. Solid State Physics Sixth Edition, S.O.Pillai, New Age International.
5. Engineering Physics, V Rajendran 2012 Tata Mc.Graw Hill Company Ltd., New Delhi.

Reference Books

1. Engineering Physics A Marikani, 2013 PHI Learning Private Limited, Delhi.
2. Engineering Physics S Mani Naidu, 2014 Pearson India Limited.

Additional Study material & e-Books

1. Laser Fundamentals- William T. Silfvast

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
• https://bookspar.com/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Journal of Aircraft	http://arc.aiaa.org/loi/ja
2	International Journal of Solids and Structures	http://www.sciencedirect.com/science/journal/00207683

11.0 Examination Note

Internal Assessment: 10+30=40 Marks

10 marks –From lab internal assessment test

30 marks-From the continuous assessment

Scheme of Evaluation for Internal Assessment (10 Marks)

(a) Internal Assessment test in the same pattern as that of the main examination: 100 marks.

(b) Continuous assessment: 30 Marks.

SCHEME OF EXAMINATION:

Two main questions to be set from syllabus covered up to I A tests.

Student has to answer two full main question and each question is for 50 marks, Total test marks is 100.

Total = 100 Marks

12.0 Course Delivery Plan

Expt. No.	Content of Lecturer	% of Portion
1	Determination of spring constants in Series and Parallel combination	8.33
2	Determination of Magnetic field intensity at the center of a circular coil carrying current(by deflection method)	16.66
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)	24.99
4	Young's modulus of a beam by Single Cantilever experiment (breadth and thickness of the beam to be given)	33.33
5	Radius of curvature of plano convex lens using Newton's rings(wavelength of light to be given)	41.65
6	Study Series and parallel LCR resonance and hence Calculate inductance, band width and quality factor using series LCR Resonance	49.98
7	Determine Acceptance angle and Numerical aperture of an optical fiber	58.31
8	Determine Wavelength of semiconductor laser using Laser diffraction by calculating grating constant.	66.64
9	Estimation of Fermi Energy of Copper	74.97
10	Study of input and output Transistor characteristics and hence calculate input resistance, α and β.	83.3
11	Draw photodiode characteristics and calculate power responsivity	91.63
12	Calculation of Dielectric constant by RC charging and Discharging	100

13.0 QUESTION BANK

1. What do you mean by resonance? State the condition for resonance.
2. What is an inductor? State the electrical phenomenon taking place in an inductor.
3. What is a capacitor? Name the factors on which capacity of a capacitor depends.
4. What is the net reactance at series resonance?
5. Why a series LCR circuit is called an acceptor circuit?
6. Give the formula for effective impedance of series LCR circuit?
7. Give the formula for effective impedance of parallel LCR circuit?
8. What is the effective impedance at series resonance?
9. What is the effective impedance at parallel resonance?
10. What does the Q-factor signify?
11. Why a parallel resonant circuit is called a rejecter circuit?
12. What does the bandwidth of the L-C-R circuit signify?
13. State Faraday's laws of induction and state Lenz's law.
14. What is a dielectric? Give the types with examples.
15. Discuss the electrical polarization mechanisms in dielectrics.
16. Distinguish between resistance, reactance, and impedance.
17. How do the R, X_L, & X_C depend upon applied frequency?
18. What is frequency of d.c.? Can it be passed through a capacitor/ an Inductor? Discuss with reasons.
19. What is a Zener diode?
20. What are semiconductors? Distinguish the types.
21. What are extrinsic semiconductors? How are they formed?
22. What is a transistor? Name the types.
23. Distinguish the types of transistors symbolically.
24. Distinguish the parts of a transistor with reference to their volume and doping concentration.
25. What are the three basic configurations of a transistor?
26. Define the current amplification factors α, β and γ.
27. How many p-n junctions does a transistor have? How are they biased? Explain the reason.
28. What are the applications of a transistor in different configurations?
29. Write the equation for current flow in a transistor.
30. Why base current is measured using micro ammeter? Explain.
31. How does Resistivity of a semiconductor vary with temperature?
32. What is negative temperature of coefficient of Resistivity?
33. What is a semiconductor? Discuss its types with examples.
34. What are pentavalent and trivalent impurities? Give examples.
35. What is interferometer?
36. What are ultrasonic waves?
37. How to measure velocity of sound using ultrasonic interferometer?
38. What is a capacitor? Name the material used between the capacitor plates.
39. What are dielectrics? Distinguish the types.
40. Name the factors on which capacity of a capacitor depends.
41. What is dielectric polarization? Discuss the various mechanisms.
42. What is dielectric loss?
43. Can direct current be passed through a capacitor? Give reasons.
44. What is the kind of the nature of graph obtained?
45. Distinguish between voltage applied & electric field generated.
46. Define dielectric constant of a material.
47. Give the significance of $T_{1/2}$.
48. What is dielectric polarization mechanism? Explain the various mechanism.

49. Explain the types of magnetic materials.
50. What do you mean by magnetic hysteresis?
51. What does area of hysteresis loop account for?
52. Explain the terms remanent magnetization, coercive field and saturation magnetization.
53. How the magnetic materials are classified on the basis of hysteresis loop properties?
54. Give the examples & applications for hard & soft magnetic materials.
55. Discuss the orientation of magnetic domains during the hysteresis process.
56. What is diffraction?
57. What is the difference between diffraction and interference?
58. How diffraction is classified?
59. Explain the requirement for each type of diffraction.
60. What is grating?
61. How do you get diffraction pattern by using grating?
62. What do you mean by grating element or grating constant?
63. State the basic condition between grating and incident light for diffraction.
64. Diffraction is based on which nature of light?
65. What is the visible range of wavelengths? State the relation between frequency and wavelength?
66. Explain the mechanism of light emission in an LED.
67. Give the formula for energy of an electron accelerated by a p.d. of V volts.
68. Distinguish between an LED and an ordinary semiconductor diode
69. What are direct and indirect semiconductors? Give examples.
70. Why an ordinary diode cannot emit visible light
71. What does Planck's quantum theory suggest?
72. What is the material used for preparing an LED?
73. Explain the range of wavelengths for IR, visible, UV, X-rays and gama rays of EM spectrum
74. State relation between frequency and wavelength of light.
75. Distinguish the mechanism of light emission in an LED and a laser diode.
76. What is a perfect black body?
77. State Wein's displacement law.
78. State Stefan's law.
79. Show the nature of blackbody radiation curve.
80. State Wein's distribution law and Rayleigh Jean's distribution law.
81. What do you mean by ultra-violet catastrophe?
82. Define the terms Fermi level, Fermi energy, Fermi temperature and Fermi velocity.
83. What are Fermions and Bosons? Give examples.
84. State Pauli's exclusion principle.
85. How does Resistivity of a conductor, an insulator and a semiconductor vary with temperature?
86. What do you mean by Fermi factor? Give its formula.
87. Discuss the location of the Fermi level in case of conductor and an insulator at room temperature.
88. Discuss the location of the Fermi level in case of intrinsic and extrinsic semiconductors at room temperature.
89. How is the energy bands generated in a solid?
90. In a solid containing N number of atoms, how many sub energy levels will be generated in a band?
91. What are valence band, conduction band and forbidden gap?
92. How are the solids classified on the basis of band theory?
93. What is monochromatic source of light?
94. Mention conditions for sustained interference.
95. What do you mean by Constructive interference?
96. What do you mean by Destructive interference?
97. How are Newton's rings formed?
98. Why are the fringes circular in Newton's rings?
99. Why center of the Newton's is rings dark?

100. When will be the centre of the Newton's rings bright?
101. What do you mean by Radius of curvature?
102. What is the advantage of using a lens of large radius of curvature?

14.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
June/ July 2019	4	25	23	13	6	0	0	0	100

Prepared by	Checked by		
Prof.V.M.Bhumannavar	Prof.V.M.Bhumannavar	HOD	Principal

Subject Title	**BASIC ELECTRICAL ENGINEERING LABORATORY - 1**		
Subject Code	18ELEL27	**IA Marks**	40
No. of Lecture hrs./Week(L.T.P)	0:0:2	**Exam Marks**	60
Total No. of Lecture Hrs	24	**Exam Hours**	03
			CREDITS – 01

FACULTY DETAILS:		
Name: Prof. Hemalata R Zinage	**Designation:** Asst. Professor	**Experience:** 19Years
No. of times course taught: 02 Times	**Specialization:** Power System	

FACULTY DETAILS:		
Name: Prof. Amit U Neshti	**Designation:** Asst. Professor	**Experience:** 11 Years
No. of times course taught: 02Times	**Specialization:** Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Topic	Class	Subject
01	Basic Knowledge of voltage, current, resistor, capacitor and inductor.	PUC I/II	Physics
02	Algebraic equation simplification	PUC I/II	Mathematics
03	AC Fundamentals	PUC-II	Physics

2.0 Course Objectives

- To provide exposure to common electrical components such as Resistors, capacitors and inductors, types of wires and measuring instruments.
- To measure power and power factor measurement of different types of lamps and three phase circuits.
- To explain measurement of impedance for R-L and R-C circuits.
- To determine power consumed in a 3 phase load.
- To determine earth resistance and explain methods of controlling a lamp from different places.

3.0 Course Outcomes

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

CO	Course Outcome	RBT Level	POs
C106.1	Identify the common electrical components and measuring instruments used for conducting experiments in the electrical Laboratory.	L4	PO1, PO2,PO3, PO4,PO6,PO8 PO9, PO10,PO12
C106.2	Compare power factors of lamps.	L4	PO1, PO2, PO3, PO4, PO6,PO8 PO9, PO10,PO12.
C106.3	Determine the impedance of an electrical circuit and power consumed in a 3 phase load.	L4	PO1, PO2,PO3 PO4,PO6,PO8 PO9, PO10,PO12
C106.4	Determine earth resistance and understand two way and three way control of lamps.	L4	PO1, PO2, PO3,PO4,PO6, PO8 PO9, PO10, PO12.

4.0 Course Content

1. Verification of KCL and KVL for DC Circuits.
2. Measurement of power and power factor of incandescent lamp, fluorescent lamp, and LED lamp.
3. Measurement of resistance and inductance of a choke coil using 3 Voltmeter method.
4. Determination of phase and line quantities in three phase star and delta connected loads
5. Measurement of three phase power using two wattmeter method.
6. Two way and three way control of lamp and formation of truth table.
7. Measurement of earth resistance.
8. Study of effect of open and short circuit in simple circuits.

Demonstration Experiments:

1. Demonstration of fuse and MCB separately by creating fault.
2. Demonstration of Cut-out sections of electrical machines (Dc machines, Induction machines and synchronous machines)
3. Understanding ac and dc supply. Use of tester and test lamp to ascertain the healthy status of mains.
4. Understanding of UPS.

5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics / Relevance
01	III	Electric Circuit Analysis	Basics of AC and DC circuits.
02	III	Transformers & Generators	Working of Transformers, Types of transformers & determination of efficiency of transformers, basics of DC motor & DC Generators, Working of Induction machines.
03	IV	Electric motors	Working of DC motor and Dc generators, three phase Induction motor.
04	V	Estimation and Costing	Basics of Domestic wiring.

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Domestic wiring
02	Usage of different types of transformers, motors and induction motors in real world.
03	Determination of power factor of different types of loads.

7.0 Books Used and Recommended to Students

Text Books
1.Basic electrical Engineering by D C Kulshreshtha, Tata McGraw Hill Revised first Edition 2. Principles of Electrical Engineering & Electronics, V. K.Mehta, Rohit Mehta, S .Chand publications.
Reference Books
1. Basic Electrical Engineering by D.P.Kothari and I.J. Nagrath, Tata McGraw Hill, 2017. 2. Fundamentals of Electrical Engineering and Electronics, B.L.Theraja, S.Chand & Company ltd, reprint Edition 2013

8.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1) www.electrical4u.com/**transformer**/ 2) http://www.electrical4u.com/working-principle-of-dc generator and alternator/

3) www.ijset.net/journal/68.pdf
4) www.electrical4u.com/**dc generator**
5) www.electrical4u.com/**alternator**

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	EC&M Magazines	http://ecmweb.com/ops-maintenance/generators
2	Oil & gas journal	https://www.sub-forms.com/dragon/init.do?site=PNW23_OGogpenew
3	IPT Magazine	https://www.intelligent-power-today.com/
4	Electric apparatus magazine	https://electricalapparatus.wordpress.com/2016/06/30/electric-generator-up-and-running/

10.0 Examination Note

Conduct of Practical Examination:

1. All Laboratory experiments are to be included for practical examination
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% marks allotted to the procedure part shall be made zero.

Internal Assessment:

Question can appear on any of experiment.

Scheme of Evaluation for Internal Assessment (30+10 Marks)

Continuous Evaluation:	30Marks
Distribution of Internal Examination marks	
Write up	3 Marks
Conduction & result	7 Marks
Viva – Voce	3 Marks
Total	**40 Marks**

Scheme of External examination:

Question can appear on any of experiment.

Scheme of Evaluation for External Assessment (100 Marks)

Write up	15 Marks
Conduction& Result	70 Marks
Viva – Voce	15 Marks
Total	**100 Marks**

11.0 Course Delivery Plan

Expt. No.	Aim of the Experiment	% of portion
1	Verification of KCL and KVL for DC Circuits.	8.33
2	Measurement of power and power factor of incandescent lamp, fluorescent lamp, and LED lamp.	8.33
3	Measurement of resistance and inductance of a choke coil using 3 Voltmeter method.	8.33
4	Determination of phase and line quantities in three phase star and delta connected loads	8.33
5	Measurement of three phase power using two wattmeter method.	8.33
6	Two way and three way control of lamp and formation of truth table.	8.33
7	Measurement of earth resistance.	8.33
8	Study of effect of open and short circuit in simple circuits.	8.33

9	Demonstration of fuse and MCB separately by creating fault.	8.33
10	Demonstration of Cut-out sections of electrical machines (Dc machines, Induction machines and synchronous machines)	8.33
11	Understanding ac and dc supply. Use of tester and test lamp to ascertain the healthy status of mains.	8.33
12	Understanding of UPS.	8.33

12.0 QUESTION BANK

1. Define KCL and KVL?
2. What is Transformer?
3. Mention different classifications of Transformer?
4. Define power factor?
5. Explain measurement of power factor by using two wattmeter method?
6. Draw the Equivalent Electric Circuit of single phase transformer?
7. Explain two way and three way control of lamp with the help of truth table?
8. What do you mean by the term "Voltage Regulation of Transformer?
9. Give the expression for the Voltage regulation in terms of approximate voltage drop.
10. Define open and short circuit in simple circuits?
11. Define fuse and MCB?
12. Write the voltage current relationships at primary & secondary of star Delta transformer.
13. Mention the application of 2-way and 3-way control of lamp?
14. Define earth resistance.
15. Explain the measurement of earth resistance.

Prepared by	Checked by		
Prof. H. R. Zinage Prof.A.U.Neshti	Prof. H. R. Zinage	HOD	Principal

Subject Title	Technical English		
Subject Code	18EGH28	CIE Marks	40
Number of Lecture Hrs / Week	2	SEE Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
		CREDITS – 01	

FACULTY DETAILS:		
Name:	Designation:	Experience: 1

1.0 Prerequisite Subjects:

Students should have the basic knowledge of English grammar and communication skills.

Sl. No	Branch	Semester	Subject
01	Common to All branch	II	TECHINAL ENGLISH

2.0 Course Objectives

To provide students with knowledge Of basic English grammar and essentials of language skills.

To train to identify the nuances of phonetics ,intonation and enhance pronunciation skills

To enhance with English vocabulary and language proficiency

3.0 Course Outcomes

On completion of this course, students will have knowledge in:

	Course Outcome	POs	RBT Levels
CO1	Use grammatical English and essentials of language skills and identify the nuances of phonetics ,intonation and flawless pronunciation	1, 3 5	L3
CO2	Implement English vocabulary at command and language proficiency	1, 3 5	L2
CO3	Identify common errors in spoken and written communication	1, 3 5	L3
CO4	Understand and improve the non verbal communication and kinesis	1, 3 5	L3
CO5	Perform well in campus recruitment ,engineeri9ng and all other general competitive examinations	1, 3 5	L2
Total Hours of instruction		**50**	

4.0 Course Content

MODULE- I: Introduction to technical communication

Skills Fundamentals of Technical communications, Barriers to Effective Communication. Different styles in technical Communication. Interpersonal Communication Skills, How to improve Interpersonal Communication Skills, Developing Interpersonal Skills.

Grammar: Basic English Grammar and Parts of speech – Nouns, pronouns, Adjectives, Verb, Adverb , Preposition , Articles, Conjunctions

(RBT Levels: L1 , L2 & L3)

MODULE-II Introduction to listening skills and Phonetics

Introduction to Phonetics, Sounds Mispronounced , Silent and Non silent Letters , Homophones and Homonyms, Aspiration, Pronunciation of the words ending with 'age' some plural forms

Articles; Use of Articles- Indefinite and Definite Articles

(RBT Levels: L1, L2 & L3)

MODULE-III: Developing listening skills (Phonetics and Vocabulary Building)

Speech Sounds: Vowels and Consonants- Exercises on it. Proposition, kinds of Prepositions often confused. Word Accent- Rules for Word Accent, Stress Shift , Question Tags for Assertive sentences- some Exceptions in Question Tags for Assertive Sentences- some exceptions in Questions Tags and Exercises, one word Substitute and Exercises. Vocabulary- Synonyms and Antonyms, Exercises on it.
(RBT Levels: L1, L2 & L3)

MODULE IV: Speaking Skills (Grammar and Vocabulary)
Syllable, Structures, Strong and weak forms of words, Words formations- Prefixes and suffixes, Contractions and abbreviations. Spelling Rules and words often Miss pelt. Exercise on it. Word pairs . the sequences of sentence of tenses and Rules.
(RBT Levels: L1, L2 & L3)

MODULE-V: Speaking Skills (Grammar and Vocabulary)
Extempore/ Public Speaking, Difference between Extempore and Public speaking, and Guidelines for Practice. Mother Tongue influence- South Indian Speakers, Various Techniques for Neutralization of mother Tongue influence – Exercises. Information Transfer: oral Presentations. Examples. Common Errors in Pronunciation.
(RBT Levels: L1, L2 & L3)

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	I/II	**Technical English** **Listening skills and phonetics** **Grammar and vocabulary**	Fundamentals of technical communication, improving interpersonal communication skills, correct pronunciation of the words. Practice of vowels and consonants,

6.0 Relevance to Real World

SL. No	
01	Will be able to work efficiently in an English speaking workplace
02	Speaking skills helps students to face interviews, competitive exams
03	Personality development and communication skills to work in various institutions and organizations
04	English is universal language which is used everywhere

7.0 Books Used and Recommended to Students

Text Books

1. **Communication Skills** by Sanjay Kumar and Phuspa Lata, Oxford- University Press- 2018. (Workbook)
2. **English Language Communication Skills**, Engage learning India Pvt Limited- 2018

Reference Books

1. English for Technical Communication by N.P Sudharashan and C. Sativa, Cambridge University press-2016
2. Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited- 2018
3. Practical English Usage by Michael Swan oxford University press
4. High School Grammar and Composition by Wren and Martin s.

8.0 Relevant Websites (Reputed Universities and Others) for

Notes/Animation/Videos Recommended

Website and Internet Contents References

1.http://www.wekipedia.com
2. https://www.phonetics.co.in
3. http:// www.communicationstudies.com
4.http://www.englishgrammar.org

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	Skills Fundamentals of Technical communications	20.0
	2	Barriers to Effective Communication	
	3	Different styles in technical Communication	
	4	Interpersonal Communication Skills	
	5	Developing Interpersonal Skills.	
	6	Grammar: Basic English Grammar	
	7	Parts of speech – Nouns, pronouns, Adjectives	
	8	Verb, Adverb , Preposition , Articles, Conjunctions	
	9	Exercise on part of speech	
		Galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, polarization of anodic & cathodic regions, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature.	
2	11	Types of corrosion- Differential metal, differential aeration (Pitting and waterline) and stress (caustic embrittlement in boilers).	20.0
	12	Corrosion control: Inorganic coatings- Anodizing of Al and phosphating.	
	13	Metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).	
	14	**Metal Finishing:** Introduction, Technological importance. Electroplating- Introduction.	
	15	Principles governing- overvoltage. - Polarization, decomposition potential and overvoltage.	
	16	Factors influencing the nature of electro deposit - Current density Concentration of metal salt, metal ion & electrolyte; pH, temperature & throwing power of plating bath, Additives- brighteners, Levellers, structure modifiers & wetting agents.	
	17	Electroplating of Nickel (Watt's Bath) and Chromium (decorative and hard).	
	18	Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.	
	19	**Fuels:** Introduction, classification, calorific value- gross and net calorific values.	
	20	Determination of calorific value of fuel using bomb calorimeter.	
3	21	Numerical problems on calorific value.	20.0
	22	Knocking of petrol engine – Definition, mechanism, ill effects and prevention.	
	23	Antiknocking agents, power alcohol, biodiesel.	
	24	**Fuel Cells:** Introduction, differences between conventional cell and fuel	

		cell, limitations & advantages.	
	25	Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte	
	26	Construction, working & applications of solid oxide fuel cell (SOFCs).	
	27	**Solar Energy**: Photovoltaic cells- introduction, construction and working of a typical PV cell.	
	28	Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells.	
	29	**Environmental Pollution:** Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide,	
	30	Air pollutants: Sources, effects and control of Oxides of nitrogen and sulphur, hydrocarbons, Particulate matter, Carbon monoxide, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion.	
4	31	**Waste Management:** Solid waste, e-waste & biomedical waste: Sources, characteristics	20.0
	32	Disposal methods (Scientific land filling, composting, recycling and reuse).	
	33	**Water Chemistry:** Introduction, sources and impurities of water Boiler feed water, boiler troubles with disadvantages -scale and sludge formation,	
	34	Boiler corrosion (due to dissolved O_2, CO_2 and $MgCl_2$). Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD)	
	35	Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD.	
	36	Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry).	
	37	Sewage treatment: Primary, secondary (activated sludge) and tertiary methods.	
	38	Softening of water by ion exchange process. Desalination of sea water by reverse osmosis.	
	39	**Instrumental methods of analysis:** Theory, Instrumentation and applications of Colorimetry	
	40	Theory, Instrumentation and applications of Flame Photometry,	
5	41	Atomic Absorption Spectroscopy.	20.0
	42	Theory, Instrumentation and applications of Potentiometry	
	43	Theory, Instrumentation and applications Conductometry(Strong acid with a strong base, weak acid with a strong base	
	44	Theory, Instrumentation and applications Conductometry (mixture of strong acid and a weak acid with a strong base)	
	45	**Nanomaterials:** Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties).	
	46	Top down and bottom up approaches, Synthesis by Sol-gel method	
	47	Synthesis by- precipitation and chemical vapour deposition,	
	48	Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications.	
	49		
	50		

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website

						/Paper
MODULE 1	Assignment 1: University Questions on Section of Electrochemistry and Energy storage systems	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 2	Assignment 2: University Questions on Corrosion and Metal Finishing	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 3	Assignment 3: University Questions on Energy Systems	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 4	Assignment 4: University Questions on Environmental Pollution and Water Chemistry	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 5	Assignment 5: University Questions on Instrumental methods of analysis and Nanomaterials	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list

14.0 Assignment Questions

Assignment No	Questions	Marks
I	1. Define single electrode potential. Derive Nernst's equation for single electrode potential. 2. Define electrochemical cells. Give the differences between Electrolytic and galvanic cells. 3. What is electrolyte concentration cell? A concentration cell was constructed by immersing two silver electrodes in 0.05M and 0.1M $AgNO_3$ solution. Write cell representation, cell reactions and calculate the EMF of the cell. 4. Define battery. Give the classification of batteries with example. 5. Explain the construction and working of Ni-MH.	5marks 5marks 5marks 5marks 5marks
II	1. What is metallic corrosion? Explain the corrosion of iron based on electrochemical theory. 2. Explain differential metal corrosion with suitable example. 3. Explain the following types of corrosion i) Pitting corrosion ii) Water line corrosion. 1. Explain the process of electroplating of nickel (Watt's bath). 2. Explain the following : i) Decomposition potential ii) over voltage	5marks 5marks 5marks 5marks 5marks
III	1. Define chemical fuels. Explain the classification of Chemical fuels and write characteristics of good fuels.	5marks

	2. Explain determination of calorific value of a solid/liquid fuel by using Bombs calorimeter. 3. Explain knocking mechanism in IC engine and its ill effects 4. Explain the construction and working of P.V. cell 5. Explain Preparation of solar grade silicon by Union Carbide Process	5marks 5marks 5marks 5marks
IV	1. Define air pollution. Explain the various causes of air pollution. 2. Explain Ozone depletion. 3. Define dissolved oxygen. Explain with reactions the determination of dissolved oxygen by Winkler's method. 4. What is softening of water? Discuss the softening of water by ion exchange (Demineralization) process. 5. Describe the method to determine COD of water.	5marks 5marks 5marks 5marks 5marks
V	1. What is flame photometry? Explain the components of flame photometer and their functions. 2. Write a note on atomic absorption spectroscopy. 3. Explain conductometry titration of strong acid with strong base. 4. Explain the synthesis of nano particles by solgel method. 5. What are nanomaterials? Explain the properties (Particle size dependent) of Nanomaterials.	5marks 5marks 5marks 5marks 5marks

15.0 QUESTION BANK

Module-I Electrochemistry and Energy storage systems

1. Explain electrode potential and cells.
2. Describe primary, secondary and concentration cells.
3. Derive Nernst equation to determine electrode potential and emf of cell.
4. Outline the process of measurement of single electrode potential.
5. Determine the pH of solution using glass electrode.
6. What is reference electrode? Explain the construction and working of calomel electrode.
7. What are ion selective electrodes? Explain the construction and working of glass electrode.
8. Write the electrode reactions and calculate the emf of the following cell at 298K. Given E° cell=1.3V $Cu|Cu^{++}(10^{-2}M)||Ag^{+}(10^{-1}M)|Ag$.
9. Explain basic concepts and battery characteristics.
10. Explain the construction and working of Ni-MH battery.
11. Outline the process of measurement of single electrode potential
12. Define battery. Explain the construction and working of Li-ion battery.

Module-II Corrosion and Metal Finishing

1. Describe the process of corrosion.
2. Illustrate the examples of metal corrosion.
3. Define chemical corrosion and electrochemical corrosion.
4. Explain different types of corrosion.
5. Outline the process of controlling the metal corrosion.
6. Explain use of corrosion inhibitors in controlling corrosion of metals.
7. Outline the different factors affecting the corrosion process.
8. Caustic embrittlement is a type of
   A) Differential metal corrosion B) Differential aeration corrosion
   C) Stress corrosion D) None
9. Coating of iron with zinc is known as
10. A) Galvanization B) Tinning C) Anodizing D) Phosphating
11. Explain metal finishing.Outline the technological importance of metal finishing.
12. Describe the significance of electro polarization, decomposition potential and hydrogen over voltage in electroplating process.

13. Explain the effect of plating variables on the nature of electrodeposite.
14. Explain electro deposition process to the chromium and gold.
15. Define electroless plating.
16. Explain electroless plating to the plating of copper on double sided PCB.

Module-III Energy Systems

1. Express Conventional energy sources and non – conventional energy sources
2. Explain the construction and working of P.V. cell
3. Explain knocking mechanism in IC engine and its ill effects.
4. Define fuel cell. Write the difference between conventional cell and fuel cell.
5. Describe the determination of calorific values of fuel using Bombs calorimeter.
6. Describe the processes of obtaining synthetic petrol by Fishcher-Tropsch process.
7. A coal sample with 93%C, 5%H_2 and 2% ash is subjected to combustion in a bomb calorimeter. Calculate the gross and net calorific value given that mass of coal sample taken is 0.95Kg, mass water taken in the copper calorimeter is 2000Kg, water equivalent of calorimeter is 700Kg, rise in temperature is 2.8°C and latent heat of steam is 2457.2KJ/Kg. Specific heat of water=4.187KJ/Kg/°C.
8. Write a note on a) Anti knocking agents b) Unleaded petrol c) power alcohol d)biodiesel.
9. Explain Preparation of solar grade silicon by Union Carbide Process
10. Explain construction and working of methanol-oxygen fuel cell.
11. Define fuel cell. Explain construction and working of solid oxide fuel cell.

Module-IV Environmental Pollution and Water Chemistry

1. What potable water? Describe reverse osmosis.
2. Explain boiler troubles with disadvantages -scale and sludge formation, priming and foaming, boiler corrosion (due to dissolved O_2, CO_2 and $MgCl_2$).
3. Determine dissolved oxygen in water by Winkler's method.
4. Describe the method to determine COD of water.
5. Describe the method to determine BOD of water.
6. Explain sewage treatment methods
7. 25 cm^3 of an effluent sample requires for oxidation 8.3 cm^3 of 0.001M $K_2Cr_2O_7$. Calculate the COD of the effluent sample
8. Explain gravimetric determination of sulfate content in water.
9. Define air pollution. Explain types of air pollution.
10. Discuss the natural sources, ill effects and SO_2 as pollutant.
11. Write note on ozone depletion.
12. Differentiate between primary and secondary air pollutants with an examples.
13. Explain disposal of solid waste by scientific land flling.
14. Explain sources and characteristics of solid waste.

Module-V Instrumental methods of analysis and Nanomaterials

1. Explain the synthesis of nano particles by solgel method.
2. Explain principle and application of potentiometry with respect to redox titration.
3. Write a note on atomic absorption spectroscopy.
4. What is flame photometry? Explain the components of flame photometer and their functions.
5. State Beer Lambert's law. Explain the colorimetric estimation of copper using NH_3 as the complexing agent.
6. Explain the nature of conductometric graph for the following titrations
   i) Strong acid with strong base ii) Strong acid with weak base
7. Give the components of the instrument required for potentiometry. Explain an application of potentiometry.
8. What is the principle of flame photometry? What are processes occur in the flame ?
9. Explain any three size dependent properties of nonmaterial's.
10. Explain the synthesis of nano particles by chemical vapour condensation method.
11. Explain the synthesis of nano particles by precipitation method
12. Explain the following nano materials.
    i) Fullerenes ii) Carbon nanotube iii) Graphenes

16.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
July 2016	00	01	07	16	36	26	49	90.36

Examination	S+	S	A	B	C	D	E	% Passing
Jan 2018	00	00	02	05	12	29	12	76.00

Prepared by	Checked by		
Prepared by			