First year Engineering
Course Plan 2022-23 Odd– Semester
(Chemistry 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.

PROGRAMME OUTCOMES (POs)

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 engineering solutions 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 and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering 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 the engineering 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 in independent and life-long learning in the broadest context of technological change.

CONTENTS

STUDENT HELP DESK

Sl. No	Purpose	Contact Person	
		Faculty	Instructor
1	Attestations	Dr. K. B. Manwade	--
2	Time table	Prof. V.M. Bhumannavar	--
3	I.A. Test Coordinator and EMS Coordinator (Online submission of exam form / revaluation form to VTU)	Dr. S. J. Walki	Mrs. S.S. Kankanwadi Mr. G. B. Dodagoudar
4	Students' Counseling &Discussion with parents	Dr. M.S. Hanagadakar Prof. V.M. Bhumannavar	--
5	Extra-Curricular & Co- Curricular Activities	Dr. S. L. Patil	Mrs. S.S. Kankanwadi Mr. G. B. Dodagoudar
7	Dispensary	Dr. Arun. G. Bullannavar Cell No.9449141549	
8	First Year Information	Dr. K. B. Manwade First Year Coordinator Mobile No: 8412968254 E-mail ID-hod.1yr@hsit.ac.in	

DEPARTMENTAL RESOURCES
FACULTY POSITION

S.N.	Category	No. in position	Average experience
1	Teaching faculty	13	17
2	Technical supporting staff	01	18
3	Helper	01	18

MAJOR LABORATORIES

S.N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs.)
1.	Engg. Chemistry Lab	200	13,83,479.00
2.	C programming Lab	200	18,75,652.00

Total Investment in the Department **Rs. 31,96,783.00**

TEACHING FACULTY DETAILS

S.N.	Name	Designation	Qualification	Specialization	Teaching Exp(In yrs)	Phone No.
1.	Dr. S. N. Topannavar	Prof. & Head	M.Tech .Ph.D	Thermal Power Engineering.	24	9482440235
2.	Dr. K. M. Akkoli	Asso.Prof.	M.Tech .Ph.D	Thermal Power Engineering	20	9739114856
3.	Dr. K. B. Manwade	Asso.Prof.	M.Tech .Ph.D	Computer Science Engg.	18	8412968254
4.	Dr. M. S. Hanagadakar	Asso.Prof.	M.Sc. Ph.D	Physical Chemistry	16	8310768223
5.	Dr. S. L. Patil	Asst.Prof.	M.Sc. Ph.D	Graph Theory	13	8867664082
6.	Dr. S. J. Walki	Asst.Prof.	M.Sc. Ph.D	Organic Chemistry	07	8105787069
7.	Prof. D. N. Inamdar	Asst.Prof.	M.Tech	Tool Design	21	9591208980
8.	Prof. S. S. Malaj	Asst.Prof.	M.Tech	Electronics & Telecommunication.	24	8073529095
9.	Prof. D.M. Kumbhar	Asst.Prof.	M.Tech	Digital electronics	22	7353545488
10.	Prof. G.M. Zulapi	Asst.Prof.	M.Tech	Product Design and Manufacturing	15	9480213587
11.	Prof. K.B. Negalur	Asst.Prof.	M.Tech	Industrial Electronics	9	9886644507
12.	Prof. S.S. Patil	Asst.Prof.	M.Tech	VLSI Design & Embedded Systems	18	9448102010
13.	Prof. P. I. Savadatti	Asst.Prof.	M.Tech	Digital Electronics	7	9964315436
14.	Prof. P.R. Patil	Asst.Prof.	M.Tech	Structural Engineering	4	9606557280
15.	Prof. I.N. Kambar	Asst.Prof.	M.Sc	Mathematics	0.3	9164296006
16.	Prof. B. S. Koteppagol	Lecturer	M.A	Kannada	4	9480849333
17.	Prof. B. S. Hooli	Lecturer	M.A	English	20	9353476479

Visvesvaraya Technological University, Belagavi
Scheme of Teaching and Examinations-2022
Outcome-Based Education(OBE)and Choice Based Credit System(CBCS)
(Effective from the academic year 2022-23)

I Semester (Electrical & Electronics Engineering Stream) **(For Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATE101	Mathematics for EES-I	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BCHEE102	Chemistry for EES	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	BCEDK103	Computer-Aided Engineering Drawing	Mechanical	2	0	2	0	03	50	50	100	03
4	ESC-I	BESCK104x	Engineering Science Course-I	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	BETCK105x	Emerging Technology Course-I	Any Dept	3	0	0	0	03	50	50	100	03
	OR												
	PLC-I	BPLCK105x	Programming Language Course-I		2	0	2	0	03				
6	AEC	BENGK106	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMS	BICOK107	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BKSKK107/ BKBKK107	Samskrutika Kannada/ Balake Kannada										
8	HSMS	BSFHK158	Scientific Foundations of Health	Any Dept.	1	0	0	0	01	50	50	100	01
		OR											
		BIDTK158	Innovation and Design Thinking		1	0	0	0	01				
			TOTAL							400	400	800	20

SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC- Emerging Technology Course, AEC- Ability Enhancement Course, HSMS-Humanity and Social Science and Management Course, SDC- Skill Development Course, CIE -Continuous Internal

Visvesvaraya Technological University, Belagavi
Scheme of Teaching and Examinations-2022
Outcome-Based Education(OBE)and Choice Based Credit System(CBCS)
(Effective from the academic year 2022-23)

I Semester (Mechanical Engineering Stream) **(For Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATM101	Mathematics for ME Streams-I	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BCHEM102	Chemistry for ME Streams	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	BCEDK103	Computer Aided Engineering Drawing	Civil/Mech Engg dept	2	0	2	0	03	50	50	100	03
4	ESC-I	BESCK104x	Engineering Science Course-I	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	BETCK105x	Emerging Technology Course-I/	Any Dept	3	0	0	0	03	50	50	100	03
	OR												
	PLC-I	BPLCK105x	Programming Language Course-I		2	0	2	0	03				
6	AEC	BENGK106	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMS	BICOK107	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BKSK0107 BKBKK107	Samskrutika Kannada/ Balake Kannada										
8	AEC/SEC	BSFHK158	Scientific Foundations for Health	Any Dept	1	0	0	0	01	50	50	100	01
		OR											
		BIDTK158	Innovation and Design Thinking		1	0	0	0	01				
				TOTAL						400	400	800	20

SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC- Emerging Technology Course, AEC- Ability Enhancement Course, HSMS-Humanity and Social Science and management Course, SDC- Skill Development Course, CIE -Continuous

Visvesvaraya Technological University, Belagavi
Scheme of Teaching and Examinations-2022
Outcome-Based Education (OBE)and Choice Based Credit System(CBCS)
(Effective from the academic year 2022-23)

I Semester (Civil Engineering Stream) (Chemistry Group)

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATC101	Mathematics for Civil Engg Stream-I	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BCHEC102	Chemistry for Civil Engg Stream-I	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	BCEDK103	Computer-aided engineering Drawing	Civil/Mech Engg dept	2	0	2	0	03	50	50	100	03
4	ESC-I	BESCK104x	Engineering Science Course-I	Respective Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	BETCK105x	Emerging Technology Course-I	Any Dept	3	0	0	0	03	50	50	100	03
	OR												
	PLC-I	BPLCK105x	Programming Language Course-I		2	0	2	0	03				
6	AEC	BENGK106	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMS	BICOK107	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BKSK107/ BKBK107	Samskrutika Kannada/ Balake Kannada										
8	HSMS	BSFHK158	Scientific Foundations of Health	AnyDept	1	0	0	0	01	50	50	100	01
	OR												
	HSMS	BITDK158	Innovation and Design Thinking	Any Dept	1	0	0	0	01				
				TOTAL	**15**	**06**	**10**	**00**	**27**	**400**	**400**	**800**	**20**

SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC-Emerging Technology Course, AEC- Ability Enhancement Course, HSMS-Humanity and Social Science and management Course, SDC- Skill Development Course,

Subject Title	**Mathematics for Electrical &Electronics Engineering Stream**		
Subject Code	BMATE101	**IA Marks(20)+Assignments(10)+**	50
Number of Lecture Hrs / Week	02+02	**Exam Marks (appearing for)**	50 (100)
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 04			

FACULTY DETAILS:		
Name: 1) Dr. S. L. Patil	**Designation** 1) Asst. Prof.	**Experience:** 1) 14 years
No. of times course taught 1) 01 (including present)	**Specialization:** Mathematics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Pre-University Course (Students should have the knowledge of basic subjects)	I and II	Mathematics

2.0 Course Objectives

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

The goal of the course Mathematics-I for Electrical & Electronics Engineering Stream- 22MATE11 is

- Familiarize the importance of calculus associated with one variable and multivariable for computer science and engineering.
- To solve the first order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.
- Analyze computer science and engineering problems by applying Ordinary Differential Equations.
- Apply the knowledge of modular arithmetic to computer algorithms.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner.

3.0 Course Outcomes

After successfully completing the course, the student will be able to understand the topics

Course Code	Course Outcome	POs
C101.1	Apply the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions.	1, 2, 3,12
C101.2	Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian.	1, 2, 3,12
C101.3	Solve first-order linear/nonlinear ordinary differential equations analytically through standard methods.	1, 2, 3,12
C101.4	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume	1, 2, 3,12

C101.5	Make use of matrix theory for solving for system of linear equations and compute eigenvalues and eigenvectors	1, 2, 3,12
Total Hours of instruction		**40**

4.0 Course Content

CONTENTS	RBTL	No. of Hrs
Module-1 Calculus Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature -Cartesian, Parametric, Polar and Pedal forms. Problems. **Self-study:** Center and circle of curvature, Evolutes and involutes **Pedagogy:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08
Module-2 Series Expansion and Multivariable Calculus Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms-L'Hospital's rule. Partial differentiation, total derivative-differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems. **Self-study:** Euler's Theorem and problems. Method of Lagrange undetermined multipliers with single constraint. **Pedagogy:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08
Module-3 Ordinary differential equations (ODE's) of first order: Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ *and* $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories, L-R and C-R circuits. Problems. **Nonlinear differential equations:** Introduction to general and singular solutions; Solvable for p only; Clairaut's equations, reducible to Clairaut's equations. Problems. **Self-Study:** Applications of ODE's. Solvable for x and y. **Pedagogy:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08
Module-4 Integral Calculus **Multiple Integrals:** Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Problems. **Beta and Gamma functions:** Definitions, properties, relation between Beta and Gamma functions.Problems. **Self-Study:** Volume by triple integration, Center of gravity. **Pedagogy:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08
Module-5 Linear Algebra Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations; Gauss-elimination method, Gauss-Jordan method and Approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors-Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **Self-Study**: Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem**.** **Pedagogy:** Chalk and talk method/Power Point Presentation	L1, L2 & L3	08

5.0 Relevance to future subjects

Sl. No.	Semester	Subject	Topics
01	Common to all	Common to all engineering Subjects	Signal and Analysis, Field Theory, Thermodynamics, Fluid Dynamics etc

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Ordinary differential equations serve as Mathematical models for many real word problems.
02	Differential equations are Radioactive decay, chemical reaction, Newton's law of cooling, RL, RC & RLC circuits, simple harmonic motion etc.
03	Integral calculus is used to find the path of the aero plane.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Integral Calculus

8.0 Books Used and Recommended to Students

Text Books

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.

Reference Books

1. V. Ramana: "Higher Engineering Mathematics"-McGraw-Hill Education, 11th Ed. 2017
2. Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Reprint, 2016.
3. N.P Bali and Manish Goyal:" A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co. Newyork, 6th Ed., 2017.
5. Gupta C.B, Sing S.R and Mukesh Kumar: Engineering Mathematics for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication 3rd Ed., 2014.
7. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

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 and II) Pune Vidyarthi Griha Prakashan, 7th Edition 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

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME
- VTU e-Shikshana Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Assignments
- Seminar

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

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Two Unit Tests each of **20 Marks (duration 01 hour**)

1. First test after the completion of 30-40 % of the syllabus
2. Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary.
However best two tests out of three shall be taken into consideration.

Two assignments each of 10 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the COs and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 60 marks and will be scaled down to 30 marks

CIE for the practical component of the Integrated Course

• On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester. The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**. The laboratory test **(duration 02/03 hours)** at the end of the 14th /15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks.** Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. 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.
3. The students have to answer 5 full questions, selecting one full question from each module

❖ The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module -1	1	**Differential Calculus-1:**Review of elementary differential calculus, Polar curves	20
	2	Angle between the radius vector and tangent	
	3	Angle between two curves & Problems	
	4	Pedal equation & Problems	
	5	Curvature and Radius of curvature in Cartesian from	
	6	Curvature and Radius of curvature in Polar from	
	7	Centre and circle of curvature (All without proof-formulae only)	
	8	Applications to evolutes and involutes	
Module-2	9	**Differential Calculus-2:** Taylor's and Maclaurin's series for one variable (statement only)	
	10	Indeterminate forms-L' Hospital's rule & Problems	

	11	Total derivatives & Problems	20
	12	Partial differentiation of composite functions	
	13	Maxima and minima for a function of two variables	
	14	Method of Lagrange multipliers with one subsidiary condition	
	15	Jacobians simple problems	
	16	Applications of maxima and minima with illustrative examples	
Module-3	17	**Ordinary differential equations(ODE's)of first order:** Exact and reducible to exact differential equations	20
	18	Bernoulli's differential equations	
	19	Applications of ODEs orthogonal trajectories	
	20	Newton's law of cooling & Problems	
	21	Introduction to general and singular solutions; Solvable for p only	
	22	Clairaut's equation	
	23	Equation reducible to Clairaut's form	
	24	L-R circuits & Nonlinear differential equations	
Module-4	25	**Integral Calculus** Evaluation of double and triple integrals	20
	26	Problems	
	27	Evaluation of double integrals by change of order of integration.	
	28	Evaluation of double integrals by changing into polar coordinates	
	29	Evaluation of Double and triple integrals to find the area and volume.	
	30	Beta and Gamma Functions-Properties	
	31	Beta and Gamma Functions- problems	
	32	Relation between Beta and Gamma function	
Module-5	33	**Linear Algebra :** Rank of a matrix-echelon form	20
	34	Solution of a system of linear equation-consistency	
	35	Solution of a system of linear equation by Gauss elimination method	
	36	Solution of a system of linear equation by Gauss Jordan method	
	37	Approximate solution by Gauss –Seidel method	
	38	Eigen values and eigenvectors-Rayleigh's power method	
	39	Solution of system of equations by Gauss-Jacobi iterative method	
	40	Inverse of a square matrix by Cayley- Hamilton theorem.	

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	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1,2 &3 of the syllabus	6	Individual Activity.	Book 1, of the reference list. Website of the Reference list
2	Assignment 2: University Questions	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 & 5 of the syllabus	11	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference List

14.0 QUESTION BANK

Module-1: Calculus

1. Find the angle of intersection of the curves $r = a\log\theta$ and $r = \frac{a}{\log\theta}$.
2. Find the Pedal equation of the curve $r^2 = a^2\sin 2\theta + b^2\cos 2\theta$.
3. Find the radius of curvature for the given curve $x^3 + y^3 + 3xy = 1$ at the point (3/2, 3/2)
4. Find the radius of curvature of the curve y = log sin x at x = π/2 .
5. Find the radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis
6. Find the radius of curvature of the curve $xy = c^2$ at (c,c).
7. Find the curvature at (3,-4) to the curve $x^2 + y^2 = 25$.
8. What is the curvature of $x^2+y^2-4x-6y+10 = 0$ at any point on it
9. Find the radius of curvature at any point on the curve $\theta = [\frac{\sqrt{r^2-a^2}}{a}] - \cos^{-1}(a/r)$
10. Find the radius of curvature at $y = 2a$ on the curve $y^2 = 4ax$.
11. Find the radius of curvature of the curve $y = a\ cosh(x/a)$ at the point where it crosses the y axis.
12. Find the radius of curvature of the curve $y = cos\ log(sec(x/c))$.
13. Find the radius of curvature at x = π/2 on the curve $y = 4sinx - sin2x$
14. Find the radius of curvature of the parabola $x = at^2, y = 2at$ at t.
17. For the curve $x = a(cos\ \theta + \theta\ sin\theta), y = a(sin\theta - \theta\ cos\theta)$, prove that the radius of curvature is aθ
18. Find the radius of curvature at any point $(a\ cos3\theta, a\ sin3\theta)$ on the Curve $x^{2/3}+y^{2/3} = a^{2/3}$
19. Find the coordinates of the centre of curvature at any point of the parabola $y^2 = 4ax$.
20. Find the centre of circle of curvature for $xy(x + y) = 2$ at (1,1)
21. Find the evolutes of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Module-2: Series Expansion and Multivariable Calculus

1. Expand e^{sinx} by Maclauris series up to the term containing x^4.
2. Expand $log\ (1 + cosx)$ by Maclauris series up to the term containing x^4.
3. Obtain the Taylor's expansion of $\log_e x$ about x=1 up to the term containing 4th degree & hence obtain $\log_e$ (1.1).
4. Using Maclaurin's series expand $log(secx)$ up to the term containing x^5
5. Evaluate $\lim_{x\to 0}\left[\frac{a^x+b^x+c^x}{3}\right]^{1/x}$.
6. Find the values of a & b such that $\lim_{x\to\frac{\pi}{2}} \frac{\log cosx}{tanx}$
7. Evaluate $\lim_{x\to\pi/4} (tanx)^{\tan 2x}$
8. Evaluate $\lim_{x\to 1}(2-x)^{\tan(\frac{\pi x}{2})}$
9. Evaluate $\lim_{x\to 0} \frac{xe^x - \log(1+x)}{x^2}$
10. If $u = \frac{xy}{z}$, $v = \frac{yz}{x}$, $and\ w = \frac{xz}{y}$ find $J = \frac{\partial(u,v,w)}{\partial(x,y,z)}$
11. If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ & $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$, then $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy} = \frac{-\sin u\cos 2u}{4\cos^3 u}$
12. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$
13. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$
14. Discuss the maxima & minima of $f(x,y) = x^3y^2(1-x-y)$
15. Examine the following function for extreme values $f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$

Module-3: Ordinary differential equations (ODE's) of first order

1. Solve $3e^x tany dx + (1 - e^x)sec^2 y dy = 0$.
2. Solve $\frac{dy}{dx}$ = x tan (y –x) + 1
3. Solve $\frac{dy}{dx} = \frac{x\,(2\log x + 1)}{\text{Siny} + y\cos y}$
4. Solve (x-y log y + y log x) dx + x (logy - log x) dy =0
5. Solve (x tan y/x – y $\sec^2$) dx + x $\sec^2$ y/x dy =0
6. Solve $\frac{dy}{dx} = \frac{2x-y+1}{x+2y-3}$
7. Solve $e^y\left(\frac{dy}{dx} + 1\right) = e^x$
8. Solve ($x^2 - 4xy - 2y^2$) dx + ($y^2 - 4xy - 2x^2$) dy = 0
9. Solve $\frac{dy}{dx} + ycotx = cosx$.
10. Solve $\frac{dy}{dx} + xsin2y = x^3 cos2y$
11. Solve $tany\frac{dy}{dx} + tanx = cosycos^2 x$
12. Solve $\frac{dy}{dx} - \frac{2y}{x} = x + x^2$
13. Solve $(xy^3 + y)dx + (x^2y^2 + x + y^4)dy = 0$
14. Solve xy(1 + xy^2)$\frac{dy}{dx}$ = 1
15. Solve $sec^2 y\frac{dy}{dx} + xtany = x^3$
16. Find the orthogonal trajectory of the family of coaxial circles $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$
17. Find the orthogonal trajectory of $r^n = a^n \sin n\theta$
18. Find the orthogonal trajectories of the cardioids r = a (1 - cos)
19. Solve the eqution $e^{3x}(p-1) + p^3 e^{2y} = 0$ by using substitution $u = e^x, v = e^y$.
20. Obtain the general & the singular solution of the eqution as clairaut's equation $xp^3 - yp^2 + 1 = 0$.
21. Solve: $y + px = x^4 P^2$
22. Solve: xp^2+x =2yp.
23. Solve the equation $e^{3x}(p-1) + p^3 e^{2y} = 0$ by using substitution $u = e^x, v = e^y$.

Module-- 4: Integral Calculus

1. Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)dxdydz$
2. Evaluate $\int_0^5\int_0^{x^2} x(x^2+y^2)dxdy$
3. Evaluate $\int_1^1\int_0^2\int_1^2 (x^2 yz)dxdydz$
4. Evaluate $\int_0\int_0\int_0 (xyz)dxdydz$.
5. Change the order of the integration in $I = \int_0^1\int_{x^2}^{2-x}(xy)dxdy$ & hence evaluate the same.
6. Find the volume bounded by the cylinder $x^2+y^2=4$ & the planes y+z=4 & z=0
7. Find the volume of the ellipsoid $x^2/a^2+y^2/b^2+z^2/c^2=1$
8. S.T the area between the parabolas $y^2=4ax$ & $x^2= 4ay$ is $16/3a^2$
9. Evaluate $\iint_A xy\,dxdy$, where A is the domain bounded by x-axis , ordinate x=2a & the curve $x^2=4ay$
10. Evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dxdy$, by changing to polar coordinates.
11. Change the order of integration and evaluate $\int_0^\infty\int_x^\infty \frac{e^{-y}}{y}dy\,dx$.

12. Find by double integration, the centre of gravity of the area of the cardioid $r = a(1 + cos\theta)$
13. Using double integration, find the centre of gravity of a lamina in the shape of quadrant of the curve $(\frac{x}{a})^{2/3}+(\frac{y}{b})^{2/3} = 1$, the density being $\rho = kxy$, where k is constant
14. P.T β(m+n , n)/m= β(m,n+1)/n = β(m,n)/m+n.
15. Prove that $\beta(m, n) = \frac{\Gamma m.\Gamma n}{\Gamma m+n}$.
16. Evaluate $\int_0^1 x^{3/2}(1-x)^{1/2}\,dx$

Module-5: Linear Algebra

1) Solve the system of linear equations by Gauss elimination method
   $x + 4y - z = -5$; $x + y - 6z = -12$; $3x - y - z = 4$.
2) Use the Gauss –Siedel iteration method to solve the system of equations
   27x + 6y –z =85, 6x + 15y +2z=72, x + y + 54z =110.
3) Solve the system of equation by Gauss- elimination method. $2x_1 + 5x_2 + 2x_3 - 3x_4 = 3$;
   $3x_1 + 6x_2 + 5x_3 + 2x_4 = 2$; $4x_1 + 5x_2 + 14x_3 + 14x_4 = 11$; $5x_1 + 10x_2 + 8x_3 + 4x_4 = 4$
4) Reduce the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ to the diagonal form
5) Solve the system of equations by Gauss Jordon method $2x + y + 4z = 12, 4x + 11y - z = 33, 8x - 3y + 2z = 20$.
6) Test for consistency and solve $5x + 3y + 7z = 4,\ 3x + 26y + 2z = 9,\ 7x + 2y + 10z = 5$.
7) Test for consistency and solve $x + 2y + 2z = 1,\ 2x + y + z = 2,\ 3x + 2y + 2z = 3,\ y + z = 0$. .
8) S.T. the transformation $y_1 = 2x_1 - 2x_2 - x_3$; $y_2 = -4x_1 + 5x_2 + 3x_3$; $y_3 = x_1 - x_2 - x_3$
   a. is regular and find the inverse transformation.
9) Find the largest Eigen value and corresponding Eigen vector by using Rayleigh power method $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$
10) Find the largest eigen value and the corresponding eigen vector of the matrix A, by using the power Method by taking initial vector as $[1,\ 0.8,\ -0.8]^T$ $A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$
11) Reduce the matrix $\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ to the diagonal form

16.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
Jan 2020	10	13	14	22	21	0	19	75.92
2021								

Prepared by	Checked by		
Dr. S. L. Patil Prof. I. N. Kambar	Dr. S. L. Patil	HOD	**Principal**

Subject Title	**Mathematics for Mechanical and Civil Engineering Stream**		
Subject Code	BMATM101/ BMATC101	**IA Marks(20)+Assignments(10)+**	50
Number of Lecture Hrs / Week	02+02	**Exam Marks (appearing for)**	50 (100)
Total Number of Lecture Hrs	40	**Exam Hours**	03
		CREDITS – 04	

FACULTY DETAILS:		
Name: 1) Prof. I. N. Kambar	**Designation** 1) Asst. Prof.	**Experience: 3 month**
No. of times course taught 1) 01 (including present)	**Specialization:** Mathematics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Pre-University Course (Students should have the knowledge of basic subjects)	I and II	Mathematics

2.0 Course Objectives

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

The goal of the course Mathematics-I for Mechanical and Civil Engineering Stream- 22MATM11/22MATC11 is

- Familiarize the importance of calculus associated with one variable and multivariable for computer science and engineering.
- To solve the first order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.
- Analyze computer science and engineering problems by applying Ordinary Differential Equations.
- Apply the knowledge of modular arithmetic to computer algorithms.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner.

3.0 Course Outcomes

After successfully completing the course, the student will be able to understand the topics

Course Code	Course Outcome	POs
C101.1	Apply the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions.	1, 2, 3,12
C101.2	Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian.	1, 2, 3,12
C101.3	Solve first-order linear/nonlinear ordinary differential equations analytically through standard methods.	1, 2, 3,12
C101.4	Demonstrate various models through higher order differential equations and solve such linear ordinary differential equations.	1, 2, 3,12

C101.5	Make use of matrix theory for solving for system of linear equations and compute Eigen values and eigenvectors	1, 2, 3,12
	Total Hours of instruction	**40**

4.0 Course Content

CONTENTS	RBTL	No. of Hrs
Module-1 Calculus Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature -Cartesian, Parametric, Polar and Pedal forms. Problems. **Self-study:** Center and circle of curvature, Evolutes and involutes **Applications:** Applied Mechanics, Strength of Materials, Elasticity, Structural design and paths. **Pedagogy:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08
Module-2 Series Expansion and Multivariable Calculus Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms- L'Hospital's rule. Partial differentiation, total derivative-differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems. **Self-study:** Euler's Theorem and problems. Method of Lagrange undetermined multipliers with single constraint. **Applications:** Computation of stress and strain, Errors and approximations in manufacturing process, Estimating the critical points and extreme values, vector calculus. **Pedagogy:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08
Module-3 Ordinary Differential Equations (ODE's) of first order: Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ *and* $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories, L-R and C-R circuits. Problems. **Nonlinear differential equations:** Introduction to general and singular solutions; Solvable for p only; Clairaut's equations, reducible to Clairaut's equations. Problems. **Self-Study:** Applications of ODE's. Solvable for x and y. **Applications:** Rate of Growth or Decay, Conduction of heat. **Pedagogy:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08
Module-4 Ordinary Differential Equations (ODE's) of higher order: Higher-order linear ODE's with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre homogeneous differential equations. Problems. **Self-Study:** Formulation and Solution of oscillations of a spring. Finding the solution by the method of undetermined coefficients. **Applications:** Applications to oscillations of a spring, Mechanical systems and Trasmission lines, highway engineering. Pedagogy**:** Chalk and talk method/Power Point Presentation	L1 , L2 & L3	08

Module-5 Linear Algebra Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations; Gauss-elimination method, Gauss-Jordan method and Approximate solution by Gauss-Seidel method. Eigen values and Eigenvectors-Rayleigh's power method to find the dominant Eigen value and Eigenvector. **Self-Study**: Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem**.** **Pedagogy:** Chalk and talk method/Power Point Presentation	L1, L2 & L3	08

5.0 Relevance to future subjects

Sl. No.	Semester	Subject	Topics
01	Common to all	Common to all engineering Subjects	Signal and Analysis, Field Theory, Thermodynamics, Fluid Dynamics etc

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Ordinary differential equations serve as Mathematical models for many real word problems.
02	Differential equations are Radioactive decay, chemical reaction, Newton's law of cooling, RL, RC & RLC circuits, simple harmonic motion etc.
03	Integral calculus is used to find the path of the aero plane.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Integral Calculus

8.0 Books Used and Recommended to Students

Text Books

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.

Reference Books

1. V. Ramana: "Higher Engineering Mathematics"-McGraw-Hill Education, 11th Ed. 2017
2. Srimanta Pal & Subodh C**.** Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Reprint, 2016.
3. N.P Bali and Manish Goyal:" A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co. Newyork, 6th Ed., 2017.
5. Gupta C.B, Sing S.R and Mukesh Kumar: Engineering Mathematics for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication 3rd Ed., 2014.
7. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

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 and II) Pune Vidyarthi Griha Prakashan, 7th Edition 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

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME
- VTU e-Shikshana Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Assignments
- Seminar

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

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Two Unit Tests each of **20 Marks (duration 01 hour**)

1. First test after the completion of 30-40 % of the syllabus
2. Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary.
However best two tests out of three shall be taken into consideration.

Two assignments each of 10 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the COs and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 60 marks and will be scaled down to 30 marks

CIE for the practical component of the Integrated Course

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester. ❑❑The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**. The laboratory test **(duration 02/03 hours)** at the end of the 14th /15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks.** Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. 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.
3. The students have to answer 5 full questions, selecting one full question from each module

❖ The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module -1	1	**Differential Calculus-1:**Review of elementary differential calculus, Polar curves	20
	2	Angle between the radius vector and tangent	
	3	Angle between two curves & Problems	
	4	Pedal equation & Problems	
	5	Curvature and Radius of curvature in Cartesian from	
	6	Curvature and Radius of curvature in Polar from	
	7	Centre and circle of curvature (All without proof-formulae only)	
	8	Applications to evolutes and involutes	
Module-2	9	**Differential Calculus-2:** Taylor's and Maclaurin's series for one variable (statement only)	20
	10	Indeterminate forms-L' Hospital's rule & Problems	
	11	Total derivatives & Problems	
	12	Partial differentiation of composite functions	
	13	Maxima and minima for a function of two variables	
	14	Method of Lagrange multipliers with one subsidiary condition	
	15	Jacobians simple problems	
	16	Applications of maxima and minima with illustrative examples	
Module-3	17	**Ordinary differential equations (ODE's) of first order:** Exact and reducible to exact differential equations	20
	18	Bernoulli's differential equations	
	19	Applications of ODEs orthogonal trajectories	
	20	Newton's law of cooling & Problems	
	21	Introduction to general and singular solutions; Solvable for p only	
	22	Clairaut's equation	
	23	Equation reducible to Clairaut's form	
	24	L-R circuits & Nonlinear differential equations	
Module-4	25	**Ordinary differential equations (ODE's) of higher order:** Definition of Ordinary Differential Equation	20
	26	Second order linear ODE's with constant coefficients	
	27	Inverse differential operators	
	28	Method of variation of parameters	
	29	Problems	
	30	Cauchy's homogeneous equations	
	31	Legendre homogeneous equations	
	32	Applications to oscillations of a spring and LCR circuits	
Module-5	33	**Linear Algebra :** Rank of a matrix-echelon form	20
	34	Solution of a system of linear equation-consistency	
	35	Solution of a system of linear equation by Gauss elimination method	
	36	Solution of a system of linear equation by Gauss Jordan method	

	37	Approximate solution by Gauss –Seidel method	
	38	Eigen values and eigenvectors-Rayleigh's power method	
	39	Solution of system of equations by Gauss-Jacobi iterative method	
	40	Inverse of a square matrix by Cayley- Hamilton theorem.	

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	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1,2 &3 of the syllabus	6	Individual Activity.	Book 1, of the reference list. Website of the Reference list
2	Assignment 2: University Questions	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 & 5 of the syllabus	11	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference List

14.0 QUESTION BANK

Module-1: Calculus

15. Find the angle of intersection of the curves $r = a\log\theta$ and $r = \frac{a}{\log\theta}$.
16. Find the Pedal equation of the curve $r^2 = a^2\sin 2\theta + b^2\cos 2\theta$.
17. Find the radius of curvature for the given curve $x^3 + y^3 + 3xy = 1$ at the point (3/2, 3/2)
18. Find the radius of curvature of the curve y = log sin x at x = π/2 .
19. Find the radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis
20. Find the radius of curvature of the curve $xy = c^2$ at (c,c).
21. Find the curvature at (3,-4) to the curve $x^2 + y^2 = 25$.
22. What is the curvature of $x^2+y^2-4x-6y+10 = 0$ at any point on it
23. Find the radius of curvature at any point on the curve $\theta = [\frac{\sqrt{r^2-a^2}}{a}] - \cos^{-1}(a/r)$
24. Find the radius of curvature at $y = 2a$ on the curve $y^2 = 4ax$.
25. Find the radius of curvature of the curve $y = a\cosh(x/a)$ at the point where it crosses the y axis.
26. Find the radius of curvature of the curve $y = \cos\log(\sec(x/c))$.
27. Find the radius of curvature at x = π/2 on the curve $y = 4\sin x - \sin 2x$
28. Find the radius of curvature of the parabola $x = at^2, y = 2at$ at t.
17. For the curve $x = a(\cos\theta + \theta\sin\theta), y = a(\sin\theta - \theta\cos\theta)$, prove that the radius of curvature is aθ
18. Find the radius of curvature at any point $(a\cos 3\theta, a\sin 3\theta)$ on the Curve $x^{2/3}+y^{2/3} = a^{2/3}$
19. Find the coordinates of the centre of curvature at any point of the parabola $y^2 = 4ax$.
20. Find the centre of circle of curvature for $xy(x + y) = 2$ at (1, 1)
21. Find the evolutes of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Module-2: Series Expansion and Multivariable Calculus

16. Expand e^{sinx} by Maclaurin's series up to the term containing x^4.
17. Expand $log\ (1 + cosx)$ by Maclauris series up to the term containing x^4.
18. Obtain the Taylor's expansion of $\log_e x$ about x=1 up to the term containing 4th degree & hence obtain $\log_e$ (1.1).
19. Using Maclaurin's series expand $log(secx)$ up to the term containing x^5
20. Evaluate $\lim_{x\to 0} \left[\frac{a^x+b^x+c^x}{3}\right]^{1/x}$.
21. Find the values of a & b such that $\lim_{x\to \frac{\pi}{2}} \frac{\log cosx}{tanx}$
22. Evaluate $\lim_{x\to \pi/4} (\tan x)^{\tan 2x}$
23. Evaluate $\lim_{x\to 1}(2-x)^{\tan(\frac{\pi x}{2})}$
24. Evaluate $\lim_{x\to 0} \frac{xe^x-\log(1+x)}{x^2}$
25. If $u = \frac{xy}{z}$, $v = \frac{yz}{x}$, $and\ w = \frac{xz}{y}$, find $J = \frac{\partial(u,v,w)}{\partial(x,y,z)}$
26. f $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ & $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$, then P T $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy} = \frac{-\sin u \cos 2u}{4\cos^3 u}$
27. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$
28. If u = f $\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$
29. Discuss the maxima & minima of $f(x,y) = x^3y^2(1-x-y)$
30. Examine the following function for extreme values $f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$

Module-3: Ordinary differential equations (ODE's) of first order

24. Solve: $3e^x tanydx + (1-e^x)sec^2ydy = 0$.
25. Solve: $\frac{dy}{dx}$ = x tan (y –x) + 1
26. Solve: $\frac{dy}{dx} = \frac{x\,(2\log x + 1)}{\sin y + y\cos y}$
27. Solve: (x-y log y + y log x) dx + x (logy - log x) dy =0
28. Solve: (x tan y/x – y $\sec^2$) dx + x $\sec^2$ y/x dy =0
29. Solve: $\frac{dy}{dx} = \frac{2x-y+1}{x+2y-3}$
30. Solve : $e^y\left(\frac{dy}{dx} + 1\right) = e^x$
31. Solve: (x^2 – 4xy – $2y^2$) dx + (y^2 – 4xy – $2x^2$) dy = 0
32. Solve: $\frac{dy}{dx} + ycotx = cosx$.
33. Solve: $\frac{dy}{dx} + xsin2y = x^3cos2y$
34. Solve: $tany\frac{dy}{dx} + tanx = cosycos^2x$
35. Solve: $\frac{dy}{dx} - \frac{2y}{x} = x + x^2$
36. Solve: $(xy^3 + y)dx + (x^2y^2 + x + y^4)dy = 0$
37. Solve: xy(1 + xy^2)$\frac{dy}{dx}$ = 1
38. Solve:$sec^2y\frac{dy}{dx} + xtany = x^3$
39. Find the orthogonal trajectory of the family of coaxial circles $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$
40. Find the orthogonal trajectory of $r^n = a^n \sin n\theta$
41. Find the orthogonal trajectories of the cardioids r = a (1 - cos _)

42. Solve the eqution $e^{3x}(p-1)+p^3e^{2y}=0$ by using substitution $u=e^x, v=e^y$.
43. Obtain the general & the singular solution of the eqution as Clairaut's equation $xp^3-yp^2+1=0$.
44. Solve: $y+px=x^4P^2$
45. Solve: $xp^2+x=2yp$.
46. Solve the equation $e^{3x}(p-1)+p^3e^{2y}=0$ by using substitution $u=e^x, v=e^y$.

Module-- 4: Ordinary differential equations of Higher order

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 $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+2y=10(\frac{x+1}{x})$.
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 $(D^2+1)^2y=x^4+2sinxcos3x.$
15. Solve: $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=e^{2x}-cos2x$.
16. Solve $(D^3-D)y=2x+1+4cosx+2e^x$
17. Solve: $\frac{d^2y}{dx^2}+-4y=cosh(2x-1)+3^x.$
18. Solve: $(D^4-1)y=e^xcosx.$
19. Solve: $((D^2-4D+4)y=8x^2+sin2x$
20. Solve: $((D^2+a^2)y=tanax.$
21. Solve $y''+2y'+y=\frac{logx}{e^x}$ by method of variation of parameter.
22. Solve: $\frac{dt}{dt}+y=sint,\frac{dy}{dx}+x=cost;\ given\ that\ x=2\ \&\ y=0\ when\ t=0.$

Module-5: Linear Algebra

12) Solve the system of linear equations by Gauss elimination method
$x + 4y - z = -5$; $x + y - 6z = -12$; $3x - y - z = 4$.

13) Use the Gauss –Siedel iteration method to solve the system of equations
27x + 6y –z =85, 6x + 15y +2z=72, x + y + 54z =110.

14) Solve the system of equation by Gauss- elimination method. $2x_1 + 5x_2 + 2x_3 - 3x_4 = 3$;
$3x_1 + 6x_2 + 5x_3 + 2x_4 = 2$; $4x_1 + 5x_2 + 14x_3 + 14x_4 = 11$; $5x_1 + 10x_2 + 8x_3 + 4x_4 = 4$

15) Reduce the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ to the diagonal form

16) Solve the system of equations by Gauss Jordon method$2x + y + 4z = 12, 4x + 11y - z = 33, 8x - 3y + 2z = 20$.

17) Test for consistency and solve $5x + 3y + 7z = 4$, $3x + 26y + 2z = 9$, $7x + 2y + 10z = 5$.

18) Test for consistency and solve $x + 2y + 2z = 1$, $2x + y + z = 2$, $3x + 2y + 2z = 3$, $y + z = 0$. .

19) S.T. the transformation $y_1 = 2x_1 - 2x_2 - x_3$; $y_2 = -4x_1 + 5x_2 + 3x_3$; $y_3 = x_1 - x_2 - x_3$
a. is regular and find the inverse transformation.

20) Find the largest Eigen value and corresponding Eigen vector by using Rayleigh power method $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$

21) Find the largest Eigen value and the corresponding Eigen vector of the matrix A, by using the power
Method by taking initial vector as $[1, 0.8, -0.8]^T$ $A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$

22) Reduce the matrix $\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ to the diagonal form

16.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing

Prepared by	Checked by		
Dr. S. L. Patil Prof. I. N. Kambar	Dr. S. L. Patil	HOD	**Principal**

FACULTY DETAILS:		
Name:1) Dr. M. S. Hanagadakar 2) Dr. S. J. Walki	**Designation:**1) Associate Prof. 2) Assistant Prof.	**Experience:**1) 16.0 Years 2) 7.0 Years
No. of times course taught: 1) 22 (including Present) 2) 14 (including Present)	**Specialization:**1) Physical Chemistry 2) Organic Chemistry	

1.0 Prerequisite Subjects:

Students should have the basic knowledge chemistry and Basic Science.

Sl. No	Branch	Semester	Subject
01	EEE/ECE	I	Chemistry for Electrical and Electronics Engineering stream

2.0 Course Objectives

To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the following fields

1. To enable students to acquire knowledge on principles of chemistry for engineering applications.
2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

3.0 Course Outcomes

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

	Course Outcome	POs	RBT Levels
CO1	Identify the terms and processes involved in scientific and engineering applications	1,2,3, & 7	L3
CO2	Explain the phenomena of chemistry to describe the methods of engineering processes	1,2,3, & 7	L1 &L2
CO3	Solve for the problems in chemistry that are pertinent in engineering applications	1,2,3, & 7	L3
CO4	Apply the basic concepts of chemistry to explain the chemical properties and processes	1,2,3, & 7	L3
CO5	Analyze properties and processes associated with chemical substances in multidisciplinary situations	1,2,3, & 7	L1&L2
Total Hours of instruction		**100**	

4.0 Course Content

MODULE 1: Chemistry of Electronic Materials

Conductors and Insulators: Introduction, principle with examples.

Semiconductors: Introduction, production of electronic grade silicon-Czochralski process (CZ) and Float Zone (FZ) methods.

Polymers: Introduction, Molecular weight - Number average, Weight average and numerical problems. Conducting polymers – synthesis and conducting mechanism of polyacetylene. Preparation, properties and commercial applications of graphene oxide. PCB: Electroless plating – Introduction, Electroless plating of copper in the manufacture of double-sided PCB.

Self-learning: Technological importance of metal finishing and distinction between electroplating and electroless plating.

MODULE 2: Energy Conversion and Storage

Batteries: Introduction, classification of batteries. Components, construction, working and applications of modern batteries; Na-ion battery, solid state battery (Li-polymer battery) and flow battery (Vanadium redox flow battery).

Fuel Cells: Introduction, construction, working and applications of methanol–oxygen and polymer electrolyte membrane (PEM) fuel cell.

Solar Energy: Introduction, importance of solar PV cell, construction and working of solar PV cell, advantages and disadvantages.

Self-learning: Electrodes for electrostatic double layer capacitors, pseudo capacitors, and hybrid capacitor.

MODULE 3: Corrosion Science and E-waste Management

Corrosion Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration. Corrosion control - galvanization, anodization and sacrificial anode method. Corrosion Penetration Rate (CPR) – Introduction and numerical problem.

E-waste Management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling. Extraction of copper and gold from e-waste.

Self-learning: Recycling of PCB and battery components

MODULE 4: Nanomaterials and Display Systems

Nanomaterials: Introduction, size dependent properties of nanomaterials (Surface area, Catalytic, Conducting), preparation of nanomaterials by sol-gel and co-precipitation method with example. Introduction, properties and applications - Nanofibers, Nanophotonics, Nanosensors.

Display Systems: Liquid crystals (LC's) - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Properties and application of Organic Light Emitting Diodes (OLED's) and Quantum Light emitting diodes (QLED's).

Perovskite Materials: Introduction, properties and applications in optoelectronic devices

Self-learning: Properties & electrochemical applications of carbon nanotubes and graphene.

MODULE 5: Sensors in Analytical Techniques

Electrode System: Introduction, types of electrodes. Ion selective electrode – definition, construction, working and applications of glass electrode. Determination of pH using glass electrode. Reference electrode - Introduction, calomel electrode – construction, working and applications of calomel electrode. Concentration cell – Definition, construction and Numerical problems.

Sensors: Introduction, working principle and applications of Conductometric sensors, Electrochemical sensors, Thermometric sensors, and Optical sensors.

Analytical Techniques: Introduction, principle and instrumentation of Colorimetric sensors; its application in the estimation of copper, Potentiometric sensors; its application in the estimation of iron, Conductometric sensors; its application in the estimation of weak acid.

Self-learning: IR and UV- Visible spectroscopy.

PRACTICAL MODULE

A– Demonstration (any two) offline/virtual:

A1. Synthesis of polyurethane
A2. Determination of strength of an acid in Pb-acid battery
A3. Synthesis of iron oxide nanoparticles
A4. Electroplating of copper on metallic objects

B – Exercise (compulsorily any 4 to be conducted):

B1.Conductometric estimation of acid mixture
B2. Potentiometric estimation of FAS using K2Cr2O7
B3. Determination of pKa of vinegar using pH sensor (Glass electrode)

B4. Determination of rate of corrosion of mild steel by weight loss method
B5.Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):
C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method
C4. Estimation of Sodium present in soil/effluent sample using flame photometry
C5. Determination of Chemical Oxygen Demand(COD) of industrial waste water sample

D – Open Ended Experiments (any two):
D1. Estimation of metal in e-waste by optical sensors
D2. Electroless plating of Nickle on Copper
D3. Determination of glucose by electrochemical sensors
D4. Synthesis of polyaniline and its conductivity measurement

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	II	Nano technology, Water chemistry, Civil. ECE/EEE,/ME,Corrosion study, (Common to all Engineering subjects)	Introduction to fundamental aspects of chemistry and Engineering chemistry in I/II semester Students will learn the laboratory and practical techniques needed for the later years of the course. Students have to choose and elective paper on applied chemistry as well.

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Generate electricity in the most efficient fashion to preserve our natural resources and protect the environment.
02	Improve mining techniques, so they minimize environmental damage and cost less.
03	Manufacture petrochemicals, making them cheaper and safe for people to use Create renewable fuels and energy sources to replace coal, petrol and gas. Refine oil into petrol, keeping petrol prices low and improving petrol quality so it doesn't pollute the air.
04	Produce safe drinking water from rivers, groundwater or the sea for city, rural and remote aboriginal communities.
05	Safely treat toxic hazardous industrial wastes so their disposal does not harm the environment
06	Nanotechnology (an emerging scientific area utilizing very small particles for diverse applications)
07	Semi-conductors & microelectronics (many chemical engineers work in these areas)

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Numerical problems discussion
02	NPTEL	Each module/ Chapter presentation

8.0 Books Used and Recommended to Students

Text Books

1. B. S. Jai Prakash, R. Venigopal, Shivakumarraiah, PushpaIyengar, Chemistry for Engineering Students, Subhas Stores (Bangalore), 2014

2. R. V. Gadag and A. N. Shetty, Engineering Chemistry, IK International Publishing House, New Delhi, Third Edition 2014
3. P.C. Jain & Monica Jain. **"Engineering Chemistry"**, DhanpatRai Publications, New Delhi (2015 Edition).
4. S. S. Dara, A textbook of Engineering Chemistry, 10th Edition, S Chand & Co., Ltd., New Delhi, 2014.
5. Physical Chemistry, by P. W. Atkins, Oxford Publications (Eighth edition-2006).

Reference Books

1. O.G.Palanna,"Engineering Chemistry",Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.
2. G.A.Ozin& A.C. Arsenault, "NanochemistryA Chemical Approach to Nanomaterials", RSC publishing, 2005.
3. V. R. Gawariker, N V. Viswanathan, JayadevSreedhar, Polymer Science, New Age International (P) Ltd., New Delhi, 2nd edition 2015.
4. M.G.Fontana., "Corrosion Engineering", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi.
5. Engineering Chemistry by S.S Dara, S.S Umare., S. Chand & Co. Pvt Ltd. New Delhi.
6. Engineering Chemistry by P.R.Vijayasarathy, Second Edition, PHI Learning Pvt. Ltd. New Delhi.
7. Puri B R Sharma L R and Madan S Pathania, Principles of Physical Chemistry, Vishal publishing Co., Edition 2004
8. ArunBahl, B. S. Bahl, A Text Book of Organic Chemistry, S Chand and Co. Ltd., First Edition 2005
9. Michael F. Ashby, Paulo J. Ferreira, Daniel L. Schodek, Nano Materials, Nanotechnologies and Design, Elsevier India Pvt. Ltd., 2011.
10. T Pradeep, NANO: The Essentials, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012, 7th Reprint
11. Fred W. Billmeyer, Text Book of Polymer Science, Wiley India (P) Ltd., Third Edition 2011

Additional Study material & e-Books

1. Introduction to Chemistry - Tracy Poulsen; 250 pages; ISBN-13: 9781478298601; ISBN-10: 147829860X
2. Elementary Applied Chemistry * - Lewis BenajahAllyn; 152 pages; Publisher: Ginn and Company 1912; ISBN/ASIN: 1112247610.
3. Kuriocose, J C and Rajaram, J, Engineering Chemistry, Volume I/II, Tata McGraw- Hill Publishing Co. Ltd.New Delhi, 2000

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

Website and Internet Contents References

1.http://www.mooc-list.com/course/chemistry-minor-saylororg
2. https://www.canvas.net/courses/exploring-chemistry
3. http://nptel.ac.in/courses/122101001/
4.http://www.nptelvideos.in/2012/11/engineering-chemistry-1.html

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/

3	Nanotechnology, Science and Applications	https://www.dovepress.com/nanotechnology-science-and-applications-journal

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 20 Marks (duration 01 hour)

* First test after the completion of 30-40 % of the syllabus
* Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration.

Two assignments each of 10 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/Hands-on practice (experiments)/Group Discussions/others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not besyllabus portion of the course). CIE methods/test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 60 marks and will be scaled down to 30 marks

CIE for the practical component of the Integrated Course

1. On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester. common/repeated for any of the methods of the CIE. Each method of CIE should have a different
2. The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
3. The laboratory test **(duration 02/03 hours)** at the end of the 14th /15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks.**
4. Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

Semester End Examination (SEE): SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. 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.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

SCHEME OF EXTERNAL EXAMINATION:

Ten main questions to be set in question paper. Each main question will carry 16 marks. Student has to answer either 1 or 2 main question. It will continue up to 10th question.

Module I– Question 1(a,b,c) or 2(a,b,c) = 20Marks
Module II – Question 3(a,b,c) or 4(a,b,c) = 20Marks
Module III– Question 5(a,b,c) or 6(a,b,c) = 20Marks
Module IV – Question 7(a,b,c) or 8(a,b,c) = 20Marks
ModuleV – Question 9(a,b,c) or 10(a,b,c) = 20Marks
Total = 100Marks

INSTRUCTION FOR ENGINEERING CHEMISTRY (22CHEE12/22) EXAMINATION

1. The total exam duration is 3 hours.
2. Use black ink pen for writing examination
3. Drawing should be drawn from dark pencil.
4. Read the questions carefully.
5. Answer the questions up to the point.

Passing standard:

1. The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
2. SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	Conductors and Insulators: Definition of conductors, semiconductor and insulators based on band theory, principle with examples taking Cu, Si **and Quartz or any suitable example.**	20.0
	2	Semiconductors: Introduction, production of electronic grade silicon from quartz	
	3	i) Czochralski process (CZ) and ii) Float Zone (FZ) methods	
	4	Polymers: Importance and developments in the field of olymers, Definition of number and weight average molecular mass, Formulae there in.	
	5	Numerical problems on Number average and Weight average molecular mass	
	6	PCB: Electroless plating – Introduction, Electroless plating of Copper in the manufacture of double-sided PCB.	
	7	Conducting polymers – synthesis of polyacetylene, Conducting mechanism of polyacetylene (explanation interms of either p or n- doping) steps involved include polaron, bipolaron and soliton	

		pair simpleaddition technique, zeigler Nutta catalyst).	
	8	Graphene Oxide: Preparation(hummers method), properties and commercial applications (any 4 each).	
2	1	Batteries: Introduction, classification of batteries as primary, secondary **and reserve batteries with examples**	**20.0**
	2,3,4	Components, construction, working and applications of modern batteries; **Na-ion battery i)solid state battery (Li-polymer battery) and iii) flow battery (Vanadium redox flow battery)**	
	6	Fuel Cells: Introduction, construction, working and applications of **methanol–oxygen**	
	7	**polymer electrolyte membrane (PEM) fuel cell**	
	8	Solar Energy: Introduction, importance of solar PV cell, Construction and working of solar PV cell, advantages and disadvantages.	
3	1	**Corrosion Chemistry:** Introduction (ill effects, global losses, technological importance), electrochemical theory of corrosion (principle, reactions under different conditions anddiagram taking iron as an example)	**20.0**
	2	Types of corrosion- differential metal ((Definition, Principle, Process and application)	
	3	Differential aeration (principle, explanation with examples), Corrosion control – ((Definition, Principle, Process and application)galvanization,	
	4	Anodization and sacrificial anode method	
	5	Corrosion Penetration Rate (CPR) (Definition and formula) - Introduction and numerical problems (at least 4)	
	6	E-waste Management: Introduction (ill effects of e-waste management, global losses, environmental importance), sources, types, effects of e-waste on environment and human health	
	7	Methods of disposal(Classification) , advantages of recycling	
	8	Extraction of copper and gold from e-waste(Principle, process, taking PCB as an example)	
4	1	Nanomaterials: Introduction, size dependent properties of nanomaterials(Surface area, Catalytic, Conducting)	**20.0**
	2	Preparation of nanomaterials by sol-gel and co-precipitation method with example.	
	3	Introduction, properties and applications - Nanofibers, Nanophotonics, Nanosensors.	
	4	Display Systems: Liquid crystals (LC's) - Introduction, classification, properties	
	5	Application in Liquid Crystal Displays (LCD's).	
	6	Properties and application of Organic Light Emitting Diodes (OLED's)	
	7	Properties and application of Quantum Light emitting diodes	

		(QLED's).	
	8	Perovskite Materials: Introduction, properties and applications in **optoelectronic devices (solar cells).**	
5	1	Electrode System: Introduction, types of electrodes	**20.0**
	2	Ion selective electrode – definition, construction, working and applications of glass electrode. Determination of pH using glass electrode	
	3	Reference electrode - Introduction, calomel electrode – construction, working and applications of calomel lectrode	
	4	Concentration cell – Definition, construction and Numerical problems	
	5	Sensors: Introduction, general working principle (schemati diagram and explanation) and applications of conductometri sensors	
	6	Introduction, brief working principle and applications electrochemical sensors, Thermometric sensors, and Optical sensors.(No instrumentation)	
	7	Analytical Techniques: Introduction, principle and instrumentation of Colorimetric sensors; application in estimation of the Copper	
	8	Potentiometric sensors; (definition and Principle Instrumentation and working application in estimation of Iron) conductometric sensors; (definition and Principle Instrumentation and working application its application in the estimation of weak acid.	

13.0 QUESTION BANK

Module-I Chemistry of Electronic Materials

1) What are conductors and insulators? Explain the principle involved in conductors and insulators by taking an examples.
2) Mention the differences between conductors, semiconductors and insulators.
3) What are semiconductors? Explain the production of electronic grade silicon by Czochralski (CZ) process.
4) Explain the production of electronic grade silicon by Float Zone (FZ) method.
5) What are conducting polymers? Explain the synthesis and conducting mechanism of polyacetylene. Mention its commerci applications.
6) Explain the preparation, properties and commercial applications of graphene oxide.
7) Define electroless plating. Describe the electroless plating of copper in the manufacture of double-sided PCB.

MODULE 2: Energy Conversion and Storage

1) Define batteries. Explain the construction, working and applications of Na-ion battery.
2) Explain the components in the battery.
3) Describe construction, working and applications of Li-polymer solid state battery.
4) Explain construction, working and applications of Vanadium redox flow battery.
5) Define fuel cells. Explain the construction, working and applications of Methanol-oxygen fuel cell.
6) Explain the construction, working and applications of polymer electrolyte membrane (PEM) fuel cell.

7) What are photovoltaic cells? Explain the construction and working of solar photovoltaic cell. Mention their advantages and disadvantages.

MODULE 3: Corrosion Science and E-waste Management

1) Define Metallic corrosion. Explain the electrochemical theory of corrosion.
2) Define differential metal corrosion and differential aeration corrosion.
3) Explain the corrosion taking place when two different metals are in contact with each other.
4) Explain the water line and pitting corrosion.
5) Define the galvanization. Explain the steps involved galvanizing.
6) Define anodization. Explain anodizing of Aluminium.
7) Define corrosion penetration rate (CPR).
8) Define E-waste. Explain the sources and types of e-waste.
9) Describe the effects of e-waste on environment and human health.
10) Explain the methods of disposal of e-waste.
11) Write a note on the advantages of recycling.
12) Explain the extraction of copper and gold from e-waste.

MODULE 4: Nanomaterials and Display Systems

1) What are nanomaterials ? Explain the size dependent properties of nanomaterials.
2) Explain the preparation of nanomaterials by sol-gel method with example.
3) Explain the preparation of nanomaterials by co-precipitation method with example.
4) Write a note on properties and applications of nanofibres.
5) Explain the properties and applications of nanophotonics and nanosensors.
6) What are liquid crystals? Explain the classification of liquid crystals.
7) Describe the properties of Liquid crystals and application in LCD's.
8) Explain the properties and applications of organic light emitting diodes (OLED's).
9) Explain the properties and applications of Quantum light emitting diodes (QLED's).
10) What are perovskite materials? Explain the properties and applications in optoelectronic devices.

MODULE 5: Sensors in Analytical Techniques

1) Explain the types of electrodes.
2) Define Ion selective electrode. Explain the construction, working and applications of glass electrode.
3) Explain the determination of pH using glass electrode.
4) Define reference electrode. Explain the construction, working and applications of calomel electrode.
5) Define concentration cells. Explain construction of concentration cells.
6) Numerical problems on Concentration cell.
7) Explain the working principle and applications of Conductometric sensors.
8) Explain the working principle and applications of electrochemical sensors.
9) Describe the working principle and applications of Thermometric sensors.
10) Describe the working principle and applications of optical sensors.
11) Explain the principle and instrumentation of colorimetric sensors and applications in the estimation of copper.
12) Explain the principle and instrumentation of potentiometric sensors and its applications in the estimation of iron.
13) Explain the principle and instrumentation of conductometric sensors and its applications in the estimation of weak acid.

14.0 University Result

Examination	S	A	B	C	D	E	% Passing
Jan 2018							

Prepared by	Checked by		
			
Prepared by **1) Dr. M. S. Hanagadakar** **2) Mr. S. J. Walki**	**HOD**(Chemistry) **(Dr. M. S. Hanagadakar)**	**HOD**	**Principal**

Subject Title	**Applied Chemistry for Mechanical**		
Subject Code	BCHEM102	**CIE Marks**	50
		SEE Marks	50
Number of Lecture Hrs / Week	05(3+2)	**Total Marks**	100
Total Number of Lecture Hrs	40 hours Theory + 10 to12 Lab slots	**Exam Hours**	03+02
CREDITS – 04			

FACULTY DETAILS:		
Name: 1) Dr. M. S. Hanagadakar 2) Dr. S. J. Walki	**Designation:** 1) Associate Prof. 2) Assistant Prof.	**Experience:** 1) 15.5 Years 2) 7.0 Years
No. of times course taught: 1) 22 (including Present) 2) 14 (including Present)	**Specialization:** 1) Physical Chemistry 2) Organic Chemistry	

1.0 Prerequisite Subjects:

Students should have the basic knowledge chemistry and Basic Science.

Sl. No	Branch	Semester	Subject
01	ME	I	Applied Chemistry for Mechanical Engineering stream

2.0 Course Objectives

To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the following fields

4. To enable students to acquire knowledge on principles of chemistry for engineering applications
5. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
6. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

3.0 Course Outcomes

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

	Course Outcome	**POs**	**RBT Levels**
CO1	Identify the terms and processes involved in scientific and engineering applications	1,2,3, & 7	L3
CO2	Explain the phenomena of chemistry to describe the methods of engineering processes	1,2,3, & 7	L1 &L2
CO3	Solve for the problems in chemistry that are pertinent in engineering applications	1,2,3, & 7	L3
CO4	Apply the basic concepts of chemistry to explain the chemical properties and processes	1,2,3, & 7	L3
CO5	Analyze properties and processes associated with chemical substances in multidisciplinary situations	1,2,3, & 7	L1&L2
Total Hours of instruction		**100**	

4.0 Course Content

Module-1: Energy; Source, Conversion and Storage

Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV.

Green fuels: Introduction, power alcohol, synthesis and applications of biodiesel.

High energy fuels: Production of hydrogen by electrolysis of water and its advantages. **Energy devices:** Introduction, construction, working, and applications of Photovoltaic cells, Li-ion battery and methanol-oxygen fuel cell.

Module-2: Corrosion Science and Engineering

Corrosion: Introduction, electrochemical theory of corrosion, types of corrosion- differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement).

Corrosion control: Metal coating-galvanization, surface conversion coating-anodization and cathodic protection-sacrificial anode method. Corrosion testing by weight loss method. Corrosion penetration rate (CPR)-numerical problems.

Metal finishing: Introduction, technological importance. Electroplating: Introduction, Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel.

Module-3: Macromolecules for Engineering Applications

Polymers: Introduction, methods of polymerization (Condensation and Freeradical), molecular weight; number average and weight average, numerical problems. Synthesis, properties and industrial applications of polyvinylchloride (PVC) and polystyrene.

Fibers: Introduction, synthesis, properties and industrial applications of Kevlar and Polyester.

Plastics: Introduction, synthesis, properties and industrial applications of poly(methyl methacrylate) (PMMA) and Teflon.

Composites: Introduction, properties and industrial applications of carbon-based reinforced composites (graphene/carbon nano-tubes as fillers) and metal matrix polymer composites.

Lubricants: Introduction, classification, properties and applications of lubricants

Module-4: Phase Rule and Analytical Techniques

Phase rule: Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component-lead-silver system.

Analytical techniques: Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetry); its application in the estimation of the copper, pH-sensor (Glass electrode); its application in the determination of pH of beverages.

Module-5: Materials for Engineering Applications

Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Brass and Alnico.

Ceramics: Introduction, classification based on chemical composition, properties and applications of perovskites ($CaTiO_3$).

Nanochemistry: Introduction, size-dependent properties of nanomaterial (surface area, catalytical and thermal), synthesis of nanoparticles by sol-gel, and co-precipitation method. **Nanomaterials:** Introduction, properties and engineering applications of carbon nanotubesand graphene.

PRACTICAL MODULE

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polyurethane

A2. Preparation of urea formaldehyde resin

A3. Synthesis of iron oxide nanoparticles

A4. Determination of acid value of biofuel

B – Exercise (compulsorily any 4 to be conducted):
B1. Conductometric estimation of acid mixture
B2. Potentiometric estimation of FAS using K2Cr2O7
B3. Determination of pKa of vinegar using pH sensor (Glass electrode)
B4. Determination of rate of corrosion of mild steel by weight loss method B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):
C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method
C4. Estimation of Sodium present in soil/effluent sample using flame photometry
C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):
D1. Estimation of percentage of iron in steel
D2. Electroplating of desired metal on substrate D3. Synthesis of biodiesel
D4. Synthesis of Aluminium Oxide nano particle

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	I	Nano technology, Water chemistry, Corrosion study, (Common to all Engineering subjects)	Introduction to fundamental aspects of chemistry and Engineering chemistry in I/II semester Students will learn the laboratory and practical techniques needed for the later years of the course. Students have to choose and elective paper on applied chemistry as well.

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Generate electricity in the most efficient fashion to preserve our natural resources and protect the environment.
02	Improve mining techniques, so they minimize environmental damage and cost less.
03	Manufacture petrochemicals, making them cheaper and safe for people to use Create renewable fuels and energy sources to replace coal, petrol and gas. Refine oil into petrol, keeping petrol prices low and improving petrol quality so it doesn't pollute the air.
04	Produce safe drinking water from rivers, groundwater or the sea for city, rural and remote aboriginal communities.
05	Safely treat toxic hazardous industrial wastes so their disposal does not harm the environment
06	Nanotechnology (an emerging scientific area utilizing very small particles for diverse applications)
07	Semi-conductors & microelectronics (many chemical engineers work in these areas)

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Numerical problems discussion
02	NPTEL	Each module/ Chapter presentation

8.0 Books Used and Recommended to Students

Text Books

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
3. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
4. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley Engineering Chemistry – I, D. Grour Krishana, Vikas Publishing.
5. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.
6. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
7. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
8. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
9. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
10. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,

Reference Books

1. 10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
2. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
3. .Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
4. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell , 2012
5. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, Elzbieta Frackowiak, Wiley-VCH; 1st edition, 2013.
6. "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017. Dr. H. Panda,
7. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
8. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
9. 18. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley & Sons, 2010
10. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan, Nirali Prakashan, 2020
11. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020

Additional Study material & e-Books

1. 21. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021
2. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16th Edition.
3. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press, 1st Edition,2002.
4. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3rd Edition
5. Principles of nanotechnology, Phanikumar, Scitech publications, 2nd Edition, 2010.

9.0 Relevant Websites (Reputed Universities and Others) for

Notes/Animation/Videos Recommended

Web links and Video Lectures (e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

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/
3	Nanotechnology, Science and Applications	https://www.dovepress.com/nanotechnology-science-and-applications-journal

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 20 Marks (duration 01 hour)

* First test after the completion of 30-40 % of the syllabus
* Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration.

Two assignments each of 10 Marks

The teacher has to plan the assignments and get them completed by the students well before the

closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/Hands-on practice (experiments)/Group Discussions/others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not besyllabus portion of the course). CIE methods/test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Continuous Internal Evaluation (CIE): The CIE marks for the theory component of the IC shall be 30 marks and for the laboratory component 20 Marks.

5. On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester. common/repeated for any of the methods of the CIE. Each method of CIE should have a different
6. The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
7. The laboratory test **(duration 02/03 hours)** at the end of the 14th /15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks.**
8. Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

Semester End Examination (SEE):

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

4. The question paper will have ten questions. Each question is set for 20 marks.
5. 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.
6. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

SCHEME OF EXTERNAL EXAMINATION:

Ten main questions to be set in question paper. Each main question will carry 16 marks. Student has to answer either 1 or 2 main question. It will continue up to 10^{th} question.

Module I– Question 1(a,b,c) or 2(a,b,c)	=	20Marks
Module II – Question 3(a,b,c) or 4(a,b,c)	=	20Marks
Module III– Question 5(a,b,c) or 6(a,b,c)	=	20Marks
Module IV – Question 7(a,b,c) or 8(a,b,c)	=	20Marks
ModuleV – Question 9(a,b,c) or 10(a,b,c)	=	20Marks
Total = 100Marks		

INSTRUCTION FOR ENGINEERING CHEMISTRY (22CHEE12/22) EXAMINATION

6. The total exam duration is 3 hours.
7. Use black ink pen for writing examination
8. Drawing should be drawn from dark pencil.
9. Read the questions carefully.
10. Answer the questions up to the point.

Passing standard:

3. The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory

component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.

4. SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	**Fuels:** Introduction, (definition and classification of chemical fuels); calorific value (definition determination of calorific value using bomb calorimeter)	20.0
	2	Numerical problems on GCV and NCV	
	3	**Green fuels:** Introduction, power alcohol, (definition, combustion characteristics, Advantages & disadvantages)	
	4	Biodiesel (definition, synthesis, Advantages, disadvantages and applications)	
	5	**High energy fuels:** Introduction, Production of hydrogen by electrolysis of water and its advantages. Applications	
	6	**Energy devices:** Photovoltaic cells (Introduction, construction, working, Advantages & disadvantages and applications)	
	7	Li-ion battery (Introduction, construction, working with reactions and applications)	
	8	**Fuel cell** (Introduction, Differences between conventional cell and fuel cell, Limitations and advantages of fuel cells, Methanol-oxygen fuel cell - construction and working methanol-oxygen fuel cell with acid electrolyte)	
2	1	**Corrosion:** Introduction (ill effects, global losses, technological impor tance),	20.0
	2	Electrochemical theory of corrosion, (principle, reactions under different conditions and diagram taking iron as an example),	
	3	**Types of Corrosion**-Differential metal (principle, explanation with examples), Differential aeration (principle, explanation with examples for waterline and pitting),	
	4	Stress corrosion (principle, explanation of caustic embrittlement as an example).	
	5	**Corrosion control:** Metal Coating - Galvanization (Definition, Principle, Process and application), Surface conversion coating - Anodization (Definition, principle, process and applications),	
	6	**Cathodic Protection-** (Definition, principle, process and applications of Sacrificial anode method) Corrosion Testing- Weight loss method and Corrosion n penetration rate (CPR)-Definition, principle, process and numerical problems.	
	7	**Metal finishing:** Introduction, technological importance. Electroplating: Introduction, Electroplating of chromium (hard and decorative).	
	8	Electro less plating: Introduction, Electro less plating of Nickel, (Principle, reactions & applications).	
3	1	**Polymers**: Introduction, methods of polymerization (Condensation and Free radical), molecular weight; number average and weight average,	20.0
	2	Numerical problems on number average and weight average molecular	

		weight	
	3	C- Polyvinylchloride (C- PVC) and Polystyrene - Synthesis, properties and industrial applications.	
	4	**Fibres:** Introduction, Definition and Structural properties, Ex-Kevlar and Polyester (synthesis, properties and industrialapplications).	
	5	**Plastics:** Introduction, Definition and Structural properties, Compounding plastics, Ex - Poly (methyl methacrylate) and Teflon – Synthesis, Properties and Industrial applications.	
	6	**Composites:** Introduction, Definition and Structural properties and industrial applications	
	7	Ex- 1. Carbon-based reinforced composites (graphene/carbon nano-tubes as fillers) Ex- 2. Metal matrix polymer composites	
	8	**Lubricants**: Introduction, classification, properties and industrial applications of lubricants	
4	1	**Phase rule**: Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation.	**20.0**
	2	**Phase diagram:** Explanation, Diagram and applications of Two component system phase diagram, Ex- Lead-Silver system	
	3	**Analytical techniques**: Introduction, General working principle, construction and classification.	
	4	**Potentiometric sensors** – Definition, Principle, instrumentation and working, application in estimation of Iron	
	5	**Optical sensors** – Definition, Principle, instrumentation and working, of colorimetry	
	6	Application of colorimetry) in estimation of the Copper	
	7	**pH sensors** – Definition, Principle, instrumentation and working, (Glass electrode),	
	8	Application of Glass electrode in the determination of pH of beverages	
5	1	**Alloys**: Introduction, Definition, classification, composition,	**20.0**
	2	Properties and applications of Stainless Steel, Solders, Brass and Alnico.	
	3	**Ceramics**: Introduction, Definition, classification based on chemical composition,	
	4	Properties and applications of perovskites (CaTiO3).	
	5	**Nanochemistry:** Introduction, size-dependent properties of nanomaterial (surface area, catalytical and thermal)	
	6	Synthesis of nanoparticles by sol-gel, and co-precipitation method	
	7	**Nanomaterials**: Introduction, properties and engineering applications	
	8	Applications of carbon nanotubes and graphene.	

13.0 QUESTION BANK

Module-1: Energy; Source, Conversion and Storage

1. Give the classification of fuels with examples.
2. On burning 0.83 x 10-3Kg of a solid fuel in a bomb calorimeter, the temperature of 3.5Kg of water increased from 26.5 oC to 29.2 oC. The water equivalent of calorimeter and latent heat of steam are 0.385Kg and 4.2 x 587 KJ/Kg respectively. If the fuel contains 0.7% hydrogen, calculate its gross and net calorific values
3. What is power alcohol? Give its advantages as a fuel.

4. Define Gross and Net calorific values. Explain Bomb's calorimetric method of determining calorific value of a solid fuel.
5. What is chemical fuel ? write a note on classification of fuel
6. Define the terms : gross calorific value & net calorific value.
7. What is solar cell? Explain the construction & working of PV cell
8. Explain the following terms : a. Power alcohol b. biodiesel

Module-2: Corrosion Science and Engineering

1. What is metallic corrosion? Explain with electrochemical theory the mechanism of corrosion of iron.
2. Define dry corrosion. Explain i) Corrosion by oxygen ii) Corrosion by other gases and iii) Liquid metal corrosion
3. Explain differential metal corrosion with suitable example.
4. Explain differential aeration or concentration cell corrosion with suitable example.
5. Explain with suitable example the following types of corrosion
   i) Pitting corrosion ii) Water line corrosion ii) Stress corrosion
6. What is metallic coating? Explain anodic coating of a metal.
7. Write a note on Galvanization
8. What is meant by anodizing? Explain anodizing of aluminum (With electrolysis diagram).
9. What is cathodic protection? Explain corrosion control by sacrificial anode and impressed current technique for prevention of corrosion method.
10. Explain the type of corrosion occurs when
    a) Small particles of dust on iron for long time.
    b) Steel pipe is connected to copper plumbing.
    c) Screw and washer are made of different metal
    d) Bolt and nut made from different metals in contact with each other.
    e) A small nail inside the wall
11. Numerical problems on corrosion penetration rate.

Module-3: Macromolecules for Engineering Applications

Module-4: Phase Rule and Analytical Techniques

1. Explain the theory, instrumentation and applications of flame photometry.
2. Explain the theory and instrumentation of potentiometry.
3. Explain Theory, Instrumentation and applications of Colorimeter.
4. Explain Theory, Instrumentation and applications of Conductometry.
5. Define :i) Transmittance (T) ii) Absorbance (A) or Optical density (O.D.)
6. State i) Beer's law ii) Lambert's law iii) Beer-Lamberts law iv) Ohms law
7. Define and explain the following i) Conductance ii)Specific conductance iii) Molar conductance iv) Equivalent conductance
8. Explain with the principle estimation of the amount of Sodium/ Potassium present in the given sample of water using flame photometry.
9. Explain with the principle colorimetric estimation of copper
10. Explain the following conductometric titrations i) Strong acid Vs Strong base ii) weak acid Vs Strong base iii) Mixture of Strong acid and weak acid Vs Strong base.
11. Explain estimation of potentiometric titration-estimation of FAS using standard $K_2Cr_2O_7$ solution.

Module-5: Materials for Engineering Applications

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14.0 University Result

Examination	S	A	B	C	D	E	% Passing

Prepared by	Checked by		
			
Prepared by **3) Dr. M. S. Hanagadakar** **4) Dr. S. J. Walki**	**HOD**(Chemistry) **(Dr. M. S. Hanagadakar)**	**HOD**	**Principal**

Subject Title	**Applied Chemistry for Civil Engineering stream**		
Subject Code	BCHEC102	**CIE Marks**	50
		SEE Marks	50
Number of Lecture Hrs / Week	05(3+2)	**Total Marks**	100
Total Number of Lecture Hrs	40 hours Theory + 10 to12 Lab slots	**Exam Hours**	03+02
CREDITS – 04			

FACULTY DETAILS:		
Name:1) Dr. M. S. Hanagadakar 2) Dr. S. J. Walki	**Designation:**1) Associate Prof. 2) Assistant Prof.	**Experience:**1) 16.0 Years 2) 7.0 Years
No. of times course taught: 1) 22 (including Present) 2) 14 (including Present)	**Specialization:**1) Physical Chemistry 2) Organic Chemistry	

1.0 Prerequisite Subjects:

Students should have the basic knowledge chemistry and Basic Science.

Sl. No	Branch	Semester	Subject
01	EEE/ECE	I	Chemistry for Electrical and Electronics Engineering stream

2.0 Course Objectives

To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the following fields

7. To enable students to acquire knowledge on principles of chemistry for engineering applications
8. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
9. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

3.0 Course Outcomes

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

	Course Outcome	POs	RBT Levels
CO1	Identify the terms and processes involved in scientific and engineering applications	1,2,3, & 7	L3
CO2	Explain the phenomena of chemistry to describe the methods of engineering processes	1,2,3, & 7	L1 &L2
CO3	Solve for the problems in chemistry that are pertinent in engineering applications	1,2,3, & 7	L3
CO4	Apply the basic concepts of chemistry to explain the chemical properties and processes	1,2,3, & 7	L3
CO5	Analyze properties and processes associated with chemical substances in multidisciplinary situations	1,2,3, & 7	L1&L2
Total Hours of instruction		**100**	

4.0 Course Content

Module -1:- Structural Materials

Metal and Alloys: Introduction (Definitions and types of alloys), Properties and applications of Iron and its alloys (Stainless Steel). Aluminium and its alloys (Duralumin and Aluminium-Mg alloy).

Cement: Introduction, composition, properties, classification, manufacturing process of cement (Wet method). Process of setting and hardening of cement. Additives for cement (Accelerators, Retarders, Extenders & dispersants) and Testing of cement (% of CaO by EDTA method).

Refractories: Introduction (Definition), classification based on chemical composition, Properties and applications of refractory materials.

Glass: Introduction (Definition),Composition, Types, Preparation of Soda-lime glass. Properties and applications of glass.

Module-2: Energy Conversion and Storage, Corrosion

Energy conversion: Introduction, construction, working, and applications of Photovoltaiccells, methanol-oxygen fuel cell.

Storage devices: Introduction, construction and working of Li-ion battery.

Corrosion: Introduction, electrochemical corrosion of steel in concrete, types (differential metal and aeration), Stress corrosion in civil structures, corrosion control (design andselection of materials, galvanization, anodization and sacrificial anode method).

Module-3: Water Technology and Nanotechnology

Water technology: Introduction, water parameters, hardness of water, determination of temporary, permanent and total hardness by EDTA method, numerical problems, softening of water by ion exchange method, desalination of water by electrodialysis, determination of COD, numerical problems. Forward osmosis: Introduction, Process and applications.

Nanotechnology: Introduction, size dependent properties of nanomaterial (surface area and catalytic), Synthesis of nanomaterial by sol-gel method and co-precipitation method.

Nano materials: Introduction, properties and engineering applications of carbon nanotubes, graphene and nanomaterials for water treatment (Metal oxide).

Module-4:Polymer and Composites

Polymer: Introduction, methods of polymerization, molecular weight of polymers, numerical problems. Synthesis, properties and engineering applications of polyethylene (PE) and Chloropolyvinyl chloride (CPVC).

Fibers: Synthesis, properties and applications of nylon fibers.

Polymer composites: Introduction, properties and applications of fiber reinforcedpolymers composites (FRPC),

Geo polymer concrete: Introduction, synthesis, constituents, properties and applications.

Adhesives: Introduction, properties and applications of epoxy resin. Biodegradable

polymers: Synthesis of polylactic acid (PLA) and their applications. Self-learning: Biopolymer: Introduction, structural properties, and applications ofcellulose and lignin

Module-5:Phase Rule and Analytical Techniques

Phase rule: Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component-lead-silver system.

Analytical techniques: Introduction, principle, instrumentation of potentiometric sensors and its application in the estimation of iron, conductometric sensors and its application in the estimation of acid mixture, pH-sensors and its application in the determination of soil sample.

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polyurethane

A1. Synthesis of polyurethane

A2. Quantitative estimation of Aluminium by precipitation method A3. Synthesis of iron oxide nanoparticles

A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using K2Cr2O7

B3. Determination of pKa of vinegar using pH sensor (Glass electrode)

B4. Determination of rate of corrosion of mild steel by weight loss method B5.Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method C4. Estimation of Sodium present in soil/effluent sample using flame photometry

C5. Determination of Chemical Oxygen Demand(COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1. Gravimetric estimation of gypsum in Portland cement D2. Electroplating of desired metal on substrate

D3. Estimation of manganese dioxide in pyrolusite

D4. Analysis of cement for its components

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	II	Nano technology, Water chemistry, Civil. ECE/EEE,/ME,Corrosion study, (Common to all Engineering subjects)	Introduction to fundamental aspects of chemistry and Engineering chemistry in I/II semester Students will learn the laboratory and practical techniques needed for the later years of the course. Students have to choose and elective paper on applied chemistry as well.

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Generate electricity in the most efficient fashion to preserve our natural resources and protect the environment.
02	Improve mining techniques, so they minimize environmental damage and cost less.
03	Manufacture petrochemicals, making them cheaper and safe for people to use Create renewable fuels and energy sources to replace coal, petrol and gas. Refine oil into petrol, keeping petrol prices low and improving petrol quality so it doesn't pollute the air.
04	Produce safe drinking water from rivers, groundwater or the sea for city, rural and remote aboriginal communities.
05	Safely treat toxic hazardous industrial wastes so their disposal does not harm the environment
06	Nanotechnology (an emerging scientific area utilizing very small particles for diverse applications)
07	Semi-conductors & microelectronics (many chemical engineers work in these areas)

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Numerical problems discussion
02	NPTEL	Each module/ Chapter presentation

8.0 Books Used and Recommended to Students

Text Books

6. B. S. Jai Prakash, R. Venigopal, Shivakumarraiah, PushpaIyengar, Chemistry for Engineering Students, Subhas Stores (Bangalore), 2014
7. R. V. Gadag and A. N. Shetty, Engineering Chemistry, IK International Publishing House, New Delhi, Third Edition 2014
8. P.C. Jain & Monica Jain. **"Engineering Chemistry"**, DhanpatRai Publications, New Delhi (2015 Edition).
9. S. S. Dara, A textbook of Engineering Chemistry, 10th Edition, S Chand & Co., Ltd., New Delhi, 2014.
10. Physical Chemistry, by P. W. Atkins, Oxford Publications (Eighth edition-2006).

Reference Books

12. O.G.Palanna,"Engineering Chemistry",Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.
13. G.A.Ozin& A.C. Arsenault, "NanochemistryA Chemical Approach to Nanomaterials", RSC publishing, 2005.
14. V. R. Gawariker, N V. Viswanathan, JayadevSreedhar, Polymer Science, New Age International (P) Ltd., New Delhi, 2nd edition 2015.
15. M.G.Fontana., "Corrosion Engineering", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi.
16. Engineering Chemistry by S.S Dara, S.S Umare., S. Chand & Co. Pvt Ltd. New Delhi.
17. Engineering Chemistry by P.R.Vijayasarathy, Second Edition, PHI Learning Pvt. Ltd. New Delhi.
18. Puri B R Sharma L R and Madan S Pathania, Principles of Physical Chemistry, Vishal publishing Co., Edition 2004
19. ArunBahl, B. S. Bahl, A Text Book of Organic Chemistry, S Chand and Co. Ltd., First Edition 2005
20. Michael F. Ashby, Paulo J. Ferreira, Daniel L. Schodek, Nano Materials, Nanotechnologies and Design, Elsevier India Pvt. Ltd., 2011.
21. T Pradeep, NANO: The Essentials, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012, 7th Reprint
22. Fred W. Billmeyer, Text Book of Polymer Science, Wiley India (P) Ltd., Third Edition 2011

Additional Study material & e-Books

1. Introduction to Chemistry - Tracy Poulsen; 250 pages; ISBN-13: 9781478298601; ISBN-10: 147829860X
2. Elementary Applied Chemistry * - Lewis BenajahAllyn; 152 pages; Publisher: Ginn and Company 1912; ISBN/ASIN: 1112247610.
3. Kuriocose, J C and Rajaram, J, Engineering Chemistry, Volume I/II, Tata McGraw- Hill Publishing Co. Ltd.New Delhi, 2000

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

Website and Internet Contents References

1. http://www.mooc-list.com/course/chemistry-minor-saylororg
2. https://www.canvas.net/courses/exploring-chemistry
3. http://nptel.ac.in/courses/122101001/

4.http://www.nptelvideos.in/2012/11/engineering-chemistry-1.html

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/
3	Nanotechnology, Science and Applications	https://www.dovepress.com/nanotechnology-science-and-applications-journal

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 20 Marks (duration 01 hour)

* First test after the completion of 30-40 % of the syllabus
* Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary.
However best two tests out of three shall be taken into consideration.

Two assignments each of 10 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/Hands-on practice (experiments)/Group Discussions/others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not besyllabus portion of the course). CIE methods/test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 60 marks and will be scaled down to 30 marks

CIE for the practical component of the Integrated Course

9. On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester. common/repeated for any of the methods of the CIE. Each method of CIE should have a different
10. The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and **scaled down to 15 marks**.
11. The laboratory test **(duration 02/03 hours)** at the end of the 14th /15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and **scaled down to 05 marks.**
12. Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of

IPCC for **20 marks**.

Semester End Examination (SEE):

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

7. The question paper will have ten questions. Each question is set for 20 marks.
8. 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.
9. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

SCHEME OF EXTERNAL EXAMINATION:

Ten main questions to be set in question paper. Each main question will carry 16 marks. Student has to answer either 1 or 2 main question. It will continue up to 10th question.

Module I– Question 1(a,b,c) or 2(a,b,c) = 20Marks
Module II – Question 3(a,b,c) or 4(a,b,c) = 20Marks
Module III– Question 5(a,b,c) or 6(a,b,c) = 20Marks
Module IV – Question 7(a,b,c) or 8(a,b,c) = 20Marks
ModuleV – Question 9(a,b,c) or 10(a,b,c) = 20Marks
Total = 100Marks

INSTRUCTION FOR ENGINEERING CHEMISTRY (22CHEE12/22) EXAMINATION

11. The total exam duration is 3 hours.
12. Use black ink pen for writing examination
13. Drawing should be drawn from dark pencil.
14. Read the questions carefully.
15. Answer the questions up to the point.

Passing standard:

5. The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
6. SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	**Metal and Alloys:** Introduction (Definitions and types of alloys), Properties and applicationsof Iron and its alloys (Stainless Steel).	**20.0**
	2	Aluminium and its alloys (Duralumin and Aluminium-Mg alloy).	
	3	**Cement:** Introduction, composition, properties, classification, manufacturing process ofcement (Wet method).	
	4	Process of setting and hardening of cement.	
	5	Additives for cement (Accelerators, Retarders, Extenders &	

		dispersants) and Testing ofcement (% of CaO by EDTA method).	
	6	**Refractories:** Introduction (Definition), classification based on chemical composition,Properties and applications of refractory materials.	
	7	**Glass:** Introduction (Definition),Composition, Types, Preparation of Soda-lime glass.	
	8	**Properties and applications of glass.**	
2	1	**Energy conversion:** Introduction (Definition of solar energy), construction, working andapplications of Photovoltaic cells.	**20.0**
	2	Methanol-oxygen fuel cell (Definition of fuel cell, construction, working, advantages andapplications).	
	3	**Storage devices:** Introduction (Definition of Battery, secondary battery), construction andworking of Li-ion battery	
	4	**Corrosion:** Introduction (Definition and global losses, technological importance), electrochemical corrosion of steel in concrete (Electrochemical theory of corrosion with all reactions)	
	5	Types (differential metal and aeration) - (Defnition, diagram and corrosion reactions withexample). Stress corrosion in civil structures: principle,	
	6	Explanation of caustic embrittlement as an example, Corrosion control (Introduction)design and selection of materials.	
	7	Galvanization and Anodization (Introduction, definition, process and applications)	
	8	Sacrificial anode method (Introduction, definition and advantages)	
3	1	**Water Technology:** Introduction, water parameters (p^H, Alkalinity, Fluoride, Nitrate) Hardness of water, determination of temporary, permanent and total hardness by EDTAmethod.	**20.0**
	2	Numerical problems (temporary, permanent and total hardness), Softening of water by Ionexchange method,	
	3	Desalination of water by electrodialysis, determination of COD, Numerical problems.	
	4	**Forward osmosis:** Introduction (Definition), Process (Diagram & Explanation) andapplications	
	5	**Nanotechnology:** Introduction (Definition of Nanomaterials), size dependent properties ofnanomaterials (surface area and catalytic).	
	6	Synthesis of nanomaterials by Sol-gel method (Explanation of sol and gel formation withreactions) and co-precipitation method.	
	7	Properties and engineering applications of carbon nanotubes (CNT& MWCNT) andgraphene.	

	8	Properties and applications Nanometal oxides for water treatment (TiO2 & Silver oxide).	
4	1	**Polymer:** Introduction (Definitions), methods of polymerization (Condensation and Freeradical polymerization)	**20.0**
	2	Molecular mass of polymers (Definition, determination of molecular mass by viscosity method and explanation about its importance: definition with formula of number average molecular mass and weight average molecular mass of polymer), numerical problems.	
	3	Synthesis, properties and engineering applications of polyethylene (PE) and chloropolyvinyl chloride (CPVC)	
	4	**Fibers:** Synthesis, properties and applications of polypropylene and Nylon fibers.	
	5	**Polymer composites:** Introduction (Definition) properties and applications of fiberreinforced polymers composites (FRPC).	
	6	**Geo polymer concrete:** Introduction, synthesis, constituents, properties and applications.	
	7	**Adhesives:** Introduction (Definition), properties and applications of epoxy resin.	
	8	**Biodegradable polymers:** Synthesis of polylactic acid (PLA) and their applications.	
5	1	**Phase rule:** Introduction, definition of terms: phase, components, degree of freedom,phase rule equation	**20.0**
	2	**Phase diagram:** (Introduction, definition) Two component-lead-silver system.	
	3	**Analytical techniques:** Introduction (Advantages, general working principle andclassification)	
	4	**Potentiometric sensors:** (Definition, Principle, instrumentation & working) and itsapplication in the estimation of iron.	
	5	**Conductometric sensors**: (Definition, Principle, instrumentation & working) and itsapplication in the estimation of acid mixture(Weak acid v/s Strong base).	
	6	**Optical sensors**: (Definition, Principle, instrumentation & working colorimetry) and itsapplication in the estimation of the beverages (Ethanol).	
	7	**p^H – sensors:** (Definition, Principle, instrumentation & working of glass electrode) and itsapplication in the determination of soil sample.	
	8	Application of p^H-sensors in the determination of soil sample p^H.	

13.0 QUESTION BANK

Module -1:- Structural Materials

1. Describe the manufacturing of cement by wet method
2. Define Refractories. Mention the properties and applications of refractories materials.
3. Explain the properties and applications of Iron and its alloys
4. Describe the preparation of Soda Lime Glass.
5. Explain the testing of Cement by EDTA method.
6. Explain the properties and applications of Aluminium and its alloys

Module-2: Energy Conversion and Storage, Corrosion

1. Illustrate the Construction and Working pf Photovoltaic Cell
2. Define Secondary Batteries. Explain Construction and working of Li – ion Battery
3. Explaina. Differential Metal Corrosion b. Differential aeration Corrosion
4. Explain the Electrochemical corrosion of steel in Concrete.
5. Explain the construction and working of Methanol oxygen fuel cell.

Module-3: Water Technology and Nanotechnology

1. Describe the estimation of Total Hardness by using EDTA solution
2. Define COD. Explain determination of COD
3. Define Nanomaterials. Explain the synthesis of Nanomaterials by Sol-gel method
4. Write a note no Carbon Nanotubes. Mention its properties and applications of Carbon Nanotubes.
5. Explain properties of nano material

Module-4:Polymer and Composites

1. Explain the synthesis, properties and applications of Polyethylene
2. Describe the Synthesis, properties and applications of Polypropylene.
3. Mention the properties and applications of Geo Polymer Concrete.
4. Define Biodegradable Polymers. Explain the synthesis and applications of Polylactic acid.
5. Explain the Condensation and Free Radical polymerization process with example.

Module-5:Phase Rule and Analytical Techniques

1. Define the following terms with examples a) Phase b) Component
2. With the help of neat phase diagram, describe the Lead – Silver system.
3. Explain the determination of p^H of Soil sample using p^H Sensors.
4. Illustrate the Principle and Instrumentation of Potentiometric Sensors.
5. Describe the Instrumentation and applications of Conductometric Sensors.
6. What is Phase rule? Explain the terms involved in it with examples.

.4.0 University Result

Examination	S	A	B	C	D	E	% Passing
Jan 2018	1	08	15	23	25	0	94.8

Prepared by	Checked by		
Prepared by **5) Dr. M. S. Hanagadakar** **6) Dr. S. J. Walki**	**HOD**(Chemistry) **(Dr. M. S. Hanagadakar)**	**HOD**	**Principal**

Subject Title	**Computer Aided Engineering Drawing**		
Course Code	BCEDK103	**CIE Marks**	50
Number of Lecture Hrs / Week	2:0:2:0	**SEE Marks**	50
Total Number of Lecture Hrs	40	**Exam Hours**	03
Credits	03		

FACULTY DETAILS:		
Name: **Prof. D.N. INAMDAR**	**Designation:** Asst .Professor	**Experience:**21Years
No. of times course taught:15	**Specialization:** Tool Design	

FACULTY DETAILS:		
Name: Prof. GIRISH M. ZULAPI	**Designation:** Asst .Professor	**Experience:** 15 Years
No. of times course taught: 01	**Specialization:** Product Design and Manufacturing	

FACULTY DETAILS:		
Name: **Prof. P.R. PATIL**	**Designation:** Asst .Professor	**Experience:**04Years
No. of times course taught:00	**Specialization:** Structural Engineering	

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 understand the basic principles and conventions of engineering drawing
CLO2: To use drawing as a communication mode
CLO3: To generate pictorial views using CAD software
CLO4: To understand the development of surfaces
CLO5: To visualise engineering components

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	Draw and communicate the objects with definite shape and dimensions	U	PO1, PO5,
CO2	Recognize and Draw the shape and size of objects through different views	U	PO1, PO5,
CO3	Develop the lateral surfaces of the object	U	PO1, PO5,
CO4	Create a 3D views using CAD software.	U	PO1, PO5,

CO5	Identify the interdisciplinary engineering components or systems through its graphical representation.	U	PO1, PO5,
Total Hours of instruction		**40**	

4.0 Course Content

MODULE-1

Introduction: ***for CIE only***

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines. (Placed in First quadrant only)

Orthographic projections of planes viz triangle, square, rectangle, pentagon, hexagon and circular laminae. (Placed in First quadrant only using change of position method).

Application on projections of Lines & Planes (For CIE only)

MODULE-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids **(Solids Resting on HP only):** Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cylinders, Cones, Cubes, &Tetrahedron.

Projections of Frustum of cone and pyramids (For practice only, not for CIE and SEE).

MODULE – 3

Isometric Projections:

Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones andspheres. Isometric projection of combination of two simple solids.

Conversion of simple isometric drawings into orthographic views.

Problems on applications of Isometric projections of simple objects / engineering components.

Introduction to drawing views using 3D environment (For CIE only).

MODULE 4

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular prisms, cylinders, pyramids, and cones resting with base on HP only.

Development of lateral surfaces their frustums and truncations.

Problems on applications of development of lateral surfaces like funnels and trays.

Problems on applications of development of lateral surfaces of transition pieces connecting circular duct andrectangular duct (For CIE Only)

MODULE-5

Multidisciplinary Applications & Practice *(For CIE Only):*

Free hand Sketching; True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc

Drawing Simple Mechanisms; Bicycles, Tricycles, Gear trains, Ratchets, two wheeler cart & Four wheeler carts todimensions etc

Electric Wiring and lighting diagrams; Like, Automatic fire alarm, Call bell system, UPS system, Basic powerdistribution system using suitable software.

Basic Building Drawing; Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges,trusses using Auto CAD or suitable software.

Electronics Engineering Drawings- Like, Simple Electronics Circuit Drawings, practice on layers concept.

Graphs & Charts: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	III	Computer aided Machine Drawing	Modeling and Assembly drawing of Machine Parts
02	V/VI	Design of Machine Elements I/II	Fasteners, Keys and Joints, Rivets and Assembly drawings.
03	VIII	Project work	Part Modeling and its detailed drawings,

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Industrial drawings and design of various components in all engineering disciplines including Mechincal Engg.
02	Model creation for Stress and thermal analysis of parts modeled
03	May be contribute as Developer of a software applications in industrial mechanical engineering needs.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Lettering, Line, Methods of dimensioning, Animated videos, online discussion on the topics as and when required to students.
02	NPTEL	Videos of machine Assembly drawings and drawing standards

8.0 Books Used and Recommended to Students

Text Books

- *S.N. Lal, & T Madhusudhan*:, Engineering Visulisation, 1st Edition, Cengage,Publication
- *Parthasarathy N. S., Vela Murali*, Engineering Drawing, Oxford University Press,2015.

Reference Books

- *Bhattacharya S. K.*, Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint2005.
- *Chris Schroder*, Printed Circuit Board Design using AutoCAD, Newnes,1997.

- *K S Sai Ram* Design of steel structures, , Third Edition byPearson
- *Nainan p kurian* Design of foundation systems, Narosapublications
- *A S Pabla*, Electrical power distribution, 6th edition, Tata Mcgrawhill
- *Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry*, 53rd edition, Charotar Publishing HousePvt. Limited, 2019.
- *K. R. Gopalakrishna, & Sudhir Gopalakrishna*: Textbook Of Computer Aided Engineering Drawing, 39thEdition, Subash Stores, Bangalore,2017

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

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks) and that for SEE minimum passing mark is 35% of the maximum marks (18 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE)

- CIE shall be evaluated for max marks 100. Marks obtained shall be accounted for CIE final marks, reducing itby 50%.
- CIE component should comprise of Continuous evaluation of Drawing work of students as and when the Modules are covered on the basis of below detailed weightage.

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Preparatory sketching (b)**
Module 1	15	10	05
Module 2	20	15	05
Module 3	20	20	00
Module 4	20	20	00
Module 5	25	15	10
Total	**100**	**80**	**20**
Consideration of Class work		**Total of [(a) + (b)] = 100 Scale down to 30 marks**	

- At least one **Test** covering all the modules is to be conducted for 100 marks and evaluation to be based SEE pattern, and the same is to be scaled down to **20Mark**s.
- The final CIE = Class work marks + Test marks

Semester End Examination (SEE)

- SEE shall be conducted and evaluated for maximum marks 100. Marks obtained shall be accounted for SEE final marks, reducing it by50%
- Question paper shall be set jointly by both Internal and External Examiner and made available for each batchas per schedule. ***Questions are to be set preferably from TextBooks***.
- **Related to Module-1**:One full question can be set either from "***points & lines***" or "***planes***".
- Evaluation shall be carried jointly by both theexaminers.
- Scheme of Evaluation: *To be defined by the examiners jointly and the same shall be submitted to the university along with questionpaper.*

One full question shall be set from each of the Module from Modules 1,2,3 and 4 as per the below tabled weightage details. *<u>However, the student may be awarded full marks, if he/she completes solution on computer display withoutsketch.</u>*

Module	**Max. Marks Weightage**	**Evaluation Weightage in marks**	
		Computer display and print out (a)	**Preparatory sketching (b)**
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
Total	**100**	**80**	**20**
Consideration of SEE Marks	**Total of (a) + (b) ÷ 2 = Final SEE marks**		

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	Teaching Method	Laboratory Component	%of Portion
I	1	Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves	**Chalk & Talk**	**Power Point Presentation & Demo using solid edge drafting software of one illustrative example**	**20**
	2	**Orthographic Projections of Points, Lines and Planes:** **Orthographic Projections of Points:** Introduction to Orthographic projections Orthographic projections of points in 1st and 3rd quadrants.			
	3	**Problems on projection of points.**			
	4	**Orthographic Projections of Lines :** Problems on Orthographic projections of lines. (Placed in First quadrant only).			
	5	Problems on Orthographic projections of lines. (Placed in First quadrant only).			
	6	**Orthographic Projections of Planes:** Orthographic projections of planes viz triangle, square, rectangle, pentagon, hexagon and circular laminae. (Placed in First quadrant only using change of position method).			
	7	Orthographic projections of planes viz rectangle, pentagon			
	8	Orthographic projections of planes viz hexagon and circular laminae.			
II	9	**Orthographic Projections of solids:** Introduction, definitions Orthographic projection of right regular solids **(Solids Resting on HP only):** Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cylinders, Cones, Cubes, &Tetrahedron.	**Chalk & Talk**	**Lab session on sketching and computer aided drafting on projection of solids.**	**20**
	10	Position of solids with reference to planes of projections			

		considering its base, face, axis, base edge, face edge, base corner etc.			
	11	Tips to draw projection of solids with an example with change of position of method			
	12	Projection of triangular, square and rectangular pyramids- variety of problems will be solved			
	13	Projection of pentagonal, hexagonal pyramids – variety of problems will be solved.			
	14	Lab session on sketching and computer aided drafting on projection of solids on triangular, square, pentagonal and hexagonal pyramids			
	15	Problems on Projection of cones and cylinders			
	16	Problems on projection of prisms – square, pentagonal, hexagonal prisms			
	17	Projections of Frustum of cone, pyramid & truncated sphere (For CIE only).			
	18	Solution of problems from VTU question papers			
III	19	**Isometric Projections :** Introduction, Isometric scale, Isometric projection of simple plane figures,	**Chalk & Talk**	**PowerPoint Presentation & Demo using solid edge drafting software of one illustrative example**	**20**
	20	Isometric projection of hexahedron(cube), right regular prisms,			
	21	Isometric projection of pyramids, cylinders			
	22	Isometric projection of cones, spheres			
	23	Isometric projection of combination of two simple solids			
	24	Conversion of given Isometric/ pictorial views to orthographic views of simple objects.			
	25	**Introduction to Conversion of simple isometric drawings into orthographic views.** Illustrative example on it.			
	26	Two simple Problems on applications of Isometric projections of simple objects / engineering components.			
IV	27	**Development of Lateral Surfaces of Solids:** Introduction to section planes and sectional views.	**Chalk & Talk**	**PowerPoint Presentation & Demo using solid edge drafting software of one illustrative example**	**20**
	28	Development of lateral surfaces of right regular prisms,			
	29	Development of lateral surfaces of right cylinders, pyramids,			
	30	Development of lateral surfaces of cones resting with base on HP only.			
	31	Development of their frustums and truncations.			
	32	Problems on applications of development of lateral surfaces like, funnels and trays.			
	33	Problems on applications of development of lateral surfaces of transition pieces connecting circular duct and rectangular duct.			

V	33	Multidisciplinary Applications & Practice (For CIE Only): Free hand Sketching; True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc		**PowerPoint Presentation & Demo using You tube tutorials/Relevant modeling drafting softwares**	**20**
	34	Drawing Simple Mechanisms; Bicycles, Tricycles, Gear trains,			
	35	Ratchets, two wheeler cart & Four wheeler carts to dimensions etc			
	36	Electric Wiring and lighting diagrams; Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system uses suitable software			
	37	Electronics Engineering Drawings- Like, Simple Electronics Circuit Drawings.			
	38	Basic Building Drawing; Like, Architectural floor plan, basic foundation drawing,			
	39	steel structures- Frames, bridges, trusses using Auto CAD or suitable software			
	40	Graphs & Charts: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.			

13.0 Assignments, Pop Quiz, Mini Project, Seminars

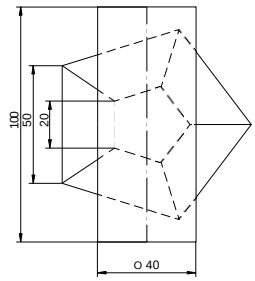
Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Projection of Points	Students study the Topics and write the Answers. Get practice to solve university questions.	Module I of the syllabus	2	Individual Activity. Drawn & Printed solution expected.	Book 1 & 2, 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 I of the syllabus	4	Individual Activity. Drawn & Printed solution expected.	Book 1 & 2, 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 I of the syllabus	6	Individual Activity. Drawn & Printed solution expected.	Book 1 & 2, of the reference list. Website of the Reference list
4	Assignment 4: University Questions on PROJECTION OF SOLIDS	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	10	Individual Activity. Drawn & Printed solution expected.	Book 1 & 2, of the reference list. Website of the Reference list
5	Assignment 5: University	Students study the Topics and write the	Module 3 of the	14	Individual Activity. Drawn & Printed	Book 1 & 2, of the

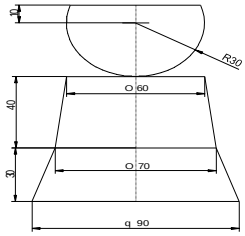
	Questions on Isometric Projections	Answers. Get practice to solve university questions.	syllabus		solution expected.	reference list. Website of the Reference list
6	Assignment 6: University Questions on PROJECTIONS ON Developments	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	12	Individual Activity. Drawn & Printed solution expected.	Book 1 & 2, of the reference list. Website of the Reference list
7	Assignment 7: Multidisciplinary Applications & Practice :	Students understand application of engineering drawing in all engineering streams with one illustrative example.	Module 5 of the syllabus	15	Individual Activity. Drawn & Printed solution expected.	Book 1 & 2, and tutorial websites of the reference list.

14.0 Assignment Questions

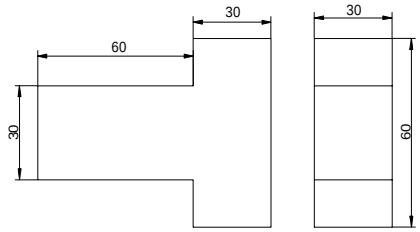
Assignment No	Questions	Marks
I	1. Draw the projection of the following points on the same XY line, keeping convenient distance between each projector. Name the Quadrants in which they lie. a. A - 30 mm above HP & 35 mm in front of VP. b. B - 35 mm above HP & 40 mm behind VP. c. C - 40 mm above HP & on VP. d. D - 35 mm below HP & 30mm in front of VP. 2. A point G is 25mm below HP & situated in the third quadrant its shortest distance from XY line is 45 mm. Draw its projections and find its distance from VP. 3. A point S is in the first quadrant and equidistance of 50 mm from all the three principle planes Draw the projection of the point. Draw all the three views of the point. 4. A point P is 30mm in front of VP, 40mm above HP and 50mm from RPP. Draw its projections. 5. A point is 35mm below HP, 20mm behind VP and 25mm behind/in front/ from RPP. Draw its projections and name the side view. 6. A point is 35mm below HP, 15mm behind VP & 25mm behind/in front/from RPP. Draw the projection and name the side view.	15 15 15 15 15 15 15
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	15 15 15

	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
III	1. An equilateral triangular lamina of 25mm side lies with one of its edges on HP such that the 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. An equilateral 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.	20 20 20 20 20 20

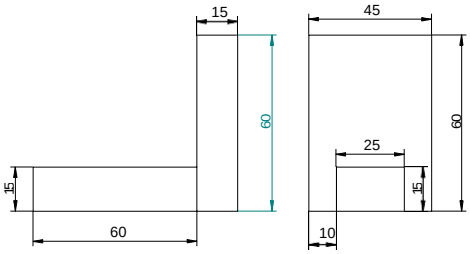
IV	1. A square prism 35mm sides of base and 60mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40 and to VP at 30 .	20
	2. 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°.	20
	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 .	20
	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 .	20
	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 .	20
	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.	20
	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.	20
V	1. Isometric projection of hexahedron (cube), right regular prisms, pyramids with illustrative examples.	
	1. Isometric projection of cylinders, cones, spheres, cut spheres with illustrative examples.	
	2. Isometric projection of combination of solids – two solids and three solids with illustrative examples from VTU question bank .	
	3. Lab session on sketching and computer aided drafting of above combination of 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.	



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



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

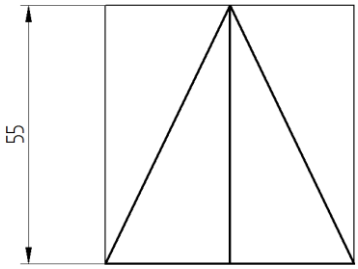


VI

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. — 20

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. — 20

20



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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.

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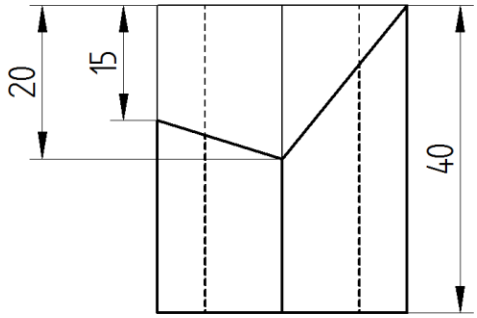
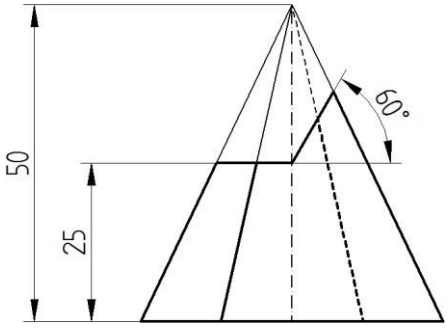


5. A rectangular pyramid, side of base 25 mm × 40 mm and height 50mm has one of the sides of the base inclined at 30° to VP. Draw the development of the lateral surface of the cut pyramid, whose front view shown below.



VII

Multidisciplinary Applications & Practice *:*

Free hand Sketching; True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc — 25

Drawing Simple Mechanisms; Bicycles, Tricycles, Gear trains,

Electric Wiring and lighting diagrams; Like, Automatic fire alarm, Call bell system, UPS system, Basic powerdistribution system using suitable software — 25

Basic Building Drawing; Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges,trusses using Auto CAD or suitable software, — 25

Electronics Engineering Drawings- Like, Simple Electronics Circuit Drawings.

Graphs & Charts: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. — 25

	using Microsoft Excel or any suitable software.	

15.0 QUESTION BANK

Module-I

Projection of Points

1. Draw the projection of the following points on the same XY line, keeping convenient distance between each projector. Name the Quadrants in which they lie.
    a. A - 30 mm above HP & 35 mm in front of VP.
    b. B - 35 mm above HP & 40 mm behind VP.
    c. C - 40 mm above HP & on VP.
    d. D - 35 mm below HP & 30mm in front of VP.
2. A point G is 25mm below HP & situated in the third quadrant its shortest distance from XY line is 45 mm. Draw its projections and find its distance from VP.
3. A point S is in the first quadrant and equidistance of 50 mm from all the three principle planes Draw the projection of the point. Draw all the three views of the point.
4. A point P is 30mm in front of VP, 40mm above HP and 50mm from RPP. Draw its projections.
5. A point is 35mm below HP, 20mm behind VP and 25mm behind/in front/ from RPP. Draw its projections and name the side view.
6. A point is 35mm below HP, 15mm behind VP & 25mm behind/in front/from RPP. Draw the projection and name the side view.

Projection of Straight Lines

1. 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.
2. 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.
3. 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.
4. 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.
5. 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

Projection of Plane Surfaces

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 – II

Projections of solids

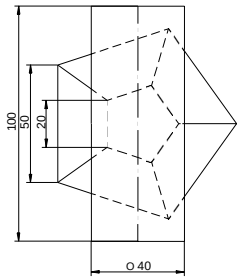
1. A square prism 35 mm sides of base and 60 mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40 deg and 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.

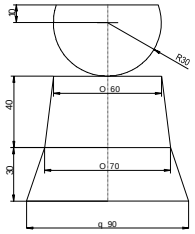
Module - III

Isometric Projections

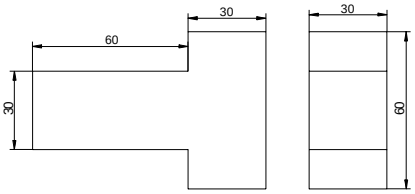
29. A hemisphere of 40 mm diameter is supported co-axially on the vertex of a cone of base diameter 60 mm and axis length 50 mm. The flat circular face of the hemi-sphere is facing upside. Draw the isometric projection of the combination of solids.
30. Draw the isometric projection of rectangular prism 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.
31. 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.
32. 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.



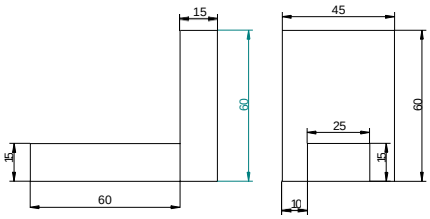
33. Following fig shows the front view of the combination of solids consisting a cut sphere and frustums of a cone and a square pyramid. Draw the isometric projections of the combination of solids.



34. 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.
35. Following fig shown the front and side views of the solid. Draw the isometric projection of the solid.



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

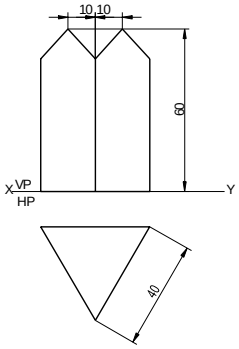


37. A sphere of diameter 40 mm is placed centrally on the flat face of the hemisphere dia 60 mm. Draw the isometric projection of the combination.
38. Three rectangular slabs (l x b x h) 100 mm x 60 mm x 20 mm, 100 mm x 40 mm x 20 mm and 100 mm x 20 mm x 20 mm are placed one above the other in the descending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

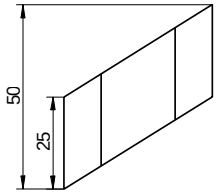
Module – IV

Development of Lateral Surfaces of Solids

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.

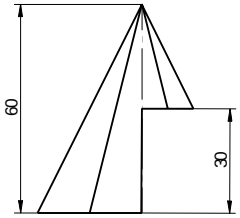


3. A hexagonal prism of base side 20 mm and height 50 mm is resting on HP on its base, such that one of its base edge is parallel to VP. The prism is cut in this position as shown in the following front view. Draw the development of the lateral surface of the prism.

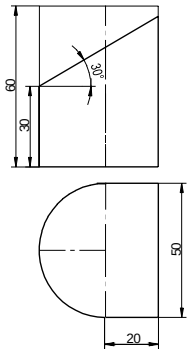


4. The inside of the hopper of the floor mill is to be lined with thin sheet. The top and bottom of the hopper are regular pentagon with each side equal to 30 mm and 22.5 mm respectively. The height of the hopper is 30 mm. Draw the shape of the sheet to which it is to be cut so as to fit into the hopper.
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.

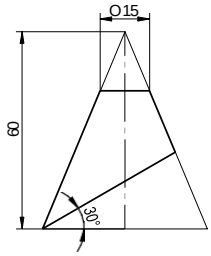
6. The hexagonal pyramid of 30 mm base sides with a side of the base parallel to VP. Draw the development of the lateral surfaces of the retained portions of the pyramid cut by two perpendicular planes shown by dark lines in the fig.



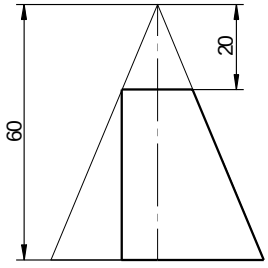
7. A pipe made of using half tubular (circular) with a half square in shape is cut as shown in the following in the fig. Draw the development of the lateral surface of the object.



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

Multidisciplinary Applications & Practice

Free hand Sketching; True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's

etc

Drawing Simple Mechanisms; Bicycles, Tricycles, Gear trains,

Electric Wiring and lighting diagrams; Like, Automatic fire alarm, Call bell system, UPS system, Basic powerdistribution system using suitable software

Basic Building Drawing; Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges,trusses using Auto CAD or suitable software,

Electronics Engineering Drawings- Like, Simple Electronics Circuit Drawings.

Graphs & Charts: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.

Prepared by	Checked by		
			
Prof.Girish M. Zulapi	**Prof.D.N.Inamdar**	**HOD**	**Principal**

Subject Title	**INTRODUCTION TO ELECTRICAL ENGINEERING**		
Subject Code	BESCK104x	**CIE Marks**	50
Teaching hours/week(L:T:P:S)	3:0:0:0	**SEE Marks**	50
Total Hours of Pedagogy	40	**Exam Hours**	100
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. K B Negalur	**Designation:** Assistant Professor	**Experience: 09 Years**
No. of times course taught(including present): 02	**Specialization:** Industrial Electronics	

1.0 Prerequisite Subjects:

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

2.0 Course Objectives

- To explain the laws used in the analysis of DC and AC circuits.
- To explain the behavior of circuit elements in single-phase circuits.
- To explain the construction and operation of transformers, DC generators and motors and induction motors.
- To introduce concepts of circuit protecting devices and earthing.
- To explain electric power generation, transmission and distribution, electricity billing, equipment and personal safety measures.

3.0 Course Outcomes

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

	Course Outcome	RBT Level	Pos
C103.1	Understand the concepts of various energy sources and Electric circuits.	L2	PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO12
C103.2	Apply the basic Electrical laws to solve circuits.	L2	PO1, PO2, PO3, PO4, PO5, PO6, PO12
C103.3	Discuss the construction and operation of various Electrical Machines.	L2	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO12
C103.4	Identify suitable Electrical machine for practical implementation.	L1	PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO12

C103.5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.	L1,L2	PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO11, PO12
	Total Hours of instruction	**40**	

4.0 Course Content

MODULE-1

Introduction: Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach.

Power Generation: Hydel, Nuclear, Solar & wind power generation (Block Diagram approach).

DC Circuits: Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.

MODULE-2

A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (only definitions) Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. (Simple Numerical).

Three Phase Circuits: Generation of Three phase AC quantity, advantages and limitations; star and delta connection, relationship between line and phase quantities (excluding proof)

MODULE-3

DC Machines:

DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple numerical.

DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only). Applications of DC motors. Simple numerical.

MODULE-4

Transformers: Necessity of transformer, principle of operation, Types and construction of single phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and simple numerical.

Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical

MODULE-5

Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of load.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

5.0 Relevance to Real World

SL. No	Real World Mapping
1.	Calculating branch current in the circuits, measurement of power, evaluating performance analysis of electric machines, Use of Fuses and MCB.
2.	Installation of Electrical Earthing and Power Supply scheme for transmission and distribution.
3.	Understanding of Electric Safety measures and Electricity billing.

6.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
1	Demonstration (Using Models, Charts and field visits)	Topic: 1) Visit to basic electrical engg. lab to understand dc circuits, Single and three phase circuit configurations, measurement of power and application of maximum power transfer theorem. 2) Visit to Electrical machines lab to observe the cut out section and actual machine parts. 3) Field visit of HT Substation, Power distribution control panel room and Generator to understand electricity billing and layout.

7.0 Books Used and Recommended to Students

Text Books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019
2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

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

Website and Internet Contents References
5) http://nptel.vtu.ac.in/econtent/BS.php
6) https://www.electrical4u.com

9.0 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

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

- Three Tests each of 20 Marks; 1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%, 70-75%, and 90-100% of the course/s respectively.
- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of 40 Marks.

If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill development activities etc then the evaluation method shall be one.

Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

Semester End Examination (SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 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.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture	% of Portion coverage
I	1.	**Introduction:** Conventional and non-conventional energy resources.	20
	2.	General structure of electrical power systems using single line diagram approach.	
	3.	**Power Generation:** Hydel, Nuclear.	
	4.	Solar & wind power generation (Block Diagram approach).	
	5.	**DC Circuits:** Ohm's Law and its limitations.	
	6.	KCL & KVL, series, parallel.	
	7.	Series-parallel circuits.	
	8.	Simple Numerical	
II	9.	**A.C. Fundamentals:** Equation of AC Voltage and current, waveform, time period, frequency, amplitude.	20
	10.	phase, phase difference, average value, RMS value, form factor, peak factor. (only definitions)	
	11.	Voltage and current relationship with phasor diagrams in R, L, and C circuits.	
	12.	Concept of Impedance. Analysis of R-L.	
	13.	R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. (Simple Numerical).	
	14.	**Three Phase Circuits:** Generation of Three phase AC quantity, advantages and limitations.	
	15.	star and delta connection, relationship between line and phase quantities (excluding proof)	
	16.	Simple numerical.	

III	17.	**DC Machines:** **DC Generator:** Principle of operation, constructional details.	**20**
	18.	Induced emf expression, Relation between induced emf and terminal voltage. Simple numerical.	
	19.	Types of generators.	
	20.	**DC Motor:** Principle of operation, back emf and its significance.	
	21.	Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only).	
	22.	Characteristics and speed control (armature & field) of DC motors (series).	
	23.	Characteristics and speed control (armature & field) of DC motors (shunt).	
	24.	Applications of DC motors. Simple numerical.	
IV	25.	**Transformers:** Necessity of transformer, principle of operation,	**20**
	26.	Types and construction of single phase transformers.	
	27.	EMF equation, losses, variation of losses with respect to load. Efficiency	
	28.	Simple numerical.	
	29.	**Three-phase induction Motors**: Concept of rotating magnetic field, Principle of operation.	
	30.	Constructional features of motor, types – squirrel cage and wound rotor.	
	31.	Slip and its significance	
	32.	Simple numerical	
V	33.	**Domestic Wiring:** Requirements, Types of wiring: casing, capping.	**20**
	34.	Two way and three way control of load.	
	35.	**Electricity Bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers, etc	
	36.	Definition of "unit" used for consumption of electrical energy, two-part electricity tariff.	
	37.	calculation of electricity bill for domestic consumers.	
	38.	**Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.	
	39.	**Personal safety measures:** Electric Shock, Earthing and its types.	
	40.	Safety Precautions to avoid shock.	

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:	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1	4	Individual Submission in the standard format is expected	Books 1 and 2 of the text books.
2	Assignment 1:	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2	6	Individual Submission in the standard format is expected	Books 1 and 2 of the text books..
3	Assignment 1:	Students study the Topics and write the Answers. Get practice to solve university questions	Module 3	8	Individual Submission in the standard format is expected	Books 1 and 2 of the text books.
4	Assignment 2:	Students study the Topics and write the Answers. Get practice to solve university questions	Module 4	10	Individual Submission in the standard format is expected	Books 1 and 2 of the text books.
5	Assignment 2:	Students study the Topics and write the Answers. Get practice to solve university questions	Module 5	12	Individual Submission in the standard format is expected	Books 1 and 2 of the text books.

14.0 QUESTION BANK

MODULE-1

Introduction and Power Generation

1. Explain about conventional and non-conventional energy sources.
2. With neat block diagram Hydel power generation.
3. Explain nuclear power generation with neat block diagram.
4. Explain solar power generation with neat block diagram.
5. Explain wind power generation with neat block diagram.
6. Explain the general structure of electrical power systems using single line diagram.

DC circuits

7. Explain ohms law and state its limitations.
8. How the voltage and current is divided in series, parallel and series-parallel circuits? Also state the advantages & limitations of these circuits.
9. Find current through all the branches of the network shown in fig1.below.
10. For the circuit shown in fig.2 Calculate, a) equivalent resistance between the supply terminals b) Current supplied by the source c) Power consumed by the 16 ohm resistor.

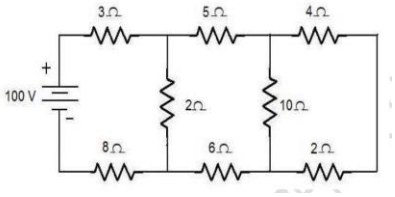


Fig.1

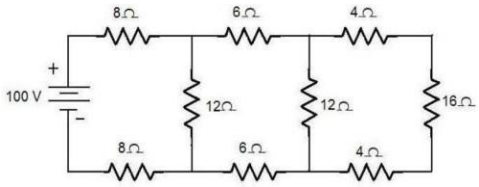


Fig.2

11. In the circuit shown in Fig3, determine the current through the 2 ohm resistor and the total current delivered by the battery. Use Kirchhoff's laws.
12. In the network shown in fig 4, find the current delivered by the battery.

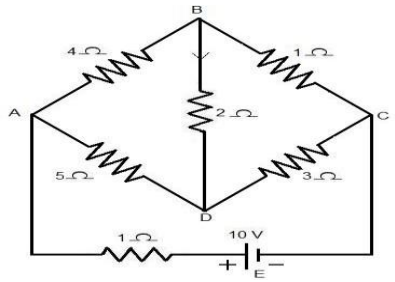


Fig.3

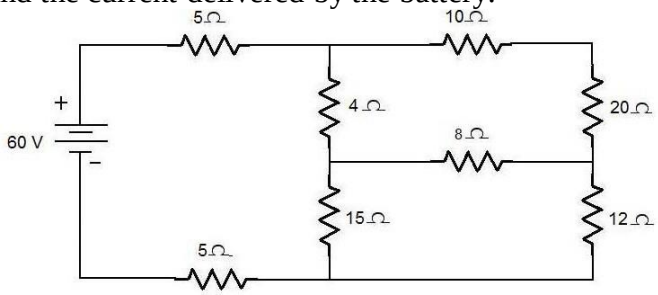


Fig.4

13. Find the unknown resistor R where power consumed by the network is 16W for the network shown in fig.5.
14. Find the currents I_1,I_2 and I_3 for the circuit shown in Fig.6. Also find potential difference between a and b.
15. Determine the potential difference between x and y. for the circuit shown in fig.7.

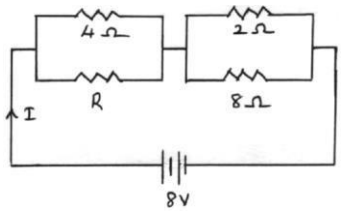


Fig.5

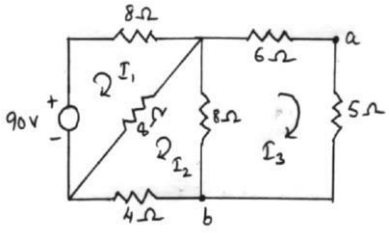


Fig.6

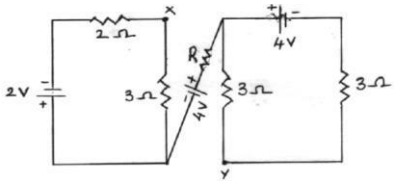
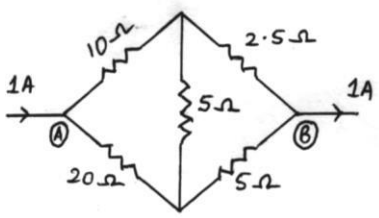


Fig.7

16. 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*.



17. 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*.
18. 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.

MODULE -2

Single Phase Circuits

1. Define/Explain the following terms w.r.t alternating quantities: a) Phase & phase difference and b) Frequency and period.
2. Define and hence find the instantaneous value, peak value, RMS value, average value, form factor and peak factor of alternating quantities.
3. With a neat schematic, explain the principle of generation of alternating voltage.
4. Explain the generation of single-phase AC induced emf with sinusoidal diagram.
5. The equation for an AC voltage is given as V= 0.04sin (200t+60º) V. Determine the frequency, the angular frequency, instantaneous voltage when t= 160μs. What is the time represented by 60' phase angle?
6. Show that the average power consumed in a pure capacitor and in a pure inductor is zero.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.

13. 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.
14. 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
15. Show that in a pure inductor the current lags behind the voltage by 90º. Also draw the voltage and current waveforms.

Three Phase Circuits:

16. 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.
17. 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.
18. Show with a relevant phasor diagram how 3-phase power can be measured by two wattmeters.
19. 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?
20. What are the advantages of a 3Φ system over a single-phase system?
21. Three coils each of impedance $20\angle 60^0$ Ω 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.
22. A balanced 3phase 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.
23. 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.

MODULE-3

DC Machines & 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 dc 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?
7. A dc shunt generator supplies a load of 10kW at 250V. Calculate the induced emf if the armature resistance is 0.5 Ωand 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.

DC Motor

10. Explain the principle of operation of a dc motor.
11. Explain the significance of back emf of a dc motor. Derive an expression for the back emf.
12. Derive the torque equation of a dc motor.
13. Explain the different types of dc motors. Mention their applications.
14. Sketch and explain the following characteristics for series, shunt motors.
    Torque vs. Armature current, and Speed vs. Armature current.
15. A 20kW, 200V dc shunt generator has a armature and field resistances of 0.05 Ω and 150 Ω respectively.
    Determine the total current and power developed when working as a motor taking 20kW power.
16. 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.
17. 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?

MODULE-4

Transformers

1. Explain the construction & principle of operation of 1Φ transformer. Derive the emf equation of a transformer.
2. What are the losses in a transformer? On what factors do they depend? How are losses reduced in a transformer by construction?
3. Explain with neat sketches the core and shell type transformers.
4. Define and explain the term *efficiency of* a transformer.
5. 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.
6. 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.
7. A 25kVA, 2200/250V transformer has an iron loss of 600W & full load copper loss of 1000W.
8. Calculate efficiencies at i) full load ii) 75% load iii) 50% load iv) 25% load at upf& 0.8pf lag,

9. v) Losses at max. Efficiency vi) load for max. Efficiency and vii) max. Efficiency at upf.
10. The iron and full load copper losses in a 40kVA, 1Φ transformer are 450W & 850W respectively.
11. Find i) efficiency at full load, 0.8pf lag ii) max efficiency and iii) load at which the maximum
12. efficiency occurs.
13. A 50kVA transformer has an efficiency of 98% at full load 0.8pf and 97% at half load 0.9pf.
14. Determine the full load iron and copper losses. Find the load at which max. Efficiency occurs as
15. also the maximum efficiency.
16. Give reasons for the following: a) Core loss in a transformer remains almost constant b) A laminated steel core is used in a transformer.
17. List different types of loss in a transformer and explain each one in brief.
18. 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.

Three Phase Induction Motors:

1. Explain the principle of operation and constructional features of a 3Φ induction motor.
2. Define and explain slip in an induction motor.
3. What are squirrel cage and wound-rotor induction motors? What are their relative advantages and disadvantages? Mention their applications.
4. 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.
5. Explain the concept of rotating magnetic field and show that resultant flux remains same at different instants of time.

MODULE-5

Domestic wiring:

1. What are the requirements of domestic wiring system?
2. Mention the various types of wiring.
3. Explain casing-capping wiring with neat diagram.
4. Explain two way control of load with neat circuit diagram and truth table.
5. Explain three way control of load with neat circuit diagram and truth table.

Electricity bill:

1. What do you understand by Tariff? Discuss the objectives of Tariff.
2. Describe the desirable characteristics of a tariff.
3. Explain two part tariff.
4. A consumer has a maximum demand of 200 kW at 40% load factor. If the tariff is Rs. 100 per kW of maximum demand plus 10aise per kWh, Find the overall cost per kWh.
5. What is the unit for measure for electricity consumption?
6. What do you understand by term "unit" w.r.t. consumption of electrical energy.

Equipment Safety measures:

1. What is fuse? Discuss the advantages and disadvantages of a fuse.

2. What are desirable characteristics of fuse element.
3. Define and explain the following terms
   i) Fusing current ii) Cut off current iii) Operating time iv) Breaking capacity
4. Explain the term 'fusing factor' with respect to fuse element.
5. Explain the working principle of fuse and MCB. Also discuss their merits and demerits.
6. Write a short note on difference between fuse and miniature circuit breaker w.r.t. protection of electrical installation.

Personal Safety measures

1. What is the need of earthing in electrical installation?
2. What is earthing? Why earthing is required?
3. With the help of neat sketch, explain plate earthing.
4. With the help of neat sketch, explain pipe earthing.
5. Write a short note on precautions against electric shock.
6. What is electric shock? What are the precautions to be taken to prevent electric shocks?

Prepared By	Checked By		
24/12	24/12/22	24/12/22	
Prof. K. B. Negalur	Prof. H R Zinage	HOD	Principal

Course Title	**Introduction to Electronics Engineering**		
Course Code	BETCK105x	**CIE Marks**	50
Teaching Hrs / Week(L:T:P:S)	3:0:0:0	**SEE Marks**	50
Total hours of Pedagogy	40	**Exam Hours**	03
		CREDITS – 03	

FACULTY DETAILS:		
Name: Smt. Purnima Savadatti	**Designation:** Asst.Professor	**Experience:** 7 years
No. of times course taught: 01		**Specialization:** Digital Electronics

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	PUC	Mathematics, Physics

2.0 Course Objectives

1) To prepare students with fundamental knowledge/ overview in the field of Electonics and Communication Engineering.
2) To equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems and communication systems.
3) Professionalism and Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context and life-long learning needed for a successful Professional career.

3.0 Course Outcomes

After successful completion of the course, students will be able to:

CO	Course Outcome	RBT Level	Pos
CO.1	Describe the concepts of electronic circuits encompassing power supplies and amplifiers.	L_1,L_2	PO1,2,3,4,5,6,8,10,12
CO.2	Explain different types oscillators and operational amplifiers.	L_1,L_2	PO1,2,3,4,5,6,8,10,12
CO.3	Present the basics of boolean algebra and digital logic circuits including combinational logic circuits design.	L_1,L_2	PO1,2,3,4,5,6,8,10,12
CO.4	Discuss the characteristics and technological advances of embedded systems.	L_1,L_2	PO1,2,3,4,5,6,8,10,12
CO.5	Describe the characteristics and technological advances of embedded systems.	L_1,L_2	PO1,2,3,4,5,6,8,10,12
Total Hours of instruction		**40**	

4.0 Course Content

Module- 1

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.

Amplifiers – Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback, multi-stage amplifiers (Text 1)

Module-2

Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations)

Operational amplifiers - Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits. Text 1).

Module-3

Boolean Algebra and Logic Circuits: Binary numbers, number base conversion, octal and hexadecimal numbers, complements, basic definitions, axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms other logic operations, digital logic gates

Combinational logic: Introduction, design procedure, adders-half adder, full adder.

Module-4

Embedded Systems-Definition, embedded systems vs general computing systems, classification of embedded systems, major application areas of embedded systems, elements of an embedded system, core of the embedded system, , r

Sensors and Interfacing-Instrumentation and control systems, transducers, sensors, actuators, LED, 7-segment LED display

Module-5

Analog Communication Schemes- modern communication system scheme, information source and input transducer, transmitter, channel or medium-hardwired and soft wired, noise, receiver, multiplexing, types of communication systems. Types of modulation (only concepts)-AM, FM, concept of radio wave propagation (ground, space, sky)

Digital Modulation Schemes: Advantages of digital communication over analog communication, ASK,FSK,PSK, radio signal transmission multiple access techniques.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project Work	Embedded system, Communication

6.0 Relevance to Real World

SL.No	
01	Analyze analog and digital circuits in real time applications

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Fundamentals of Electronics.

8.0 Books Used and Recommended to Students

Text Books

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4th Edition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980
2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84.
3. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited,

2016
4. S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017.

Reference Books

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Additional Study material & e-Books

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

Website and Internet Contents References
7) Electronic Circuits, Fundamentals & Applications'DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980
8) 'Communication Systems' https://elib4u.ipublishcentral.com/pdfreader/communication-system

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	Electronics for You	www.efymag.com/magazine

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

Three Tests each of 20 Marks**;**

- 1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%, 70-75%, and 90-100% of the course/s respectively.
- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of 40 Marks.

If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill development activities etc then the evaluation method shall be one. Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	Power Supplies- Block diagram, Half-wave rectifier	20
	2	Full wave rectifier and filters	
	3	voltage regulators, output resistance and voltage regulation	
	4	voltage multipliers	
	5	Amplifiers – Types of amplifiers, Gain	
	6	Input and output resistance, Frequency response	
	7	Bandwidth, Phase shift	
	8	Negative feedback, multi-stage amplifiers	
2	9	Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators	20
	10	Ladder network oscillator, Wein bridge oscillator	
	11	Multivibrators, Single-stage astable oscillator	
	12	Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations)	
	13	Operational amplifier parameters	
	14	Operational amplifier characteristics	

	15	Operational amplifier configurations	
	16	Operational amplifier circuits	
3	17	Boolean Algebra and Logic Circuits: Binary numbers, number base conversion	20
	18	Octal and hexadecimal numbers	
	19	Complements, basic definitions	
	20	Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra	
	21	Boolean functions, canonical and standard forms	
	22	Other logic operations, digital logic gates	
	23	Intoduction to Combinational logic circuits, design procedure	
	24	Adders-half adder, full adder	
4	25	Embedded Systems-Definition, embedded systems vs general computing systems	20
	26	Classification of embedded systems, major application areas of embedded systems	
	27	Elements of an embedded system, core of the embedded system	
	28	Microprocessor vs Microcontroller, RISC vs CISC	
	29	Sensors and Interfacing – Instrumentation and control systems	
	30	Transducers, Sensors	
	31	Actuators, LED	
	32	7-Segment LED Display	
5	33	Modern communication system scheme, Information source, and input transducer	20
	34	Transmitter, Channel or Medium – Hardwired and Soft wired	
	35	Noise, Receiver, Multiplexing, Types of communication systems	
	36	Types of modulation (only concepts) – AM , FM,	
	37	Concept of Radio wave propagation (Ground, space, sky)	
	38	Digital Modulation Schemes: Advantages of digital communication over analog communication,	
	39	ASK, FSK, PSK	
	40	Radio signal transmission Multiple access techniques	

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 Power Supplies and amplifiers	Students study the concepts of electronic circuits encompassing power supplies and amplifiers.	Module 1	2	Individual Activity.	Text book no.1
2	Assignment 2: University Questions on Oscillators and Operational amplifiers	Students study different types of oscillators and operational amplifiers.	Module 2	4	Individual Activity.	Text book no.1

3	Assignment 3: University Questions on Boolean Algebra and Logic Circuits and Combinational logic	Students able to present the basics of boolean algebra and digital logic circuits including combinational logic circuits design.	Module 3	6	Individual Activity.	Text book no.2
4	Assignment 4: University Questions on Embedded Systems and Sensors and Interfacing	Students able to discuss the characteristics and technological advances of embedded systems	Module 4	8	Individual Activity.	Text book no.3
5	Assignment 5: University Questions on Analog Communication Schemes and Digital Modulation Schemes	Students able to describe the characteristics and technological advances of embedded systems.	Module 5	10	Individual Activity.	Text book no.4

14.0 QUESTION BANK

Module 1:

1. Explain the block diagram of DC power supply with principal components
2. Explain with neat circuit diagram and waveforms half wave rectifier with reservoir capacitor.
3. Explain how Zener diode used as voltage regulator
4. Derive the gain for negative series feedback amplifier
5. Describe different types of amplifiers.
6. What you understand by the terms Bandwidth and Phase shift?
7. Discuss about multi-stage amplifiers in detail.
8. Explain full wave rectifier with neat circuit diagram and waveforms.

Module 2:

1. Explain operational amplifier parameters
2. Explain operational amplifier configurations
3. Explain operational amplifier circuits
4. Explain conditions for oscillations
5. Explain ladder network oscillator
9. Explain Wien bridge oscillator
7. Describe Single stage astable oscillator
8. Explain Crystal controlled oscillator

Module 3:

1. Write symbol and truth table for NOR, NAND and XOR logic gates
2. Implement full adder using 2 half adders
3. Basic theorems and properties of Boolean algebra
4. Discuss the design procedure of combinational logic circuits
5. Explain the axiomatic definition of Boolean algebra.
6. Find 2's complement of (1 0 0 1)2
7. Subtract 72532-3250 using 10's complement.
8. Simplify the following Boolean expressions to a minimum number literals.
   a) $XY+XY^1$
   b) $(X+Y)+(X+Y^1)$
   c)

Module 4:

1. Explain two types of classifications of embedded systems
2. List out application areas of embedded systems
3. Explain basic block diagram embedded systems
4. Differentiate microprocessor and microcontroller
5. Differentiate RISC and CISC processor architecture
6. Draw and explain instrumentation and control system
7. Explain any five examples of input transducers
8. Describe the about elements of an embedded system

Module 5:

1. Explain modern communication system.
2. Explain Hardwired and Soft wired Channels.
3. Find the expression for Noise Figure (F).
4. Draw the detailed block diagram of a typical receiver section and explain the concept. Of receiver,
5. Explain the different types of Communication System.
6. Explain Amplitude modulation and draw the waveforms related to Amplitude modulation.
7. Explain Ground Wave Propagation.
8. Describe the following: a) ASK b) FSK c)PSK

15.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing

Prepared by	Checked by		
Purnima 29/12/2022	29/12/2022	29/12/22	
Smt. P.I Savadatti	Shri.M.P.Yenagimath	HOD	Principal

Introduction to C Programming

Subject Code	**BPLCK105x**	**CIE Marks**: IA-Tests(20) + Assignments(10)+ Quiz/GD/Seminar(20)	**50**
Teaching Hours/Week (L:T:P:S)	**2:0:2:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**30**	**Total marks (CIE + SEE)**	**100**
Credits	**03**	**SEE Hours**	**01**

FACULTY DETAILS:		
Name: Dr. K. B. Manwade	**Designation:** Associate Professor	**Experience:** 18 Yrs
No. of times course taught: 3	**Specialization:** Computer Science and Engineering	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	-	-	Basic Mathematics, Logic & Reasoning ability

2.0 Course Objectives

- ✓ Elucidate the basic architecture and functionalities of a Computer
- ✓ Apply programming constructs of C language to solve the real-world problems
- ✓ Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems.
- ✓ Design and Develop Solutions to problems using modular programming constructs such as functions and procedures.

3.0 Course Outcomes [C112]

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

CO	Course Outcome	Cognitive Level	POs
C112.1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.	L1,L2	1,2,3,8,10
C112.2	Apply programming constructs of C language to solve the real world problem.	L1,L2,L3	1,2,3,8,10
C112.3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.	L1,L2,L3	1, 2, 3,8,10
C112.4	Explore user-defined data structures like structures, unions and pointers in implementing solutions.	L1,L2,L3	1, 2,3,8,10
C112.5	Design and Develop Solutions to problems using modular programming constructs using functions.	L1,L2,L3	1, 2,3,8,10

4.0 Course Content

Module-1

Introduction to C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C.

Module -2

Operators in C, Type conversion and typecasting.

Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement.

Module- 3

Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.

Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions.

Module- 4

Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays. Applications of arrays and introduction to strings: Applications of arrays, case study with sorting techniques.

Introduction to strings: Reading strings, writing strings, summary of functions used to read and write characters. Suppressing input using a Scanset.

Module-5

Strings: String taxonomy, operations on strings, miscellaneous string and character functions, arrays of strings.
Pointers: Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables
Structures: Introduction to structures

5.0 Relevance to future subjects

S. No	Semester	Subject	Topics
01	III	Data Structures & Applications	Arrays, Structure, union, pointers
02	IV	Design of Algorithms	Arrays, Structure, union, pointers
03	V, VI	Any programming language	Basic programming constructs

6.0 Relevance to Real World

S. No	Real World Mapping
01	Widely used and highly portable Language for building system as well as application software.

7.0 Gap Analysis and Mitigation

S. No	Delivery Type	Details
01	E-content	E-learning. vtu.ac.in/econtent/courses/video/BS/15PCD23.html
02	MOOC	https://nptel.ac.in/courses/106/105/106105171/

8.0 Books Used and Recommended to Students

Text Books
1. Computer fundamentals and programming in c, "Reema Thareja", Oxford University, Second edition, 2017.
Reference Books
1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill. 2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.
Additional Study material & e-Books
1. C Tutorials –videos on YouTube 2. E-learning- vtu.ac.in/econtent/courses/video/BS/15PCD23.html 3. https://nptel.ac.in/courses/106/105/106105171/

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

Website and Internet Contents References
1) https://nptel.ac.in/courses/106/105/106105171/

10.0 Magazines/Journals Used and Recommended to Students

S. No	Magazines/Journals	website
1	C/C++ Users Wiki Journal	https://en.wikipedia.org/
2	Electronics for You	https://electronicsforu.com/

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE)

The CIE marks for the theory component of the IC shall be 30 marks and for the laboratory component 20 Marks.

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totaling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to 30 marks

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The 15 marks are for conducting the experiment and preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (duration 03 hours) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for 20 marks.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE)

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. 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.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture		% of Portion
		PART - A	**Teaching-Learning Process**	
1	1	Introduction to computers, input and output devices		20
	2	Designing efficient programs.		
	3	Introduction to C, Structure of C program,		

	4	Files used in a C program, Compilers, Compiling and executing C programs	Chalk &board, PPT, Animation, Active Learning	
	5	Variables, constants		
	6	Input/output statements in C		
2	7	Operators in C, Type conversion and typecasting	Chalk & board, Active Learning, Problem based learning	20
	8	Introduction to decision control		
	9	Conditional branching statements		
	10	Iterative statements		
	11	Nested loops		
	12	Break and continue statements, goto statement.		
3	13	Introduction using functions, Function definition, function declaration, function call	Chalk & board, PPT, Animation, NPTEL, Active Learning	20
	14	Return statement, passing parameters to functions, scope of variables		
	15	Storage classes, recursive functions.		
	16	Declaration of arrays, accessing the elements of an array		
	17	Storing values in arrays, Operations on arrays		
	18	Passing arrays to functions		
4	19	Two dimensional arrays, operations on two-dimensional arrays	Chalk& board, Problem based learning	20
	20	Two-dimensional arrays to functions, multidimensional arrays.		
	21	Applications of arrays, case study with sorting techniques.		
	22	Reading strings, writing strings		
	23	Summary of functions used to read and write characters.		
	24	Suppressing input using a Scanset.		
5	25	String taxonomy, operations on strings,	Chalk& board, Problem based learning	20
	26	Miscellaneous string and character functions		
	27	Arrays of strings		
	28	Understanding the Computer's Memory		
	29	Introduction to Pointers, Declaring Pointer Variables		
	30	Introduction to structures		

13.0 Assignments, Quiz,GD, Mini Project, Seminars

S. No.	Title	Outcome expected	Related Study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	**Assignment-1:** Introduction to Computer Hardware & Software.(**10Marks**)	Students study the Topic and write the Answers.	Chapter-1 of Module-1	4	Individual Activity.	Book 1, 2 of the reference list.
2	**Assignment-2:** Character Array & Stings including problems. (**10Marks**)	Students study the Topics and write the Answers.	Chapter-2 of Module-3	9	Individual Activity.	Book 1, 2 of the reference list.

3	Quiz/Seminar/GD (**20Marks**)	Students study the Topics and answer the Quiz / present seminar.	Will be Notified later.	13	Individual/Group activity.	Book 1, 2 of the reference list.

14.0 Lab Assignments

Sl. No.	Title of assignment
1	C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.
2	C Program to convert Kilometers into Meters and Centimeters.
3	C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4	Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b1, b2, b3 such that the equation is balanced on both sides and it must be the reduced form.
5	Implement Matrix multiplication and validate the rules of multiplication.
6	Compute sin(x)/cos(x) using Taylor series approximation. Compare you result with the built-in library function. Print both the results with appropriate inferences.
7	Sort the given set of N numbers using Bubble sort.
8	Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.
9	Implement structures to read, write and compute average-marks and the students scoring above and below the average marks for a class of N students.
10	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.

15.0 QUESTION BANK

Module: 1

1	What is Computer? List and explain the generations of Computer.
2	Draw a neat block diagram of Computer and explain.
3	List and Explain the types of Computer based on size/Speed.
4	Draw a neat block diagram of Computer and explain (Jan-2020)
5	Differentiate between Primary memory and Secondary memory.
6	What is network? List and explain types of network.
7	What is Software? Explain the two types of software with Examples.
8	Write basic structure of C program and explain its different sections. (June/July-2018)
9	What is constant? Explain different types of constants with examples.
10	Define variables. List the rules for naming variables.
11	What is data type? Explain the basic data types that are supported by C
12	What is data type? Explain the basic data types that are supported by C
13	What are the rules to be followed to declare an identifier with example? **(**June/July-2018)
14	Define C- tokens. List and explain different C- tokens. (June/July-2018)

15	Write a note on operator precedence and Associatively.(June/July-2018)
16	Give classification of operators in C, explain with examples. (June/July-2019)
17	Define expression. Explain different types of Expressions. (June/July-2019)
18	How would you explain the components of a computer with the block diagram?
19	Describe the types of computers. (Dec 2019/Jan 2020)
20	How can you write the basic structure of a C program? Explain with examples. (Dec 2019/Jan 2020)
21	Define a token. Explain the different tokens available in C language. (Dec 2019/Jan 2020)
22	How would you explain logical operator in a C language. (Dec 2019/Jan 2020)

Module -2

1	What is formatted and unformatted input/output statement? Explain formatted and unformatted input/output statement with syntax and examples.
2	Explain printf( ) and Scanf( ) function with an example.
3	Explain the getch( ), gets ( ) function with example.
4	Write a C program that takes the radius of the circle and calculates the area and perimeter of circle.
5	Write a C program that takes from the user and calculates their sum and average.
6	Write a C program to print numbers from 4 to 9 and their squares using printf ( ) function.
7	Write a C program to find out largest of three numbers.
8	Write a C program to find the largest of three numbers using conditional operators.
9	An Electric power distribution company charges its domestic customers as follows: **Consumption Units** | **Rate of charge** 0 - 200 | Rs 0.50 per units 201 – 400 | Rs 100 + Rs 0.65 per unit excess of 200 401 – 600 | Rs 230 + Rs 0.80 per unit excess of 400 601 - above | Rs 390 + Rs 1.00 per unit excess of 600 Write a C program to compute and print amount to be paid by the customer. (June/July-2018)
10	Write the Syntax of different looping control constructs and explains their working. (June/July-2018)
11	Distinguish between the following: i) goto and if ii) break and continue (June/July-2018)
12	Write the syntax of nested if …else statement and explain its working. (June/July-2018)
13	Differentiate between do…while and while loop, with the help of Syntax. (June/July-2018)
14	Write a C program to calculate area of circle, rectangle and triangle using switch
15	Write a C program to plot a Pascal's triangle by reading the value of n.
16	Given an integer number, write a C program using while loop to reverse the digits of the number.
17	Write a C program to compute the binomial coefficients by reading the value of n.
18	Write a C program to find the factorial of a given number using while loop. (June/July-2019)
19	Write a C program to find roots of quadratic equation ax^2+bx+c. (June/July-2019)
20	Explain with syntax and example the switch case statement. (June/July-2019)
21	Write a C program to find whether given no. is palindrome or not(June/July-2019)
22	Write a C program to check whether the entered no. is prime or not. (June/July-2019)
23	Explain the nesting of loops in C with examples. (June/July-2019)
24	With example how would describe the formatted input and formatted output statements in C language. (Dec 2019/Jan 2020)
25	How would you explain if-else statement in C language? Give the relevant example. (Dec 2019/Jan 2020)
26	Write a program in C to display the grade based on the marks of the students. (Dec 2019/Jan 2020)
27	How would you explain switch statement with an example? (Dec 2019/Jan 2020)
29	How the while loop differs from do-while loop. (Dec 2019/Jan 2020)
30	Write a program to check whether a given integer is palindrome or not. (Dec 2019/Jan 2020)

Module- 3

1	What is array? How do you classify arrays? What are the advantages of arrays?
2	Explain the declaration and Initialization of 1-D and 2-D arrays with examples.
3	With an example, explain how the elements of two dimensional arrays stored in row major and column major order.
4	Define string? Explain the string handling functions in C.
5	What is string? How are they declared and initialized? Explain with example.
6	Explain the following string library functions: i. strlen( ) ii. strcpy( ) iii. strcat( )
7	Write a C program to compare two strings without using library function.
8	Write a C program that accepts a string at the runtime and checks whether string is palindrome or not.
9	Given a string. Write a C program to count the number of A's in that string. Do not use any built in function.
10	Write a C program to find the largest element of an array of a given size.
11	Write a C program to find the number of positive, negative and zero elements in a given list of integers
12	Write a C program to find sum and average of N integer numbers using arrays.
13	Write a C program to find addition of two matrices.
14	Write a C program to find product of two matrices.
15	Write a C program to input 30 students' marks in a test through the keyboard. Compute and display average marks, highest marks and lowest marks.
16	Write a C program to search a given number in the list using Linear search.
17	Write a C program to search a key integer element in the given array of N elements using binary search Technique. Print the output with suitable headings. (June/July-2018) (June/July-2019)
18	Write a C program to sort the given numbers in ascending order using Bubble sort. (June/July-2019)
19	Write a C program to sort the given numbers in ascending order using Selection sort. (June/July-2019)
20	Write a C program to find length of a string without using strlen() function. (June/July-2018)
21	Define an array. How would you explain declaration and initialization of one dimensional array? (Dec 2019/Jan 2020)
22	Write a program to implement binary searching technique. (Dec 2019/Jan 2020)
23	How would you explain with examples, the string manipulation functions? (Dec 2019/Jan 2020)
24	Write a program to read N integers and to arrange them in ascending order using bubble sort technique. (Dec 2019/Jan 2020)
25	How would you explain the declaration and initialization of string variables? (Dec 2019/Jan 2020)
26	Write a program to multiply 2 matrices by suring their multiplication compatibility. (Dec 2019/Jan 2020)

Module- 4

1	What is function? What are the needs of function? What are its advantages?
2	Explain the function declaration with a suitable example.
3	Explain the different types of functions with examples.
4	What are the elements of functions? Explain.
5	What are the different ways of passing parameters to functions? Explain
6	Distinguish between actual parameters and formal parameters.
7	Distinguish between local and global variables.
8	Write a program to find the sum of odd numbers up to 50 using function.
9	Write a C functions to find sum of individual digits of given a number.
10	What is recursive function? Write a C program to accept two positive integers and compute their GCD using a recursive function.
11	Write a C program to print numbers from 1 to n, which are divisible by 6, using a function.
12	Write a function to test whether or not a given integer number is prime. Write main ( ) which reads the integer to be tested from keyboard and calls the function to test for primness
13	Write a C program to find sum, Average & standard deviation of n values using functions.
14	Write a C function to length of string and check whether the entered string is palindrome or not. (Dec 2019/Jan 2020)

15 Write a C function to find sum of specified row, sum of specified column and sum of all the elements of a matrix. (Dec 2019/Jan 2020)
16 Write a C function to search the given element in a list using linear search technique. (June/July-2019)
17 Write a C program to find n^{th} Fibonacci number in the series using recursion. (June/July-2018)
18 Write a C program to find the factorial of a positive integer using function. (June/July-2019)
19 How would you illustrate the elements of user defined functions with examples? (June/July-2019)
20 Write a program in C to find the factorial of a given integer using functions. (Dec 2019/Jan 2020)
21 Explain how call by value differs from call by reference while invoking a function. (Dec 2019/Jan 2020)
22 How would you explain the categories of user defined functions? (Dec 2019/Jan 2020)
23 Write a program in C to compute the Fibonacci series up to N terms using recursion. (Dec 2019/Jan 2020)
24 List the storage class specifiers. Explain any one of them. (Dec 2019/Jan 2020)

Module- 5

1	What are the structures in C? What is the need of structures?
2	What is Union? Give difference between union and structure with examples.
3	Explain declaring structure variables and initializing structure variables.
4	Explain nested structures with examples.
5	Write a note on the following with as example for each: (June/July-2018) i) Array of structures ii) Array within structures iii) Structures within structures
6	Create a structure st_record having member's student Name (Sname) and students marks (Smarks). Write a C program which reads name and marks of two students and compare whether both students are same. (June/July-2018)
7	Mention syntax and give an example for the following: i) Structure definition ii) Structure variable declaration (June/July-2018)
8	Write a program that takes roll numbers, names, and marks of three students in three different subjects as input and prints total marks and percentage of each student
9	Write a program that takes book id, author name, publisher name, and price for a book as input and prints the same information as output.
10	What is pointer? Explain how to declare a variable as a pointer.
11	Write a C program to demonstrate the usage of pointers.
12	Write a program to display the value of variable and its location using pointer
13	If P is a pointer having address 2000 what could be values for the following: P = P+2; for int *P; P = P-1; for float *P; P = P+10; for char *P; P = P+1; for double *p;
14	Write a program to read two integers M and N and swap the content of two variables M and N using pointers.
15	Write a program using pointers in C to print a string in reverse order. (June/July-2019)
16	Explain defining macro with example.
17	Explain the using of compiler control directives with examples. (June/July-2019)
18	Write a C program demonstrating the use of the #if, #else, and #endif preprocessor directives. (June/July-2019)
19	Write a program demonstrating the use of the #undef preprocessor directives. (June/July-2019)
20	Define a structure. How would you declare and initialize structure variables? Give examples. (Dec 2019/Jan 2020)
21	Define a pointer. How the pointers are declared and initialized? (Dec 2019/Jan 2020)
22	Write a C program to read details of 10 students and to print the marks of student if his name is given as input. (Dec 2019/Jan 2020)
23	Write a program in C to add two numbers using pointers. (Dec 2019/Jan 2020)
24	How would you explain the categories of preprocessor directives in C? (Dec 2019/Jan 2020)
25	How would you explain nested structures? (Dec 2019/Jan 2020)

16.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
JAN - 2021									
JAN - 2020									
JAN - 2019									

Prepared by	Checked by		
			
Dr. K B Manwade	Dr. M G Huddar	HOD	Principal

Subject Title	**RENEWABLE ENERGY SOURCES**		
Subject Code	BETCK105E	**IA Marks(20)+Assignments(10)+ Laboratory work (20)**	50
Number of Lecture Hrs / Week	3 hrs	**Exam Marks(appearing for)**	50(100)
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Dr. K. M. Akkoli	**Designation:** Associate Professor	**Experience:** 20Years
No. of times course taught: 01	**Specialization:** Thermal Power Engineering	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	PUC	Mathematics, Physics and chemistry

2.0 Course Objectives

Students belonging to all branches of Engineering are made to learn certain fundamental topics related to the renewable energy field so that they will have a minimum understanding and working of renewable energy conversion systems, equipment and process.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to understand construction and working mechanical systems.

CO'S	Course Outcome	Cognitive Level	POs
C114.1	Describe the environmental aspects of renewable energy resources. In comparison with various conventional energy systems, their prospectus and limitations	L1,L2&L3	PO1, PO6,PO7,PO8 & PO12
C114.2	Describe the use of solar energy and various components used in the energy production with respect to applications like heating cooling, desalination, power generation.	L1,L2&L3	PO1, PO6,PO7,PO8 & PO12
C114.3	Understand the conversion principles of wind and tidal energy.	L1,L2&L3	PO1, PO6,PO7,PO8 & PO12
C114.4	Understand the concept of biomass energy resources and green energy.	L1,L2&L3	PO1, PO6,PO7,PO8
C114.5	Acquire the basic knowledge of ocean thermal energy conversion and hydrogen energy.	L1,L2&L3	PO1, PO6,PO7,PO8 & PO12
Total Hours of instruction		**40**	

4.0 Course Content

Module - 1

Introduction: Principles of renewable energy; energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, oil shale. Introduction to Internet of energy (IOE). **8 Hours**

Module- 2

Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. Solar Thermal systems: Flat plate collector; Solar distillation; Solar pond electric power plant.
Solar electric power generation- Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system. **8 Hours**

Module- 3

Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Basic components of wind energy conversion system (WECS); Classification of WECS- Horizontal axis- single, double and multiblade system. Vertical axis- Savonius and darrieus types.
Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies -fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft). **8 Hours**

Module- 4

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations.
Ocean Thermal Energy Conversion: Principle of working, OTEC power stations in the world, problems associated with OTEC. **8 Hours**

Module- 5

Green Energy: Introduction, Fuel cells: Classification of fuel cells – H_2; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy. **8 Hours**

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project work	Fundamental concepts
02	V/VI	Energy conversion systems	Internal combustion engines, gas cycles, Turbines, Refrigeration & air conditioning,

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Electricity generation, Energy harnessing, Industrial automation, Robots configuration, machining operations,
02	Working and operation of IC engines, boilers, turbines, Air-conditioner, Refrigerator, Welding, brazing, soldering.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	NPTEL Tutorial	Topic: Energy resources, internal combustion engines, Turbines, Non conventional energy sources, Renewable energy sources.

8.0 Books Used and Recommended to Students

Suggested Books
1. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition 1. Energy Technology, S. Rao and Dr. B.B. Parulekar, Khanna Publication. 2. Solar energy, Subhas P Sukhatme, Tata McGraw Hill, 2nd Edition, 1996.
Additional Study material & e-Books
3. Principles of Energy conversion, A. W. Culp Jr.,, McGraw Hill, 1996 4. Non-Convention Energy Resources, Shobh Nath Singh, Pearson, 2018

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

Website and Internet Contents References
• E-book URL: https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html • E-book URL:https://www.pdfdrive.com/non-conventional-energy-systems-nptel- d17376903.html • E-book URL: https://www.pdfdrive.com/renewable-energy-sources-and-their-applications- e33423592.html • E-book URL: https://www.pdfdrive.com/lecture-notes-on-renewable-energy-sources- e34339149.html • https://onlinecourses.nptel.ac.in/noc18_ge09/preview

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	Elsevier	https://www.journals.elsevier.com
2	International Journal of Renewable Energy Research (IJRER)	http://www.ijrer.org

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Three Tests each of 20 Marks;

1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%, 70-75%, and 90-100% of the course/s respectively.

Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of 40 Marks.

If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill development activities etc then the evaluation method shall be one. Total CIE marks (out of 100 marks) shall be scaled down to 50 marks Semester End Examination (SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.

The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 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.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	Teaching Method	% of Portion
1	1	Introduction: Principles of renewable energy;	Chalk and Talk, Power-point Presentation	20%
	2	Energy and sustainable development, fundamentals and social implications.	Chalk and Talk, Power-point Presentation	
	3	Worldwide renewable energy availability, renewable energy availability in India,	Chalk and Talk, Power-point Presentation	
	4	Brief descriptions on solar energy, wind energy	Chalk and Talk, Power-point Presentation	
	5	Tidal energy, wave energy, Ocean thermal energy	Chalk and Talk, Power-point Presentation	
	6	Biomass energy,	Chalk and Talk, Power-point Presentation	
	7	Geothermal energy, oil shale.	Chalk and Talk, Power-point Presentation	
	8	Introduction to Internet of energy (IOE).	Power-point Presentation	
2	9	Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces;	Chalk and Talk, Power-point Presentation	40%
	10	Solar radiation Measurements- Pyrheliometers,	Chalk and Talk, Power-point Presentation	
	11	Pyrometer, Sunshine Recorder.	Chalk and Talk, Power-point Presentation	
	12	Solar Thermal systems: Flat plate collector;	Chalk and Talk, Power-point Presentation	
	13	Solar distillation; Solar pond electric power plant.	Chalk and Talk, Power-point Presentation	

	14	Solar electric power generation- Principle of Solar cell,	Chalk and Talk, Power-point Presentation	
	15	Photovoltaic system for electric power generation,	Chalk and Talk, Power-point Presentation	
	16	Advantages, Disadvantages and applications of solar photovoltaic system.	Chalk and Talk, Power-point Presentation	
3	17	Wind Energy: Properties of wind, availability of wind energy in India,	Chalk and Talk, Power-point Presentation	60%
	18	Wind velocity and power from wind; major problems associated with wind power, Basic	Chalk and Talk, Power-point Presentation	
	19	Components of wind energy conversion system (WECS); Classification of WECS- Horizontal axis- single, double and multiblade system.	Chalk and Talk, Power-point Presentation	
	20	Vertical axis- Savonius and darrieus types.	Chalk and Talk, Power-point Presentation	
	21	Biomass Energy: Introduction; Photosynthesis Process; Biofuels;	Chalk and Talk, Power-point Presentation	
	22	Biomass Resources; Biomass conversion technologies -fixed dome;	Chalk and Talk, Power-point Presentation	
	23	Urban waste to energy conversion;	Chalk and Talk, Power-point Presentation	
	24	Biomass gasification (Downdraft)	Chalk and Talk, Power-point Presentation	
4	25	Tidal Power: Tides and waves as energy suppliers and their mechanics;	Chalk and Talk, Power-point Presentation	80%
	26	fundamental characteristics of tidal power,	Chalk and Talk, Power-point Presentation	
	27	Harnessing tidal energy,	Chalk and Talk, Power-point Presentation	
	28	Advantages and limitations.	Chalk and Talk, Power-point Presentation	
	29	Ocean Thermal Energy Conversion:	Chalk and Talk, Power-point Presentation	
	30	Principle of working,	Chalk and Talk, Power-point Presentation	
	31	OTEC power stations in the world,	Chalk and Talk, Power-point Presentation	
	32	Problems associated with OTEC.	Chalk and Talk,	
5	33	Green Energy: Introduction, Fuel cells:	Chalk and Talk, Power-point Presentation	100%
	34	Classification of fuel cells – H2;	Chalk and Talk, Power-point Presentation	
	35	Operating principles,	Chalk and Talk, Power-point Presentation	
	36	Zero energy Concepts.	Chalk and Talk, Power-point Presentation	
	37	Benefits of hydrogen energy,	Chalk and Talk, Power-point Presentation	
	38	Hydrogen production technologies (electrolysis method only),	Chalk and Talk, Power-point Presentation	
	39	Hydrogen energy storage, applications of hydrogen energy,	Chalk and Talk, Power-point Presentation	
	40	Problems associated with hydrogen energy.	Chalk and Talk, Power-point Presentation	

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 Introduction to Renewable Energy Sources, Solar Energy and Wind Energy.	Students study the Topics and prepare the multiple choice questioner with answer.	1st , 2nd and ½ of 3rd Module of the syllabus	4	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Biomass energy, wave energy, tidal energy, OTEC and green energy.	Students study the Topics and prepare the multiple choice questioner with answer.	½ of 3rd ,4th , and 5th Module of the syllabus	8	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
3	Quiz: University Questions on	Students study the Topics and prepare the multiple choice questioner with answer.	All Modules of the syllabus	12	Group Activity. Each group should prepare minimum 05 questions expected.	Book 1, 2 of the reference list. Website of the Reference list

15.0 QUESTION BANK

Sample Questions	Questions
VIII	**Module 1** 1. Explain principles of renewable energy 2. Explain Energy and sustainable development, 3. Give fundamentals and social implications. 4. Describe worldwide renewable energy availability and renewable energy availability in India 5. Briefly describe solar energy 6. Briefly describe wind energy 7. Briefly describe tidal energy 8. Briefly describe wave energy 9. Briefly describe ocean thermal energy 10. Briefly describe biomass energy 11. Briefly describe geothermal energy and oil shale. 12. Explain Introduction to Internet of energy (IOE)
IX	**Module 2** 1. Explain Solar Radiation geometry 2. discuss Estimation of solar radiation on horizontal and inclined surfaces 3. Explain solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. 4. Explain with sketch working of solar Flat plate collector 5. Explain with sketch working of Solar distillation 6. Explain with sketch working of solar pond electric power plant. 7. Explain Principle of Solar cell, 8. Explain with sketch working of Photovoltaic system for electric power generation, 9. Give advantages, Disadvantages solar photovoltaic system 10. Give applications of solar photovoltaic system.

X	**Module 3** 1. What is wind power explain briefly? 2. Describe with a neat sketch the working of wind energy system with main components 3. How power extracted by wind turbine? 4. List out type of wind turbine and what are the wind power plants are grouped 5. Discuss the advantages and disadvantages of horizontal and vertical axis wind mill. 6. What methods are used to overcome the fluctuate power generation of wind mill? 7. What are the advantages and disadvantages of wind turbine? 8. How performance of the wind turbine is determined? Explain its operational characteristics. 11. What is biomass, bio-fuel , bio energy and biogas? 12. What are the methods used for biomass conversion to energy? Explain in brief? 13. What are the factors affecting the generation of bio gas? 14. What are the constituents of biomass materials? 15. What is fermentation, aerobic and anaerobic, hydrolysis explain each. 16. Explain fixed dome bio digester with sketch 17. With a neat sketch explain downdraft biomass gasifiier?
XI	**Module 4** 1. What is tide? Explain tidal energy and its conversion with neat diagram 2. Explain the basic components of a tidal thermal power plant 3. Whate are advantages and disadvantages tidal power generation. 4. What is the nature of tidal power extracted from single basin arrangement and double basin arrangement? 5. What are the wave energy conversion machines, explain any one conversion methods. 6. What is the basic principle of ocean thermal energy conversion? 7. What are the main types of OTEC power plants? Describe their working in brief. 8. What are advantages and disadvantages
XII	**Module 5** 1. What are Fuel cells 2. Classify of fuel cells 3. Explain Operating principles of fuel cells 4. Explain Zero energy Concepts. 5. What are Benefits of hydrogen energy 6. Explain hydrogen production technologies electrolysis method 7. Describe hydrogen energy storage 8. Give applications of hydrogen energy 9. What are problems associated with hydrogen energy.

16.0 University Result

Examination	S^+	S	A	B	C	D	E	F	% Passing

Prepared by	Checked by		
			
Dr. K. M.Akkoli	**Dr. M. M. Shivashimpi**	**HOD**	**Principal**

Subject Title	**Internet of Things**		
Subject Code	BETCK105H	**IA Marks (30) +Assignments (10) +Quiz(10)=50**	50
Number of Lecture Hrs/Week /	03	**Exam Marks (appearing for)**	50 (100)
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. Sunita. S. Malaj	**Designation:** Asst Professor	**Experience: 24** years
No. of times course taught:0	**Specialization: Electronics & Telecommunication**	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects, Internet	----------	Physics

2.0 Course Objectives

The course objective is to make students of all the branches of engineering to understand the fundamentals of Internet of things and its building blocks along with their characteristics, recent application domains of IoT in everyday life which are pervasive in engineering applications.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	PO's
CO1	Describe the evolution of IoT, IoT networking components.	U	1,5,6,7,8,11,12
CO2	Classify various sensing devices and actuator types.	U	1,5,6,7,8,11,12
CO3	Demonstrate the processing in IoT.	U	1,5,6,7,8,11,12
CO4	Explain Associated IOT Technologies	U	1,5,6,7,8,11,12
CO5	Illustrate architecture of IOT Applications	U	1,5,6,7,8,11,12
Total Hours of instruction		**40**	

4.0 Course Content

Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1		
Basics of Networking: Introduction, Network Types, Layered network models **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components	**08**	**L1, L2,L3**
Module -2		

IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.	**08**	
Module-3		
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies ,IoT Device Design and Selection Considerations, Processing Offloading.	**08**	**L1, L2,L3**
Module-4		
ASSOCIATED IOT TECHNOLOGIES Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service. IOT CASE STUDIES Agricultural IoT – Introduction and Case Studies	**08**	**L1, L2,L3**
Module-5		
IOT CASE STUDIES AND FUTURE TRENDS Vehicular IoT – Introduction Healthcare IoT – Introduction, Case Studies IoT Analytics – Introduction	**08**	**L1, L2, L3**

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project Work	IOT based projects

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Build a application based on IoT

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Vehicular IoT
02	Tutorial	Topic: Health Care IoT

8.0 Books Used and Recommended to Students

Text Books

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.

Reference:

2. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
3. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
4. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Note: E-book versions are available at 'https://www.knimbus.com/' of the VTU consortium. Remote

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

Website and Internet Contents References
9) 1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Internet of Things-Magazine-IEEEIoTM	https://www.comsoc.org/publications/magazines/ieee-internet-things-magazine

11.0 Examination Note

Assessment Details both (CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Tests each of 20 Marks**;**
1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%, 70-75%, and 90-100% of the course/s respectively.
Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of 40 Marks.
If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill development activities etc then the evaluation method shall be one.
Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**
The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.
The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks.
The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 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

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	Teaching Method	% Of Portion
1	1	Introduction	Chalk and talk,	
	2	Network Types	Chalk and talk, PPT	
	3	Layered network models	Chalk and talk	
	4	Layered network models	Chalk and talk	

	5	Introduction, Evolution of IoT	Chalk and talk	20
	6	Enabling IoT and the Complex Interdependence of Technologies	Chalk and talk,	
	7	Enabling IoT and the Complex Interdependence of Technologies	Chalk and talk	
	8	IoT Networking Components	Chalk and talk,	
2	9	Introduction, Sensors	Chalk and talk,	20
	10	Introduction, Sensors	Chalk and talk	
	11	Sensor Characteristics	Chalk and talk, PPT	
	12	Sensorial Deviations	Chalk and talk,	
	13	Sensing Types	Chalk and talk,	
	14	Sensing Types	Chalk and talk,	
	15	Sensing Considerations, Actuators	Chalk and talk,	
	16	Actuator Types, Actuator Characteristics	Chalk and talk,	
3	17	Data Format	Chalk and talk, PPT	20
	18	Importance of Processing in IoT	Chalk and talk, PPT	
	19	Importance of Processing in IoT	Chalk and talk	
	20	Processing Topologies	Chalk and talk	
	21	IoT Device Design and Selection Considerations	Chalk and talk	
	22	IoT Device Design and Selection Considerations	Chalk and talk	
	23	Processing Offloading	Chalk and talk	
	24	Processing Offloading	Chalk and talk	
4	25	Introduction	Chalk and talk	20
	26	Virtualization	Chalk and talk	
	27	Cloud Models	Chalk and talk	
	28	Service-Level Agreement in Cloud Computing	Chalk and talk	
	29	Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service.	Chalk and talk	
	30	Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service.	Chalk and talk	
	31	Introduction and Case Studies	Chalk and talk	
	32	Introduction and Case Studies	Chalk and talk	
5	33	Vehicular IoT - Introduction	Chalk and talk,PPT	20
	34	Vehicular IoT - Introduction	Chalk and talk,PPT	
	35	Vehicular IoT - Introduction	Chalk and talk,PPT	
	36	Health Care-IoT-Introduction	Chalk and talk,PPT	
	37	Health Care-IoT-Introduction	Chalk and talk,PPT	
	38	IoT Analytics – Introduction	Chalk and talk,PPT	
	39	IoT Analytics – Introduction	Chalk and talk,PPT	
	40	IoT Analytics – Introduction	Chalk and talk,PPT	

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 Network Types, Layered Network models, Sensors and sensing considerations and Actuators ,Processing Topologies IoT Device design and selection considerations, Vehicular IoT, Health care IoT, IoT Analytics	Students study the Topics and will prepare for Final Exam.	Module-1,2,3,4,5 of the syllabus	3	Individual Activity	Book 1 of the text list.

14.0 University Result

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15.0 QUESTION BANK

Module – 1

1. Differentiate between point-to-point and point-to-multipoint connection types.
2. Discuss the pros and cons of the following network topologies:
   (a) Star
   (b) Ring
   (c) Bus
   (d) Mesh
3. How are PANs different from LANs?
4. How are MANs different from WANs?
5. What is the ISO-OSI model?
6. Discuss the highlights of the seven layers of the OSI stack.
7. What is the Internet protocol suite?
8. How is the Internet protocol suite different from the ISO-OSI model?
9. What is smart dust?
10. Differentiate between IoT and M2M.
11. Differentiate between IoT and WoT.
12. What is Web of Things (WoT)?
13. What are the various IoT connectivity terminologies?
14. Differentiate between an IoT proxy and an IoT gateway.

Module -2

1. Differentiate between sensors and actuators.
2. Differentiate between sensors and transducers.
3. How is sensor resolution different from its accuracy?
4. Differentiate between scalar and vector sensors.
5. Differentiate between analog and digital sensors.
6. What is an offset error?
7. What is a hysteresis error?
8. What is a quantization error?
9. What is aliasing error?
10. Differentiate between hydraulic and pneumatic actuators with examples.
11. What are shape memory alloys (SMA)?

12. What are soft actuators?
13. What are the main features of shape memory polymers?
14. What are light activated polymers?

Module -3

1. What are the different data formats found in IoT network traffic streams?
2. Depending on the urgency of data processing, how are IoT data classified?
3. Highlight the pros and cons of on-site and off-site processing.
4. Differentiate between structured and unstructured data.
5. How is collaborative processing different from remote processing?
6. What are the critical factors to be considered during the design of IoT devices?
7. What are the typical data offload locations available in the context of IoT?
8. What are the various decision making approaches chosen for offloading data in IoT?
9. What factors are to be considered while deciding on the data offload location.

Module – 4

1. How is fog computing different from cloud computing?
2. List the characteristics of a fog node.
3. How can fog computing be used in a smart city?
4. What is the role of the \protocol abstraction layer" of a fog node?
5. What are roles of software backplane in the software view of a fog computing architecture?
6. What do you mean by time sensitiveness in fog computing?
7. How is the fog computing architecture useful in a hospital scenario/environment?
8. Why is autonomous decision making important in fog computing?
9. What do you mean by community fog node?
10. List the type of sensors which can be used for agricultural IoT.
11. Explain two use cases where drones can be used for agricultural IoT.
12. Design a scenario where we can use fog computing in agriculture.
13. How can agricultural IoT help in the efficient distribution of water in agricultural fields?
14. What are the roles of the various IoT components in an agri-chain?
15. What are the advantages of agricultural IoT?
16. List a few communication modules used for agricultural IoT?
17. Design a case study to develop an IoT-based agricultural planter. In the case study, you should include the requirement analysis of different components and justify their usability in the planter.
18. What is the importance of satellites in agricultural IoT?

Module – 5

1. What is the role of cloud and fog computing in vehicular IoT?
2. What are the applications of IoT in transportation?
3. What are the advantages of vehicular IoT?
4. Give an example of image processing in vehicular IoT.
5. What are roadside units (RSUs)?
6. How can data analytics help in a vehicular IoT system?
7. What are the uses of a camera sensor in vehicular IoT?
8. How can a vehicular IoT system ensure the safety of drivers?
9. Design a use case for developing an IoT-based driver sleep detection system.
10. Please mention all types of sensors required for developing the same.
11. List the components of healthcare IoT.
12. Why privacy and security is important for healthcare?

13. What is a wireless body area network (WBAN)?
14. What is the difference between electrocardiogram (ECG) and electromyogram (EMG) sensors?
15. List the advantages of healthcare IoT.
16. List the risks associated with healthcare IoT systems.
17. How can data analysis be used in healthcare IoT?
18. What is a local processing unit (LPU)?
19. Discuss an idea for developing an IoT-based healthcare system, where we can include fingerprint sensor
20. Why is cloud computing important for a healthcare IoT system?
21. What is machine learning (ML)? Why do we use ML?
22. What are the major challenges in ML?
23. What are the types of ML?

Prepared by	Checked by		
			
Prof. S.S.Malaj	**Dr.R.R.Magavi**	**HOD**	**Principal**

Subject Title	**Introduction to Cyber Security**		
Subject Code	**BETCK105I**	**IA Marks**	50(100)
Number of Lecture Hrs/Week	03	**Exam Marks (appearing for)**	50(100)
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS–03			

FACULTYDETAILS:		
Name: Prof. Sachin S Patil	**Designation:** Assistant Professor	**Experience: Teach-18**years (**Ind**2.3years)
No.of times coursetaught:00	**Specialization:** VLSI Design & Embedded Systems	

1.0 PrerequisiteSubjects:

Sl.No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	I& II	Internet Usage

2.0 Course Objectives

This course will enable students

- To familiarize cybercrime terminologies and perspectives
- To understand Cyber Offenses and Botnets
- To gain knowledge on tools and methods used in cybercrimes
- To understand phishing and computer forensics

3.0 CourseOutcomes

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

	CourseOutcome	Cognitive Level	PO's
CO1	Explain the cybercrime terminologies	U	1-12
CO2	Describe Cyber offenses and Botnets	U	1-12
CO3	Illustrate Tools and Methods used on Cybercrime	U	1-12
CO4	Explain Phishing and Identity Theft	U	1-12
CO5	Justify the need of computer forensics	U	1-12
Total Hours of instruction		**40**	

4.0 Course Content

Modules	Teaching Hours	Bloom'sTaxonomy(RBT)level
Module1		
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking, and Indian Laws., Global Perspectives Textbook:1 Chapter 1 (1.1 to 1.5, 1.7-1.9)	**8**	**L1,L2,L3**
Module-2		
Cyber Offenses: How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cyber caafe& cybercrimes. Botnets: The fuel for cybercrime, Attack Vector. Textbook:1 Chapter 2 (2.1 to 2.7)	**8**	**L1,L2,L3**
Module-3		
Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks. Textbook:1 Chapter 4 (4.1 to 4.9, 4.12)	**8**	**L1,L2,L3**
Module-4		
PhishingandIdentityTheft: Introduction,methodsofphishing,phishing,techniques,spearphishing,typesofphishing scams,phishingtoolkitsandspyphishing,counter measures,IdentityTheft Textbook:1Chapter5(5.1.to5.3)	**8**	**L1,L2,L3**
Module-5		
Understnading Computer Forensics: Introdcution, Historical Background of Cyberforensics, Digital ForesicsScience, Need for Computer Foresics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain ofCustodyConcepts,network forensics. Textbook:1Chapter7(7.1.to7.5, 7.7to7.9)	**8**	**L1, L2,L3**

5.0 Relevancetofuturesubjects

Sl.No	Semester	Subject	Topics
01	VII/VIII	Project Work	All Modules
02	VII	HPCN	All Modules

6.0 RelevancetoRealWorld

SL.No	Real World Mapping
01	Design of electronic circuits for different applications.
02	Hobby/Mini projects
03	Home appliances/controlling of equipments.

7.0 Gap Analysis and Mitigation

Sl.No	Delivery Type	Details
01	Tutorial	Topic: Antivirus, Firewall
02	NPTEL	Cyber Security

8.0 Books Used and Recommended to Students

TextBooks

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

9.0 RelevantWebsites(ReputedUniversitiesandOthers)forNotes/Animation/ VideosRecommended

Website and Internet Contents References

https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu
https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_
https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z_hDwT95xlk
https://www.youtube.com/watch?v=KqSqyKwVuA8

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEEXplorer	http://ieee.com
2	International Journal of Science and Technology	http://www.sciencedirect.com/science/journal/00207683
3	Journal of Communication Engineering	http://ieee.com

1.0 Examination Note

Assessment Details both (CIEand SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Two Unit Tests each of 30 Marks (duration 01 hour)
First test after the completion of 30-40 % of the syllabus
Second test after completion of 80-90% of the syllabus

one Improvement test before the closing of the academic term may be conducted if necessary. However best two

tests out of three shall be taken into consideration
Two assignments each of 20 Marks
The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. . The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.
The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 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.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	Teaching Method	%Of Portion
1	1	**Cybercrime:** Definition and Origins of the Word,	1. Chalk and Board 2. Demonstration 3. Interactive learning 4. Videos and Online material	20
	2	Cybercrime and Information Security,	-do-	
	3	Who are Cybercriminals?	-do-	
	4	Classifications of Cybercrimes	-do-	
	5	Classifications of Cybercrimes	-do-	
	6	An Indian Perspective	-do-	
	7	Hacking	-do-	
	8	Indian Laws., Global Perspectives	-do-	
	9	**How Criminals Plan Them**: Introduction	-do-	

2	10	How criminals plan the attacks	-do-	20
	11	Source follower	-do-	
	12	Social Engineering	-do-	
	13	Cyber Stalking	-do-	
	14	Cybercafe & cybercrimes.	-do-	
	15	Botnets: The fuel for cybercrime	-do-	
	16	Attack Vector.	-do-	
3	17	**Tools and Methods used in Cybercrime**: Introduction	-do-	20
	18	Proxy Servers	-do-	
	19	Anonymizers, Phishing	-do-	
	20	Password Cracking	-do-	
	21	Key Loggers and Spyways	-do-	
	22	Virus and Worms, Trozen Horses and Backdoors	-do-	
	23	Steganography, DoS and DDOS Attackes	-do-	
	24	Attacks on Wireless networks	-do-	
4	25	**Phishing and Identity Theft :**Introduction	-do-	20
	26	methodsofphishing	-do-	
	27	phishing,techniques	-do-	
	28	spearphishing	-do-	
	29	typesofphishing scams	-do-	
	30	phishingtoolkitsandspy phishing	-do-	
	31	counter measures	-do-	
	32	IdentityTheft	-do-	
	33	**Understanding Computer Forensics:** Introdcution	-do-	
	34	Historical Background of Cyber-forensics	-do-	
	35	Digital ForesicsScience	-do-	

5	36	Need for Computer Forensics	-do-	20
	37	Cyber Forensics and Digital Evidence	-do-	
	38	Digital Forensic Life cycle	-do-	
	39	Chain ofCustodyConcepts	-do-	
	40	network forensics	-do-	

13.0 Assignments, PopQuiz, MiniProject, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual /Group activity	Reference:book/website /Paper
1	Assignment 1: **Cybercrime**	Studentsstudy theTopicsandwillprepare for FinalExam.	Module-1of thesyllabus	3	Individual Activity	Book 1 of the textlist.
2	Assignment 2: **How Criminals Plan Them**	Studentsstudy theTopicsandwillprepare for FinalExam.	Module-2of thesyllabus	6	Individual Activity.	Book 1 of the textlist.
3	Assignment 3: **Tools and Methods used in Cybercrime**	Studentsstudy theTopicsandwill prepareforFinal Exam.	Module-3of thesyllabus	9	Individual Activity.	Book 1 of the textlist.
4	Assignment 4: **PhishingandIdentityTheft**	Studentsstudy the Topicsandwillpreparefor Final Exam.	Module-4of the syllabus	12	Individual Activity	Book3ofthetextlist.
5	Assignment 5: **Understanding Computer Forensics**	Studentsstudy the Topicsandwillpreparefor Final Exam.	Module-5of the syllabus	15	Individual Activity	Book3ofthetextlist.

14.0 University Result

15.0 QUESTION BANK

Module–1

1. What is cybercrime? How do you define it?
2. How do we classify cybercrimes? Explain each one briefly.
3. What are the different types of cybercriminals?
4. Is there a difference between "cybercrime" and "cyberfraud"? Explain.
5. How do viruses get disseminated? Explain with diagrams.
6. Write a short note on "Indian Legal Perspective on Cybercrimc." You may like co augment your note using your own research, in addi•tion to the material presented in this chapter.
7. How do you think cybercrime has relevance in the extended enterprise context? Explain.
8. Explain in your own words what you under•stand about cheglobaJ cooperation requfred in fighting against cybercrime.

Module-2

1. How are cybercrimes classified? Explain with explain.
2. Explain the difference between passive and active attacks. Provide examples.
3. What is social engineering?
4. What is cyberstalking? As per your understanding is it a crime under the Indian IT Act?
5. Explain how Botnets can be used as a fuel to cybercrime.
6. What are the different attacks launched with attack vector. Explain.
7. Explain cloud computing and cybercrime.

Module-3

1. What are the different phases during the attack on the network?
2. what is the difference between proxy server and anonymizer,
3. what are the different ways of password cracking.
4. how can keyloggers be used to commit a cybercrime.
5. what is the difference between a virus and a worm.
6. what is virus hoax?
7. what is the difference between Trojan horses and backdoors?
8. what is the difference between steganography and cryptography?
9. are countermeasures employed against steganography? Explain.
10. what is the difference between DoS and DDoS?
11. What is SQL injection and what are the different countermeasures to prevent the attack?
12. What is blind SQL injection attack? Can it be prevented?
13. What are different buffer overflow attacks?
14. What are the different components of wireless network?
15. What is the difference between WEP and WPA2?
16. How can wireless networks be compromised?
17. what is the difference between WAP kitting and WAP jacking?

Module–4

1. What is fishing? Explain with examples.
2. Differentiate between spam and hox mails.
3. What are the different methods of phishing attacks?
4. What is spare phishing? Explain with examples.

5. What is whaling? Explained the difference between whaling and spear phishing.
6. what is identity theft? Explain with examples.
7. How can information be classified?
8. What are the different types of ID theft?
9. What are the different techniques of ID theft?
10. How to prevent being a victim of ID theft?

Module–5

1. Is there a difference between computer security and computer forensics? Explain.
2. Can a cybercrime investigation be done without involving a forensic expert? Explain with reasons.
3. Explain the importance of strong documentation in cyber forensics profession.
4. Explain the importance of chain of custody concept. Provide illustrations to support your answer.
5. Explain how an e-mail can be traced for forensic purposes. Outline the various keys steps involved.
6. What are the typical elements of a digital forensic investigation reports.?
7. What would be the nature of evidence collected for network forensics?

Prepared by	Checked by		
Prof. S. S. Patil	Prof. P. V. Patil	HOD	Principal

Communicative English			
Subject Code	**BENGK106**	**CIE Marks**: IA-Tests(20) + Assignments(10)+ Quiz/GD/Seminar(20)	**50**
Teaching Hours/Week (L:T:P:S)	**1:0:0:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**15**	**Total marks (CIE + SEE)**	**100**
Credits	**01**	**SEE Hours**	**01**

FACULTY DETAILS:		
Name: Prof. B. S. Hooli	**Designation: Lecturer**	**Experience:** 20 Yrs
No. of times course taught: 2	**Specialization:** English	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	-	-	Basic English Skills

2.0 Course Objectives

The course Communicative English (22ENG16) will enable the students,

- ✓ To know about Fundamentals of Communicative English and Communication Skills in general.
- ✓ To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
- ✓ To impart basic English grammar and essentials of important language skills.
- ✓ To enhance with English vocabulary and language proficiency for better communication skills.
- ✓ To learn about Techniques of Information Transfer through presentation.
- ✓

3.0 Course Outcomes [C112]

At the end of the course Communicative English (22ENG16) the student will be able to:

CO	Course Outcome	Cognitive Level	POs
C123	Understand and apply the Fundamentals of Communication Skills in their communication skills.	L1,L2	1,2,3,8,10
C123	Identify the nuances of phonetics, intonation and enhance pronunciation skills.	L1,L2,L3	1,2,3,8,10
C123	To impart basic English grammar and essentials of language skills as per present requirement.	L1,L2,L3	1, 2, 3,8,10

C123	Understand and use all types of English vocabulary and language proficiency.	L1,L2,L3	1, 2,3,8,10
C123	Adopt the Techniques of Information Transfer through presentation.	L1,L2,L3	1, 2,3,8,10

4.0 Course Content

Module-1

Introduction to Communicative English: Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.

Module -2

Introduction to Phonetics : Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation.

Module- 3

Basic English Communicative Grammar and Vocabulary PART - I : Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.

Module- 4

Basic English Communicative Grammar and Vocabulary PART - II: Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.

Module-5

Communication Skills for Employment : Information Transfer: Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises.

5.0 Books Used and Recommended to Students

Text Books

1. **Communication Skills** by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd - 2019.
2. **A Textbook of English Language Communication Skills,** (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

Reference Books

1. **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
2. **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3. **English Language Communication Skills – Lab Manual cum Workbook,** Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.
4. **A Course in Technical English – D Praveen Sam, KN Shoba,** Cambridge University Press – 2020.
5. **Practical English Usage** by Michael Swan, Oxford University Press – 2016.

6.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE)

Three Unit Tests each of 20 Marks (duration 01 hour)

- First test after the completion of 30-35 % of the syllabus
- Second test after completion of 35-70% of the syllabus
- Third test after completion of 70-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best three tests out of three shall be taken into consideration.

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others.. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of three tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student must secure a minimum of 35% of the maximum marks for SEE.

7.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture		% of Portion
		PART - A	**Teaching-Learning Process**	
1	1	Introduction to Communicative English	Chalk &board, PPT, Animation, Active	20
	2	Fundamentals of Communicative English		
	3	Process of Communication		
	4	Barriers to Effective Communicative English		
	5	Different styles and levels in Communicative English		

	6	Interpersonal and Intrapersonal Communication Skills	Learning	
2	7	Introduction to Phonetics, Phonetic Transcription, English Pronunciation	Chalk & board, Active Learning, Problem based learning	20
	8	Pronunciation Guidelines to consonants and vowels		
	9	Sounds Mispronounced, Silent and Non silent Letters		
	10	Word Accent, Stress Shift and Intonation		
	11	Spelling Rules and Words often Misspelt		
	12	Common Errors in Pronunciation		
3	13	Grammar: Basic English Grammar and Parts of Speech	Chalk & board, PPT, Animation, NPTEL, Active Learning	20
	14	Articles and Preposition		
	15	Question Tags, One Word Substitutes		
	16	Question Tags, One Word Substitutes		
	17	Strong and Weak forms of words		
	18	Introduction to Vocabulary. All Types of Vocabulary – Exercises on it		
4	19	Basic English Communicative Grammar and Vocabulary PART - II	Chalk& board, Problem based learning	20
	20	Words formation - Prefixes and Suffixes		
	21	Contractions and Abbreviations		
	22	Word Pairs (Minimal Pairs) – Exercises		
	23	Tense and Types of tenses		
	24	The Sequence of Tenses (Rules in use of Tenses) and Exercises on it		
5	25	Communication Skills for Employment :Information Transfer: Oral Presentation and its Practice	Chalk& board, Problem based learning	20
	26	Difference between Extempore/Public Speaking		
	27	Communication Guidelines		
	28	Mother Tongue Influence (MTI)		
	29	Various Techniques for Neutralization of Mother Tongue Influence		
	30	Reading and Listening Comprehensions – Exercises		

8.0 QUESTION BANK

Choose the correct option from those given in each of the sentences below.

1. The direction in which the formal communication flows is always_____.
A. Upward B. Downward C. Horizontal D. All of the Above

2. Communiction in an organization should ideally flow_____
A. From top to bottom B. From bottom to top C. Both ways D. None of these

3. Which one of the following cannot become a type of written communication_____
A. Pictures and visual aids B. Meetings and conferences C. Letters and suggestions D. Rules and Instructions

4. Consider the following statements about communication,
1. It is a process of interaction with people and environment
2. Two or more individuals interact and influence the ideas, beliefs and attitudes of each other.
3. They can exchange information through words, gestures, signs and symbols, expressions etc.
Answer using the following codes: A. 1 and 2 B. 2 and 3 C. 1 and 3 D. 1, 2 and 3

5. Which of the following is/are not included in the tools of verbal communication?
A. Listening B. Reading C. Writing D. Graphics

6. Which of the following statements explain Interpersonal skills?
A. The skills that a person uses to interact with other people.
B. People skills or communication skills
C. It explains how people relate to one another D. All the above.
7. Which of the following is not a way to improve interpersonal skills?
A. Think positively, and enter the mindset to work well with others and maintain good relationships. B. Criticise others or yourself. B. Do not criticize others or yourself.
C. Be patient. D. Be clear

8. Consider the following:
A. Common frame of reference B. Mutual Interest C. Common Language D. Common environment
Which of the above is/are features of effective communication? Answer using codes:
A. 1, 2, 3 and 4 B. 1, 2 and 3 C. 1 and 2 D. 1 and 3

9. In communication, when people do not talk much, question even less, and actually do very little it is called,
A. Assertive style B. Passive style C. Passive – aggressive style D. Aggressive style

10. Which of the following are the key elements of communication?
A. Communication is a two way process B. There has to be a message
C. Commonness of understanding D. All the above

Choose the correct option from those given in each of the sentences below.

11. Interpersonal communication is the process by which people exchange information, feelings, and meaning through verbal and non-verbal messages.
A.True B. False C. possible D. may be

12. Communicating the right way is not equally important in every walk of like, be it in personal, professional or social life.
A. True B. False C. possible D. may be

13. The success of any business lies as much in networking and building sound professional relationships as it does in individual tact and business acumen. Communication is a crucial decisive factor in business relations.
A. True B. False C. possible D. may be

14. Maintaining professional etiquette in oral and written business communication is of utmost importance and must not be taken lightly.
A. True B. False C. possible D. may be

15. Communication is not indeed, the very lubricant that makes the machinery of human relations function smoothly.
A. True B. False C. possible D. may be

Choose the best word to describe the PARTS OF SPEECH from those given in each of thesentences below as underlined.

16. I always go to the park on the weekends. A. Noun B. Adjective C. Verb D. Adverb

17. On cold winter days, I love to have a cup of hot chocolate.
A. Adverb B. Adjective C. Verb D. Pronoun

18. Dinosaurs were very large, and they lived millions of years ago.
A. Noun B. Verb C. Adjective D. Preposition

19. Those flowers are very beautiful. How much do they cost?
A. Adjective B. Verb C. Conjuction D. Preposiion

20. Stewart can speak Arabic very well because he lived in Egypt for a year.
A. Verb B. Adjective C. Adverb D. Conjuction

Choose the correct option from those given in each of the sentences below.

21. According to phonetic method, the unit of a word is : A. Sentence B. Word C. Sound D. Letter

22. Total number of sounds in English language is : A. 12 B. 8 C. 20 D. 44

23. Which of the following has /i: / sound : A. Car B. Seat C. fit D. Books

24. The word "Doctor" has : A. Two syllables with stress on one B. Two syllables with stress on both C. Two syllables with stress on first D. Two syllables with stress on second

25. According to phonetic method, the unit of a word is : A. Sentence B. Word C. Letter D. Sound

26. Majority of staff members were not satisfied with the new director. (Which word is a compound noun?) A. director B. staff members C. new D. majority

27. I want see justice served. (Which word is an abstract noun?)
A. i B. seen C. want D. justice

28. Alice's father is a surgeon, he mostly does not have time to spend with his family. (Which word is a singular possessive noun?) A. surgeon B. time C. family D. Alice's

29. Australian government will bring together anti-terror laws. (Which word is a nominative noun?)
A. bring B. Australian C. anti-terror D. government

30. They discussed the problems, but could not find the solution. (Which word is a uncountable noun?)
A. could not B. find C. solution D. discussed

choose the whether the underlined nouns are common, proper, collective or abstract.
31. Honesty is the best policy. A. Common B. Proper C. Collective D. Abstract
32. Solomon was famous for his wisdom. A. Common B. Proper C. Collective D. Abstract
33. James is a bright student . A. Common B. Proper C. Collective D. Abstract
34. My family lives in that house. A. Common B. Proper C. Collective D. Abstract
35. A committee of five was appointed. A. Common B. Proper C. Collective D. Abstract

Silent and non Silent Letters

Select the missing silent letters from the options given. Check the spelling carefully.
36. I___now London very well. A. w B. k C. w D. k
37. Reading is easier than__riting. A. ing B. r C.w D. ng
38. I always__rap up warm in winter. A. a B. s C. g D. w
39. Did you see the mangled __eck? A. wr B. ek C. s D. n
40. People read __salms and sing hymns in church. A. p B. psa C. ssl D. pis

Choose the most suitable answer that identifies the homophones in the sentence.
41. India_____the cricket match by 26 runs. A) One B) Won C) Ones D) Owned
42. The fisherman_____a big fish. A) Court B) Caught C) Catch D) Collect
43. The doctor took blood from my_____. A) Vein B) Vain C) Vaien D) Vyine
44. It was good to be back in_____. A) Sink B) Sync C) synchronic D) Sinken
45. She_____after standing for two hours in a queue. A) Fainted B) Feinted C) Faint D) Feint

Questions (46-50) test your ability to use articles. Select the correct option in the series.
46. Travelling by flight is really_____experience to be remembered. (A) an (B) a (C) the (D) no article
47. The sun rises in_____east. (A) an (B) a (C) the (D) no article
48. I go to_____school every morning. (A) no article (B) the (C) a (D) an
49. I carried_____umbrella with me while going to school. (A) the (B) an (C) a (D) no article
50. Ravi is_____tallest boy among his friends. (A) an (B) the (C) no article (D) a

Speech Sounds
51. Which of the following has / ə / sound : (A) but (B) am (C) about (D) aunt
52. Diphthong is a : (A) Pure vowel sound (B) Pure consonant sound
(C) Vowel glides or mixed vowel sounds (D) none of the above

Preposition : Choose the suitable prepositions and darken correct option in the series (1) (2) (3)& (4) from the options given.
53. My parents live_____New Zealand now. (A) in (B) to (C) live (D) now
54. We slept_____the open sky. (A) under (B) below (C) in (D) on

55. Our friends in the apartment____us are really noisy. (A) over (B) below (C) above (D) inside
56. I am planning to meet all my friends_____these holidays. (A) on (B) within (C) during (D) over
57. I was waiting____the bus stop. (A) on (B) at (C) in (D) for
58. There are two students_____the class. (A) next (B) in (C) on (D) front
59. The oranges are not in the basket. They are_____the table. (A) in (B) between (C) on (D) next
60. My pencil is_____the books and the notebooks. (A) between (B) inside (C) outside (D) above

Word Stress : Select the correctly spelt/ stressed word

61. I want to be a photographer.
(A) PHO-to-graPH-er (B) PHO-to-graph-er (C) pho-TO-graph-er (D) pho-TO-Graph-er

62. How do you pronounce this word?
(A) PRO-nOUnce (B) pro-NOUnce (C) pro-NOUNCE (D) PRO-nounce

63. We had a really interesting conversation.
(A) con-ver-SA-tion (B) con-VER-SA-tion (C) con-VER-sa-tion (D) con-VeR-sa-tion

Tag Questions : Choose the correct question tag to complete each sentence.

64. Nobody called,_____(A) do they? (B) didn't they? (C) did they? (D) do not they?
65. They will wash the car,_____(A) will it? (B) won't they? (C) wouldn't they? (D) do not they?
66. We must lock the doors,_____(A) mustn't they? (B) shouldn't we? (C) mustn't we? (D) do they?
67. I'm right,_____(A) amn't I? (B) am not I? (C) aren't I? (D) do I ?
68 . So you bought a car,_____(A) did you? (B) haven't you? (C) weren't you? (D) don't I ?
69. You wouldn't like to invite my Dad,_____(A) did you? (B) would you? (C) won't you? (D) don't you ?
70. We won't be late,_____(A)won't we? (B) will we? (C) are we? D) don't we ?

Synonyms: Choose the word that is closest in meaning.

71. Mendacity : (A)Insolence (B) Risk taking nature or recklessness (C) Untruthfulness (D) Susceptibility
72. Juxtaposing : (A) Posting (B) Placing side by side (C) Contrasting (D) Combining
73. Obscure : (A) Block (B) Obstruct (C) Constrain (D) Vague
74. Altercation : (A) Adjustment (B) Option (C) Row (D) Modification
75. Massive : (A) Lump sum (B) Strong (C)Little (D) Huge
76. Difer : (A) Indiferent (B) Defy (C) Differ (D) Postpone
77. Animosity : (A) Agony (B) Hostility (C) Wrath (D) Displeasure
78. Boisterous : (A) Ultimate (B) Suave (C) Noisy (D) Childish
79. Effluent : (A) Abundant (B) Costly (C) Full (D) Waste
80. Decadence : (A) Destroy (B) Declining (C) Sick (D) Go weak

Antonyms: Choose the word that is opposite in meaning.

81. Absence : (A) untidy (B) wise (C) presence (D) above
82. Abundant : (A) wrong, left (B) scarce (C) accidental (D) wide
83. Accept : (A) wet, left (B) aid, help (C) worst (D) refuse

Prefixes and suffixes :Choose the correct prefix or suffix from the options given to complete thegap.

84. In many countries it is …..legal to keep a gun in your house (A) ill (B) un (C) il (D) el
85. Which of the following is the suffix of 'Suit….'? (A) Ary (B) Able (C) Ness (D) un
86. Which of the following is the prefix of '….Polite'? (A) im (B) dis (C) in (D) il
87. The assignment is …complete. (not finished). (A) not (B) un (C) in (D) on
88. I just can't believe it! The story is____believable! (A) un (B) in (C) not (D) unn
89. I had a sleep___night last night (I did not sleep). (A) less (B) able (C) ing (D) ept

Select the correct or preferred spelling for each of these commonly misspelled words.Which of the following spellings is correct?

90. (A) accommodate (B) accomodate (C) acommodate (D) accommodate
91. (A) argument (B) arguments (C) arguemint (D) arguemintes
92. (A) acknowledgment (B) acknowledgement (C) acknowlegment (D) acknowlegement

Choose the correct verb/ tense form from the options given to complete the gap.

93. Our Holy Books tell us that man ---------- mortal. (A) is (B) was (C) will be (D) are
94. The teacher asked the boys whether they---------- the problems.
(A) solve (B) have solved (C) had solved (D) solves

Choose the pairs of word/ phrases from the options given that best expresses a similarrelationship to that of the given pair.

95. Patient : Hospital, (A) Teacher : School (B) Pilot : Aeroplane (C) Litigant : Court (D) Priest : Church
96. Truck : Cargo, (A) Ship : Water (B) Aircraft : Fuel (C) Bus : Passengers (D) Theatre : Movie
97. Entomology : Insects (A) Oncology : Cancer (B) Gerontology : Germs (C) Tantology : Tortoises (D) Phonology : Telephones
98. See : Invisible (A) Sell : Insoluble (B) Alien : Inalienable (C) Satisfy : Insatiable (D) Differ : Indifferent
99. Duck : Drake (A) Bull : Cow (B) Dog : Kennel (C) Deer : Fawn (D) Goose : Gander
100. Gemini : Zodiac (A) Star : Galaxy (B) Ministry : Government (C) May : Year (D) Channels : Television

101. In, an Organization, when a colleague shares official information with the other of an equal hierarchical level, this kind of communication is_____.
a) Horizontal b) Vertical c) Radial d) Informal

102. In communication, the observation of a receiver's response is called_____.
a) Survey b) Feedback c) Channel d) Message

103. This type of communication takes place within an individual:_____.
a) Extra personal b) Intrapersonal c) Organizational d) Interpersonal

104. Which of the following is an oral communication?
a) Dictation b) Brochures c) Notice d) Letters

105. Who encodes a message in communication?
a) Sender b) Receiver c) transmitting medium d) Both (a) and (b)

106. Proposal prepared for submission to the boss_____.
a) Vertical b) Downward c) Upward d) Diagonal

107. No communication is complete without_____.
a) Noise b) Semantic barrier c) Interpersonal d) Feedback
108. Announcement of the changes of Internals date_____.
a) Radial b) Vertical c) Diagonal d) Horizontal

109. Communication takes place between managers and workers located in different functional units _____.
a) Horizontal b) Downward c) Upward d) Diagonal

110. This kind of communication moves in all direction_____.
a) Spiral b) Vertical c) Diagonal d) Horizontal

111. Feedback given to a student by a teacher about his/her performance in an assignment
a) Upward b) Downward c) Horizontal d) Spiral

112. I_____tennis every Sunday.
a) Playing b) play c) am playing d) am play

113. You can keep my iPod if you like. I_____it any more
a) don't use b) doesn't use c) didn't use d) not using
114. Sara_____her blue jeans today, but usually she wears a skirt or a dress.
a) Wears b) wearing c) wear d) is wearing

115. John_____his teeth before breakfast every morning.
a) will cleaned b) is cleaning c) cleans d) clean

116. Which of these is a communication skill?
a) Swimming b) Running c) Sleeping d)Asking question

117. I complimented him_____his brilliant success in the examination.
a) Over b) for c) to d) on

118. "Our blessings come from **above**". The underlined word is
a) Noun b) pronoun c) verb d)adverb

119. Which of the following Nouns is generally used as plural forms?
a) Economics b) Furniture's c) Public d) News

120. "None **but** the brave deserve the best". The underlined word is
a) Preposition b) Noun c) Conjunction d) verb

121. You and Ahmed have wasted_____time.
a) they b) your c) yours d) him

122. The abstract noun of the verb "Go" is
a) Goit b) Glutton c) gone d) go

123. As I approached_____him, he turned and walked away
a) To b) by c) beside d) no preposition needed

124. The horse and carriage_____ready.
a) Is b) are c) were d) have

125. He is wise_____he is young.
a) Though b) where c) before d) because

126. Our teacher has read_____book of this library.
a) Small b) little c) every d) very

127. Those flowers are very **beautiful**. The underlined word is
a) Adjective b) preposition c) Conjunction d) verb

128. India_____the cricket match by 26 runs
a) one b) won c) ones d) owned

129. Woman is looking_____her diamond ring.
a) to b) at c) in d) inside

130. I'm_____. I'm late, my car broke down.
a) wrong b) bad c) sorry d) unhappy

131. The antonym for the word POSTPONE:_____.
a) before b) prepone c) advance d) soon
132. The silent letter in the word COM_____.
a) D b) F c) E d) B

133. The silent letter in the word_____NEUMONIA.
a) P b) CH c) GH d) PH

134. The synonym of the word Friend:_____.
a) dear b) close c) foe d) comrade

135. The synonym of the word Decadence :_____.
a) destroy b) declining c) sick d) go weak

136. Which of these is an intrapersonal communication barrier?

a) Lack of knowledge b) reading c) listening d) writing

137. Which of the following is called as an Aspiration?
a) actual song b) forceful release of air c) sound d) pronunciation

138. Which of the following skill has the largest share in communication time in school/colleges?
a) reading b) listening c) writing d) speaking

139. In general, the oral communication is the interchange of_____between the sender and the receiver.
a) cues and clues b) written messages c) signs and gestures d) verbal messages

140. Comparatively, oral communication is better than written communication in
a) conveying feelings b) conveying facts c) saving time d) conveying opinions

141. The total number of sounds in English language is _____
a) 12 b) 8 c) 20 d) 44

142. Question tag : I'm right,_____.
a) amn't I? b) am not I? c) aren't I? d) don't I?

143. Question tag : We shouldn't be late,_____.
a) shouldn't we? b) will we? c) should we? d) won't we?

144. Which of the following is the suffix of 'Suit'?
a) ary b) able c) ness d) un

145. Which of the following is the prefix of 'Polite'?
a) im b) dis c) in d) ill

146. "The stars are shining above the sky" the underline word is
a) noun b) pronoun c) adjective d) adverb

147. The meaning of the noun 'Advices' is
a) counsel b) opinion c) information d) advise

148. The plural form of the compound noun 'son-in-law' is
a) son-in-laws b) sons-in-law c) sons-in-laws d) son-in-law

149. The police_____arrested the thief.
a) has b) have c) has been d) will

150. My brother likes comics'_____much.
a) very b) too c) most d) so

151. My pencil is_____the books and the notes.

a) between b) inside c) outside d) above

152. There are two students_____the class.
a) next b) in c) on d) front

153. I am planning to meet all my friends_____these holidays.
a) on b) within c) during d) over

154. I go to_____School every morning.
a) no article b) a c) the d) an

155. The antonym for the word INTEREST:_____.
a) Uninterest b) disinterest c) non-interest d) curious

156. It is_____hot to drink.
a) much b) very c) more d) too

157. _____boys passed with distinction.
a) full b) a few c) little d) a number

158. Our holy book tell us that man_____mortal.
a) is b) was c) will be d) are

159. The teacher asked the boys whether they_____the problems.
a) solve b) have solved c) had solved d) solves
160. He is_____not recovered from yesterday's shock.
a) till b) until c) still d) but

161. According to phonetics method, the unit of a word is_____.
a) sentence b) word c) sound d) Letters

162. Which of the following has / :i / sound_____.
a) car b) seat c) fit d) books

163. The word "**Doctor**" has_____syllable.
a) two syllable with one stress b) two syllable with stress on both c) two syllable with stress on first d) two syllable with stress on second

164. I____now London very well. (**Find out the missing letter**)
a) now b) know c) knew d) known

165. People read_____salms and sing hymns in church.
a) phsalms b) psalms c) sslams d) pisalms

166. I completed my homework_____my mother prepared the dinner. (Find the right preposition)

a) for b) while c) as if d) within

167. The oranges are not in the basket. They are_____the table. (**Find the right preposition**)
a) in b) between c) on d) next

168. The **synonym** of the word **Effluent**:_____.
a) abundant b) waste c) costly d) full

169. The **synonym** of the word **Massive**:_____.
a) lump sum b) strong c) little d) huge

170. The **antonym** of the word **Fresh**:_____.
a) stale b) stole c) steal d) steel

171. The **antonym** of the word **Hostile**:_____.
a) innocent b) friendly c) lazy d) crazy

172. Choose the appropriate **Homophone** for **Ad**:_____.
a) had b) odd c) and d) add

173. Choose the appropriate **Homophone** for **Scene**:_____.
a) seen b) rain c) see d) saw

174. They have reached the place_____time.
a) on b) in c) at d) over

175. The_____of an earthquake is the movement of tectonic plates.
a) reason b) cause c) habit d) wind
176. One who knows many languages is called_____.
a) linguist b) emigrant c) omnipotent d) fatalist

177. A person walking and not using vehicle is called_____.
a) pedestrian b) patriot c) pessimist d) usurer

178. Choose the **prefix** for_____**driven**.
a) wise b) self c) un d) re

179. Choose the **prefix** for_____**chairman**.
a) wise b) vice c) nice d) un

180. Choose the **suffix** for **affection_____**.
a) ade b) es c) eat d) ate

181. Choose the **suffix** for **Astro_____**.
a) logo b) logist c) loger d) ist

182. Identify the word with one syllable.
a) fulfil b) awsome c) space d) phonetics

183. My aunt_____on the ice and broke her leg.
a) fall b) felt c) fell d) felled

184. _____ woman was seen pushing the car along the street.
a) an b) a c) that d) these

185. I've never _____ to the USA.
a) gone b) been c) being d) going

186. The doctor took blood from my_____.
a) vein b) vain c) vaien d) vyine

187. The fisherman_____a big fish.
a) court b) catch c) caught d) collect

188. Would you like_____cup of tea.
a) another b) other c) an another d) author

189. I have worked here_____three years.
a) since b) in c) for d) from

190. Are you_____get up soon?
a) going to b) will c) be d) go to

191. They_____in the basement for three months.
a) were made sleeping b) were made sleep c) were made to sleep d) made to sleep

192. If success_____we need to prepare ourselves for every possible scenario.
a) is to be achieved b) is achieved c) will be achieved d) is due to achieve

193. Which of the following spelling is correct?
a) acknowlegment b) acknowledgement c) acknowlegment d) acknowledgement

194. Diphthong is a
a) pure vowel sound b) pure consonant sound
c) vowel glides or mixes vowel sound d) none of the above

Choose the option that is the most appropriate synonym.
195. Foment.
a) vex b) waste c) renounce d) instigate

196. Placate.
a) rouse b) harass c) pacify d) rejoice

197. Solicitous.
a) obscene b) wise c) wholesome d) confident

198. Adulation.
a) approval b) extension c) applause d) greeting

199. Sordid.
a) harmful b) dirty c) splendid d) dangerous

200. Debunk
a) expose b) cheat c) threaten d) pacify

9.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
JAN - 2021									
JAN - 2020									
JAN - 2019									

Prepared by	Checked by		
			
Prof. B. S. Hooli	Dr. K. B. Manwade	HOD	Principal

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Subject Title	¸ÁA¸ÀÌøwPÀ PÀ£ÀßqÀ		
Subject Code	BKSKK107	CIE Marks	50
		SEE Marks	50
Number of Lecture Hrs / Week	1	Total Marks	100
Total Number of Lecture Hrs	15	Exam Hours	1 H
Credits: 1			

FACULTY DETAILS:		
Name: Smt. B S KOTEPPAGOL	Designation: Asst. Professor	Experience: 05
No. of times course taught:5	Specialization: MA IN KANNADA	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
1	Kannada medium students	1-10 Standard	kakk kannada Language

2.0 Course Objectives

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3.0 Course Outcomes

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4.0 Course Content

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5.0 Relevance to future subjects

Textbook 1: Chapter 10:10.2, 10.3, 10.4, Textbook 2:7.10 – 7.12, 7.15 Chapter 1:

Sl NoSl. No.	S Semester	Subject	Topics
			-
			-

6.0 Relevance to Real World

SL Sl.No	Real World Mapping

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details

8.0 B Books Used and Recommended to Students

Text Books
1.PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw ¸À«ÄÃPÉë - JZï w¥ÉàÃgÀÄzÀæ¸Áé«Ä.
2. PÀ£ÁðlPÀ UÀvÀªÉÊ¨sÀªÀ - D®ÆgÀ ªÉAPÀlgÁAiÀÄ
3. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ - gÀA. ²æÃ ªÀÄÄUÀ½
4. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ - vÀ.¸ÀÄ. ±ÁªÀÄgÁAiÀÄ
5. ºÉÆ¸ÀUÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ - J¯ï. J¸ï. ±ÉÃµÀVjgÁªï.

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

Website and Internet Contents References

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	Website
3		

11.0 Examination Note

12.0 Course Delivery Plan

Module	Lecture	Content of Lecture	% of

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	No./Practical Session		Portion	
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	L-4	□□□□□□□□ □□□□□□		
	L-5	□□□□□ □□□□□□□□ □□□□□		
				L1
□□□ -2	L-1	□□□□□□ : □□□□□□, □□□□□□□□□□, □□□□□□□□□□,	20	
	L-2	□□□□□□ :□□□□□□□□ □□□□□□, □□□□□□□□□□□□, □□□□□□□□ □□□□□□□		
	L3	□□□□□□□□□□ : □□□□□□□□□ □□ □□□□□□□□□ □□		
	L-4	□□□□□□□□□□ : □□□□□□□□□□□ □□□□□ □□□□ □□□□		
	L-5	□□□□□□□□□ : □□□□□ □□□□□ □□□□□□ - □□□□□□□ □□□□		
□□□ -3	L-1	□□□□□□ □□□ □□□□□□□□□ □□□□□□□□ □□□□ □□□□□ □□□□□	20	
	L-2	□□□□□□ □□□ □□□□□□□□□ □□□□□□□□ □□□□ □□□□□ □□□□□		
	L3	□□□□□□ □□□□□□ : □□.□□. □□□□□□□		
	L-4	□□□□□□□□ □□□□ : □□□□□□□		
	L-5	□□□□□□□□ □□□□ : □□□□□□□		
□□□ -4	L-1	□□. □□□. □□. □□□□□□□□□□□□□ : □□□□□□□ □□□□□ □□□□□□ - □ □□□ □□□□□□□□□□	20	
	L-2	□□. □□□. □□. □□□□□□□□□□□□□ : □□□□□□□ □□□□□ □□□□□□ - □ □□□ □□□□□□□□□□		
	L3	Video		
	L-4	□□□□□□ □□□□□□ □□□□□ □□□□□□□ □□□□□□□ : □□□□□□ □□□□□□□□□		

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	L-5	□□□□□□ □□□□□□ □□□□□ □□□□□□□ □□□□□□□ : □□□□□□ □□□□□□□□□	
□□□ -5	L-1	□□□□□□ : □□□□□□□□□	20
	L-2	□□□□□□ : □□□□□□□□□	
	L3	Video	
	L-4	□□□□□□ □□□ □□□□□□ □□□□□ : □□.□□. □□□□□□□□□	
	L-5	□□□□□□ □□□ □□□□□□ □□□□□ : □□.□□. □□□□□□□□□	

13.0 QUESTION BANK

□□□ -1

PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw:

PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw ¯ÉÃR£ÀzÀ ¯ÉÃRPÀgÀÄ AiÀiÁgÀÄ?

ºÀA¥À £ÁUÀgÁdAiÀÄå

"PÀ©âUÀgÀ PÁªÀå" PÁªÀå gÀa¹zÀ PÀ« ºÉ¸ÀgÀÄ K£ÀÄ?

DAqÀAiÀÄå

PÀ£ÀßqÀzÀ ªÉÆzÀ® G¥À®§Þ UÀæAxÀ AiÀiÁªÀÅzÀÄ?

PÀ«gÁdªÀiÁUÀð

PÀ«gÁdªÀiÁUÀæzÀ PÀvÀÈð AiÀiÁgÀÄ?

²æÃ«dAiÀÄ

ªÀÄºÁ¸Àw JAzÀgÉ AiÀiÁgÀÄ? À

¥ÀwAiÀÄÄ ªÀÄgÀt ºÉÆA¢zÁUÀ ¸ÀwAiÀÄÄ avÉ KgÀÄªÀzÀÄ (¨ÉAQUÉ ºÁj ¥Áæt ©qÀÄªÀzÀÄ)

«dAiÀÄ£ÀUÀgÀzÀ ¥Àæ¹zÀÞ zÉÆgÉ AiÀiÁgÀÄ ?

²æÃ PÀÈóóµÀßÀÚßzÉÃªÀgÁAiÀÄ

¥ÀA¥À gÀa¹zÀ PÀÈwUÀ¼À£ÀÄß ºÉ¸Àj¹?

1) D¢¥ÀÄgÁt 2) «PÀæªÀiÁdÄð£À «dAiÀÄ (¥ÀA¥À ¨sÁgÀvÀ)

"¨sÀgÀvÉÃ±À ªÉÊ¨sÀªÀ' gÀa¹zÀ PÀ« AiÀiÁgÀÄ?

gÀvÁßPÀgÀªÀtÂð

ºÀA¥À £ÁUÀgÁdAiÀÄå d¤¹zÀ HgÀÄ AiÀÄªÀÅzÀÄ?

PÉÆÃ¯ÁgÀ f¯Éè UËj©zÀ£ÀÆgÀÄ vÁ®ÆèQ£À ºÀA¥À¸ÀAzÀæ

ºÀA¥À £ÁUÀgÁdAiÀÄå ¥ÀqÉzÀ ¥Àæw¶×vÀ ¥Àæ±À¹Û AiÀiÁªÀÅzÀÄ?

¥ÀA¥À ¥Àæ±À¹Û

2. PÀ£ÁðlPÀzÀ KQÃPÀgÀt ; MAzÀÄ C¥ÀÆªÀð ZÀjvÉæ:

1. PÀ£ÁðlPÀ KQÃPÀgÀt ; MAzÀÄ C¥ÀÆªÀð ZÀjvÉæ. EzÀgÀ ¯ÉÃRPÀgÀ ºÉ¸ÀgÉÃ£ÀÄ?

¥ÉÆæ.. f. ªÉAPÀl¸ÀÄ§âAiÀÄå

2. ¥ÉÆæ.. f. ªÉAPÀl¸ÀÄ§âAiÀÄå£ÀªÀgÀ d£Àä ¸ÀÜ¼À AiÀiÁªÀÅzÀÄ?

ªÀÄAqÀå f¯ÉèAiÀÄ ²æÃgÀAUÀ¥ÀlÖtzÀ UÀAeÁA.

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3. 'EUÉÆ PÀ£ÀßqÀ' PÀÈwAiÀÄ£ÀÄß gÀa¹zÀªÀgÀÄ AiÀiÁgÀÄ?
¥ÉÆæ. f. ªÉAPÀl¸ÀÄ§âAiÀÄå.
4. PÀ£ÁðlPÀ KQÃPÀgÀt JAzÀgÉÃ£ÀÄ?
PÀ£ÀßqÀ ¨sÁ¶PÀ ¥ÀæzÉÃ±ÀUÀ¼À£ÀÄß MAzÉÃ DqÀ½vÀ ªÀåªÀ¸ÉÛUÉ M¼À¥Àr¹gÀÄªÀÅzÉÃ PÀ£ÁðlPÀ KQÃPÀgÀtªÁVzÉ.
5. ¸Àgï. xÁªÀÄ¸ï ªÀÄ£ÉÆæÃ AiÀiÁgÀÄ?
EªÀgÀÄ ©ænµï C¢üPÁj §¼Áj f¯ÉèAiÀÄ (1800gÀ°è) PÀ¯ÉPÀÖgï DVzÀÝgÀÄ.
6. AiÀiÁgÀ ¥ÀæAiÀÄvÀß¢AzÀ 1890gÀ°è «zÁåªÀzsÀðPÀ ¸ÀAWÀ ¸ÁÛ¥Ä£ÉAiÀiÁ¬ÄvÀÄ?
gÁ. °À. zÉÃ±À¥ÁAqÉ.
7 'PÀ£ÁðlPÀ UÀvÀªÉÊ¨sÀªÀ' PÀÈwAiÀÄ£ÀÄß gÀa¹zÀªÀgÀÄ AiÀiÁgÀÄ?
D®ÆgÀÄ ªÉAPÀlgÁAiÀÄgÀÄ.
8. PÀ£ÁðlPÀ KQÃPÀgÀtªÁzÀ ªÀµÀð AiÀÄªÀÅzÀÄ?
1956 £ÀªÉíA§gÀ 1
9. ªÉÄå¸ÀÆgÀ gÁdåPÉÌ PÀ£ÁðlPÀÀªÉAzÀÄ £ÁÀªÀÄPÀgÀt ªÀiÁrzÀ ªÀµÀð AiÀÄªÀÅzÀÄ?
1973 £ÀªÉíAgÀ 1
10. 1955gÀ°è gÁAiÀÄZÀÆj£À°è £ÀqÉzÀ PÀ£ÀßqÀ ¸ÁÀ»vÀå ¸ÀªÉÄäÃ¼À£ÀzÀ CzsÀåóPÀógÀÄ AiÀiÁgÁÀVzÀÝgÀÄ?
²æÃgÀAUÀgÀÄ

3. DqÀ½vÀ ¨sÁµÉAiÀiÁV PÀ£ÀßqÀ
ªÀ¸ÀÄÛ ¤µÀ× ¥Àæ±ÉßUÀ¼ÀÄ
dUÀwÛ£À°è ºÉZÀÄ ÑªÀÄA¢ ªÀiÁvÀ£ÁqÀÄªÀ ¨sÁµÉAiÉÄA§ £É¯ÉAiÀÄ°è PÀ£ÀßqÀPÉÌ JµÀÖ£ÉÃ ¸ÁÜ£À ¹QÌzÉ?
E¥ÀàvÉÆÛA§vÀÛ£ÉAiÀÄ ¸ÁÜ£À ¹QÌzÉ
PÀ£ÀßqÀ ¨sÁµÉ AiÀiÁªÀ °¦¬ÄAzÀ gÀÆ¥ÀUÉÆArzÉ?
¨Áæ»ä°¦¬ÄAzÀ gÀÆ¥ÀUÉÆArzÉ
«£ÉÆÃ¨Á ¨sÁªÉAiÀÄªÀgÀÄ PÀ£ÀßqÀ ¨sÁµÉAiÀÄ °¦AiÀÄ£ÀÄß K£ÉAzÀÄ PÀgÉ¢zÁÝgÉ?
'°¦UÀ¼À gÁtÂ'
¸ÀA«zsÁ£ÀzÀ JµÀÖ£ÉÃ C£ÀÄZÉÒÃzÀzÀ ¥ÀæPÁgÀ DAiÀiÁ gÁdåUÀ¼À°è §¼ÀPÉAiÀiÁUÀÄªÀ ¨sÁµÉUÀ¼À£ÉßÃ DqÀ½vÀ ¨sÁµÉAiÉÄAzÀÄ wÃªÀiÁð¤¸À¯ÁVzÉ?
343£ÉÃ C£ÀÄZÉÒÃzÀ
AiÀiÁªÀ ªÀµÀðzÀ°è ¸ÁªÀðwæPÀªÁV £ÁåAiÀiÁ®AiÀÄUÀ¼À wÃ¦ð£À ¨sÁµÉ PÀ£ÀßqÀªÉÃ DVgÀ¨ÉÃPÉAzÀÄ CAwªÀÄ DeÉÕ ºÉÆgÀr¸À¯Á¬ÄvÀÄ?
1980gÀ°è ºÉÆgÀr¸À¯Á¬ÄvÀÄ

□□□ -2
DzsÀÄ¤PÀ ¥ÀÆªÀð PÁªÀå ¨sÁUÀ
1. ªÀZÀ£ÀUÀ¼ÀÄ:

1. PÀ£ÀßqÀzÀ ªÉÆzÀ® DzÀå ªÀZÀ£ÀPÁgÀ AiÀiÁgÀÄ?
eÉÃqÀgÀ zÁÀ¹ªÀÄAiÀÄå
2. eÉÃqÀgÀ zÁ¹ªÀÄAiÀÄå£À ªÀZÀ£ÀUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
gÁªÀÄ£ÁÀxÀ
3. eÉÃqÀgÀ zÁ¹ªÀÄAiÀÄå C½ªÀÄ£ÀzÀªÀ£À ¨sÀQÛAiÀÄ£ÀÄß AiÀiÁªÀÅzÀPÉÌ ºÉÆÃ°¹zÁÝgÉ?
ºÀjzÀ UÉÆÃtÂ aÃ®.
4. C®èªÀÄ ¥Àæ¨sÀÄUÀ¼À ªÀZÀ£ÀUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
UÀÄºÉÃ±ÀégÀ
5. ªÀÄÈvÀÄå«£À ¨Á¬ÄUÉ vÀÄvÁÛzÀªÀgÀÄ AiÀiÁgÀÄ JAzÀÄ C®èªÀÄ ¥Àæ¨sÀÄUÀ¼ÀÄ ºÉÃ½zÁÝgÉ?
ªÉÃµÀqÀA§PÀgÀÄ
6. §¸ÀªtÚ£ÀªÀgÀ ªÀZÀ£ÀUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
PÀÆqÀ®¸ÀAUÀªÀÄzÉÃªÁ

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7. .§¸ÀªÀtÚ£ÀªÀgÀÄ ªÀÄgÀºÀÄ WÀ£ÀªÁzÀgÀÆ AiÀiÁªÀÅzÀ£ÀÄß QjAiÀÄzÉ£Àß¨ÁgÀzÉAzÀÄ ºÉÃ½zÁÝgÉ?
£É£ÉªÀ ªÀÄ£À QjzÉ£Àß¨ÁgÀzÉAzÀÄ ºÉÃ½zÁÝgÉ
8. CPÀÌªÀÄºÁzÉÃ«AiÀÄ ªÀZÀ£ÀUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
ZÀ£ÀßªÀÄ°èPÁdÄð£À
9. ZÀ£ÀßªÀÄ°èPÁdÄð£À AiÀiÁgÀ£ÀÄß £ÀgÀPÀzÀ°èPÀÌzÉ ©qÀÄªÀÅ¢®èªÉAzÀÄ CPÀÌªÀÄºÁzÉÃ« ºÉÃ½zÁÝ¼É?
CwAiÀiÁzÀ ¸ÀA¸ÁgÀzÀ°è ¹PÀÄÌ zÀÄBR¢AzÀ C¼À®£ÀÄß vÉÆrPÉÆ¼ÀÄîvÀÛ ²ªÀ¤®è,ªÀÄÄQÛ¬Ä®è
EzÉ¯Áè ºÀÄ¹ J£ÀÄßªÀªÀgÀ£ÀÄß ZÀ£ÀßªÀÄ°èPÁdÄð£À£ÀÄ £ÀgÀPÀzÀ°èPÀÄÌªÀ£ÀÄ JAzÀÄ ºÉÃ½zÁÝ¼É
10. DAiÀÄÝQÌ ªÀiÁgÀAiÀÄå£ÀªÀgÀ ªÀZÀ£ÀUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
CªÀÄgÉÃ±ÀégÀ °AUÀ
11. DAiÀÄÝQÌ ®PÀÌªÀÄä£ÀªÀgÀ ªÀZÀ£ÀUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
ªÀiÁgÀAiÀÄå ¦æÀææAiÀÄ CªÀÄgÉÃ±ÀégÀ °AUÀ.
12. DAiÀÄÝQÌ ®PÀÌªÀÄä AiÀiÁjUÉ §qÀvÀ£À«®è JAzÀÄ ºÉÃ½zÁÝ¼É?
WÀ£À ²ªÀ¨sÀPÀÛjUÉ §qÀvÀ£À«®è JAzÀÄ ºÉÃ½zÁÝ¼É

2. QÃvÀð£ÉUÀ¼ÀÄ:
1) ¥ÀÄgÀAzÀgÀzÁ¸ÀgÀ QÃvÀð£ÉUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
¥ÀÄgÀAzÀgÀ«oÀ®
'CzÀjAzÉÃ£ÀÄ ¥sÀ® EzÀjAzÉÃ£ÀÄ ¥sÀ®' QÃvÀð£É gÀa¹zÀ zÁ¸ÀgÀ ºÉ¸ÀgÉÃ£ÀÄ?
¥ÀÄgÀAzÀgÀzÁ¸ÀgÀÄ
PÀ£ÀPÀzÁ¸ÀgÀ QÃvÀð£ÉUÀ¼À CAQvÀ£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
PÁV£É¯É D¢PÉÃ±ÀªÀ
'vÀ®ètÂ¸À¢gÀÄ PÀAqÀå vÁ¼ÀÄ ªÀÄ£ÀªÉ' QÃvÀð£É gÀa¹zÀ zÁ¸ÀgÀ ºÉ¸ÀgÉÃ£ÀÄ?
PÀ£ÀPÀzÁ¸ÀgÀÄ
3. vÀvÀé¥ÀzÀUÀ¼ÀÄ (¸Á«gÀ PÉÆqÀUÀ¼À ¸ÀÄlÄÖ)
1) '¸Á«gÀ PÉÆqÀUÀ¼À ¸ÀÄlÄÖ' F vÀvÀé¥ÀzÀªÀ£ÀÄß gÀa¹zÀªÀgÀÄ AiÀiÁgÀÄ?
²±ÀÄ£Á¼À ±ÀjÃ¥sÀgÀÄ

□□□ -3
DzsÀÄ¤PÀ PÁªÀå ¨sÁUÀ

1. ªÀÄAPÀÄwªÀÄä£À PÀUÀÎ
1) r.«.f. AiÀÄªÀgÀÄ J°è ªÀÄvÀÄÛ AiÀiÁªÀUÀ d¤¹zÀgÀÄ?
r.«.f. AiÀÄªÀgÀÄ PÉÆÃ¯ÁgÀ f¯ÉèAiÀÄ ªÀÄÄ¼À¨ÁV®Ä UÁæªÀÄzÀ°è 1887gÀ°è d¤¹zÀgÀÄ.
2) "ªÀÄAPÀÄwªÀÄä£À PÀUÀÎ' PÀÈwAiÀÄ£ÀÄß gÀa¹zÀªÀgÀÄ AiÀiÁgÀÄ?
r.«.f.(zÉÃªÀ£ÀºÀ½î ªÉAPÀlgÀªÀÄtAiÀÄå UÀÄAqÀ¥Àà)
3) ¥ÀzÀåªÀ£ÀÄß ¥ÀÆtðUÉÆ½¹
ºÀÄ¯ÁèUÀÄ ¨ÉlÖzÀr, ªÀÄ£ÉUÉ ªÀÄ°èUÉAiÀiÁUÀÄ |
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(PÀ¯ÁèUÀÄ PÀµÀÖUÀ¼À ªÀÄ¼ÉAiÀÄ «¢ü ¸ÀÄjAiÉÄ ||
¨É®è¸ÀPÀÌgÉAiÀiÁUÀÄ ¢Ã£ÀzÀÄ§ð®jAUÉ |
J®ègÉÆ¼ÀUÉÆAzÁUÀÄ ªÀÄAPÀÄwªÀÄä ||)
4) ºÉÆ¸ÀaUÀÄgÀÄ ºÀ¼É ¨ÉÃgÀÄ PÀÆrgÀ®Ä --------
(ªÀÄgÀ¸ÉÆ§UÀÄ |)

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2. PÀÄgÀÄqÀÄ PÁAZÁuÁ

zÀ. gÁ. ¨ÉÃAzÉæAiÀÄªÀgÀ ¥ÀÆtð ºÉ¸ÀgÉÃ£ÀÄ?
zÀvÁÛvÉæÃAiÀÄ gÁªÀÄZÀAzÀæ ¨ÉÃAzÉæ
zÀ. gÁ. ¨ÉÃAzÉæAiÀÄªÀgÀÄ J°è d¤¹zÀgÀÄ?
zsÁgÀªÀqÀzÀ°è d¤¹zÀgÀÄ.
zÀ. gÁ. ¨ÉÃAzÉæAiÀÄªÀgÀ PÁªÀå£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
'CA©PÁvÀ£ÀAiÀÄzÀvÀÛ'
¨ÉÃAzÉæAiÀÄªÀgÀ AiÀiÁªÀ PÀªÀ£À ¸ÀAPÀ®£ÀPÉÌ eÁÕ£À¦ÃoÀ ¥Àæ±À¹Û ®©ü¹zÉ?
'£ÁPÀÄvÀAw' (1974)
PÀÄgÀÄqÀÄ PÁAZÁuÁ PÀªÀ£ÀªÀÀ£ÀÄß AiÀiÁªÀÅzÀjAzÀ DAiÀÄÄÝPÉÆ¼Àî¯ÁVzÉ?
'£ÁzÀ°Ã¯É' PÀªÀ£À ¸ÀAPÀ®£À¢AzÀ DAiÀÄÄÝPÉÆ¼Àî¯ÁVzÉ.
¥ÀzÀåªÀ£ÀÄß ¥ÀÆtðUÉÆ½¹
PÀÄgÀÄqÀÄ PÁAZÁuÁ PÀÄtÂAiÀÄÄvÀ°vÀÄÛ

(PÁ°UÉ ©zÀÝªÀgÀ vÀÄ½AiÀÄÄvÀ°vÉÆÛÃ
PÀÄgÀÄqÀÄ PÁAZÁt)

3. ºÉÆ¸À¨Á½£À VÃvÉ
1) PÀÄªÉA¥ÀÄgÀªÀgÀÄ J°è ªÀÄvÀÄÛ AiÀiÁªÀUÀ d¤¹zÀgÀÄ?
²ªÀªÉÆUÀÎ f¯ÉèAiÀÄ wÃxÀðºÀ½î vÁ®ÆèQ£À PÀÄ¥Àà½îAiÀÄ°è 1904gÀ°è d¤¹zÀgÀÄ.
2) PÀÄªÉA¥ÀÄgÀªÀgÀ ¥ÀÆtð ºÉ¸ÀgÉÃ£ÀÄ?
PÀÄ¥Àà½î ªÉAPÀl¥Àà ¥ÀÄlÖ¥Àà.
3) PÀÄ¥Àà½î ªÉAPÀl¥Àà ¥ÀÄlÖ¥Àà£ÀªÀgÀ PÁªÀå£ÁªÀÄ AiÀiÁªÀÅzÀÄ?
PÀÄªÉA¥ÀÄ
4) 'ºÉÆ¸À¨Á½£À VÃvÉ' PÀªÀ£ÀªÀ£ÀÄß AiÀiÁªÀÅzÀjAzÀ Dj¹PÉÆ¼Àî¯ÁVzÉ?
PÉÆÃV¯É ªÀÄvÀÄÛ ¸ÉÆÃ«AiÀÄvï gÀµÁå ¸ÀAPÀ®£À¢AzÀ Dj¹PÉÆ¼Àî¯ÁVzÉ.
5) '£É£À¦£À zÉÆÃtÂ' EzÀÄ AiÀiÁgÀ DvÀä ZÀjvÉæ?
PÀÄªÉA¥ÀÄgÀªÀgÀzÀÄÝ
6) 'gÁµÀÖçPÀ«' ¥Àæ±À¹Û ¥ÀqÉzÀ PÀ« AiÀiÁgÀÄ?
PÀÄªÉA¥ÀÄ
PÀÄªÉA¥ÀÄgÀªÀgÀ AiÀiÁªÀ PÁªÀåPÉÌ eÁÕ£À¦ÃoÀ ¥Àæ±À¹Û ®©ü¹zÉ?
'²æÃ gÁªÀiÁAiÀÄt zÀ±Àð£ÀA' ªÀÄºÁPÁªÀåPÉÌ ®©ü¹zÉ.

PÁ£ÀÆgÀÄ ºÉUÀÎqÀw PÁzÀA§jAiÀÄ£ÀÄß gÀa¹zÀªÀgÀÄ AiÀiÁgÀÄ?
PÀÄªÉA¥ÀÄ
'gÀ¸ÀIÄ¶' JAzÀÄ PÀgÉ¬Ä¹PÉÆAqÀ PÀ« AiÀiÁgÀÄ?
PÀÄªÉA¥ÀÄ

□□□ -4 vÁAwæPÀ ªÀåQÛUÀ¼À ¥ÀjZÀAiÀÄ

1. qÁ. «±ÉéÃ±ÀégÀAiÀÄå – ªÀåQÛ ªÀÄvÀÄÛ LwºÀå

¥Àæ±Éß 1) qÁ. «±ÉéÃ±ÀégÀAiÀÄå – ªÀåQÛ ªÀÄvÀÄÛ LwºÀå ¯ÉÃR£ÀªÀ£ÀÄß §gÉzÀ ¯ÉÃRPÀgÀÄ AiÀiÁgÀÄ?
J.J£ï.ªÀÄÆwðgÁªï
¥Àæ±Éß 2) J.J£ï.ªÀÄÆwðgÁªïgÀ ¥ÀÆtð ºÉ¸ÀgÉÃ£ÀÄ?
CQÌºÉ¨Áâ¼ÀÄ £ÀgÀ¹AºÀ ªÀÄÄÆwðgÁªï
¥Àæ±Éß 3) 'avÀæUÀ¼ÀÄ ¥ÀvÀæUÀ¼ÀÄ' JA§ PÀÈwUÉ AiÀiÁªÀ ¥Àæ±À¹Û zÉÆgÉwzÉ?
PÉÃAzÀæ ¸Á»vÀå CPÁqÉ«Ä ¥Àæ±À¹Û zÉÆgÉwzÉ.

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¥Àæ±Éß 4) '¸ÀAeÉ UÀtÂÚ£À »£ÉÆßÃl' DvÀäZÀjvÉæ PÀÈw §gÉzÀªÀgÀÄ AiÀiÁgÀÄ?
J.J£ï.ªÀÄÆwðgÁªï
¥Àæ±Éß 5) 'PÀÈµÀÚgÁd¸ÁUÀgÀ PÀtÚA¨Ár DuÉPÀlÖ£ÀÄß PÀnÖ¹zÀªÀgÀÄ AiÀiÁgÀÄ?
¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå
¥Àæ±Éß 6) ¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀgÀÄ AiÀiÁªÀ gÁdå ªÀÄ£ÉvÀ£ÀzÀ°è ¢ªÁ£ÀgÁV PÉ®¸À ªÀiÁrzÀgÀÄ?
ªÉÄÊ¸ÀÆgÀÄ MqÉAiÀÄgÀ gÁdå ªÀÄ£ÉvÀ£ÀzÀ°è ¢ªÁ£ÀgÀV PÉ®¸À ªÀiÁrzÀgÀÄ.
¥Àæ±Éß 7) ªÉÄÊ¸ÀÆgÀÄ ¢ªÁ£ÀgÀ ºÀÄzÉÝUÉ ¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀgÀÄ gÁf£ÁªÉÄ ¤ÃqÀ®Ä PÁgÀtªÁzÀ ªÀgÀ¢
'«Ä®ègï ªÀgÀ¢'
¥Àæ±Éß 8) ¸Àgï. JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀgÀ ºÀÄlÆÖgÀÄ AiÀiÁªÀÅzÀÄ?
ªÀÄÄzÉÝÃ£ÀºÀ½î
¥Àæ±Éß 9) ¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀgÀÄ ¥ÀæAiÀiÁt ºÉÆgÀnÖzÁÝUÀ CªÀgÀ ¸ÀÆmÉÌÃ¸À£À°è AiÀiÁªÀ ¥ÀÄ¸ÀÛPÀ EgÀÄwvÀÄÛ?
'¨sÀUÀªÀ¢ÎÃvÉ'
¥Àæ±Éß 10) JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀjUÉ '¸Àgï' ¥ÀzÀ« ¤Ãr UËgÀ«¹zÀªÀgÀÄ AiÀiÁgÀÄ?
©ænµï ¸ÀPÁðgÀ
¥Àæ±Éß 11) £Á®ér PÀÈµÀÚgÁd MqÉAiÀÄgÀÄ £ÉÃ«Ä¹zÀ DAiÉÆÃUÀ AiÀiÁªÀÅzÀÄ?
«Ä®ègï DAiÉÆÃUÀ
¥Àæ±Éß 12) ªÀÄAqÀå f¯ÉèAiÀÄ°è C£Àß§ºÀät CªÀvÁgÀ ªÀiÁr¹zÀªÀgÀÄ AiÀiÁgÀÄ?
¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå
¥Àæ±Éß 13) ¨sÀzÁæªÀw PÀ©â£À ªÀÄvÀÄÛ GQÌ£À PÁSÁð£É ¤«Äð¹zÀªÀgÀÄ AiÀiÁgÀÄ?
¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå
¥Àæ±Éß 14) PÉÊUÁjÃPÀgÀt DUÀzÉ EzÀÝgÉ ¨sÀ«µÀåzÀ ¨sÁgÀvÀPÉÌ ªÀÄvÀÄÛ £ÀªÀÄä £ÁqÀÄ PÀ£ÁðlPÀPÉÌ Gdé® ¨sÀ«µÀå«®è JA§
ªÀiÁvÀ£ÀÄß ºÉÃ½zÀªÀgÀÄ AiÀiÁgÀÄ?
¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀgÀÄ.
¥Àæ±Éß 15) PÉÊUÁjPÉUÀ¼À£ÀÄß ¨É¼É¸À¢zÀÝgÉ ¨sÁgÀvÀPÉÌ G½UÁ®«®è JAzÀÄ ªÀÄ£ÀUÀAqÀªÀgÀÄ AiÀiÁgÀÄ?
¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀgÀÄ.
¥Àæ±Éß 16) '¨sÁgÀvÀ gÀvÀß' ¥Àæ±À¹Û ¥ÀqÉzÀ PÀ£ÀßqÀzÀ ªÉÆzÀ® ªÀåQÛ AiÀiÁgÀÄ?
¸Àgï.JA.«±ÉéÃ±ÀégÀAiÀÄå£ÀªÀ

2. PÀgÀPÀÄ±À® PÀ¯ÉUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀgÀA¥ÀgÉAiÀÄ «eÁÕ£À

¥Àæ±Éß 1) PÀgÀPÀÄ±À® PÀ¯ÉUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀgÀA¥ÀgÉAiÀÄ «eÁÕ£À ¯ÉÃR£ÀªÀ£ÀÄß §gÉzÀ ¯ÉÃRPÀgÀÄ AiÀiÁgÀÄ?
qÁ. PÀjÃUËqÀ ©ÃZÀ£ÀºÀ½î
¥ÀæÀæ±Éß 2) ¨sÁgÀwÃAiÀÄ PÀgÀPÀÄ±À® PÀ¯ÉUÀ½UÉ AiÀiÁªÀ PÁ®¢AzÀ C¥ÁgÀ ¨ÉÃrPÉ EzÉ?
Qæ. ¥ÀÆ. 2500 ªÀµÀðUÀ½AzÀ®Æ ¨sÁgÀwÃAiÀÄ PÀgÀPÀÄ±À® PÀ¯ÉUÀ½UÉ C¥ÁgÀ ¨ÉÃrPÉ EzÉ.
¥Àæ±Éß 3) ¨sÁgÀvÀ¢AzÀ gÀ¥sÁÛUÀÄwÛzÀÝ ««zsÀ §UÉAiÀÄ PÀgÀPÀÄ±À® ªÀ¸ÀÄÛUÀ¼À §UÉÎ «zÉÃ² §gÀºÀUÀ¼À°è ¥Àæ¸ÁÛ¦¹gÀÄªÀ
§gÀºÀUÁgÀgÀÄUÀ¼ÀÄ AiÀiÁgÀÄ?
ªÉÄUÁ¸ÀÛ¤Ã¸ï ªÀÄvÀÄÛ ¸ÁÖç¨ÉÆÃ
¥Àæ±Éß 4) ¨sÁgÀvÀzÀ°è ¨ÉÃgÉ ¨ÉÃgÉ §tÚUÀ¼À£ÀÄß ¤ÃqÀÄªÀ ¸ÀÄªÀiÁgÀÄ JµÀÄÖ VqÀUÀ½ªÉ?
¸ÀÄªÀiÁgÀÄ 300 VqÀUÀ½ªÉ.

□□□ -5 PÀxÉ ªÀÄvÀÄÛ ¥ÀæªÁ¸À PÀxÀ£À

1. AiÀÄÄUÁ¢

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¥Àæ±Éß 1) AiÀÄÄUÁ¢ PÀxÉAiÀÄ£ÀÄß §gÉzÀ PÀxÉUÁgÀgÀ ºÉ¸ÀgÉÃ£ÀÄ?
ªÀ¸ÀÄzsÉÃAzÀæ
¥Àæ±Éß 2) ªÀ¸ÀÄzsÉÃAzÀæ PÀxÉUÁgÀgÀÄ J°è d¤¹zÀgÀÄ?
§¼Áîj f¯ÉèAiÀÄ ¸ÀAqÀÆj£À°è d¤¹zÀgÀÄ.
¥Àæ±Éß 3) AiÀÄÄUÁ¢ PÀxÉAiÀÄ°èAiÀÄ JgÀqÀÄ ªÀÄÄRå ¥ÁvÀæUÀ¼ÀÄ AiÀiÁªÀÅªÀÅ? UÉÆÃ¥ÀtÚ ªÀiÁ¸ÀÛgÀ 2) ¥ÀæºÁèzÀ
¥Àæ±Éß 4) UÉÆÃ¥ÀtÚ ªÀiÁ¸ÀÛgÀgÀ ºÉAqÀwAiÀÄ ºÀ¸ÀgÉÃ£ÀÄ?
gÀÄQätªÀÄä
¥Àæ±Éß 5) UÉÆÃ¥ÀtÚ ªÀiÁ¸ÀÛgÀgÀ ¸ÉßÃ»vÀ£À ºÉ¸ÀgÉÃ£ÀÄ?
PÁ¹A¸Á§
¥Àæ±Éß 6) ¥ÀæºÁèzÀ AiÀiÁªÀ PÀA¥À¤AiÀÄ°è PÉ®¸À ªÀiÁqÀÄwÛzÀÝ?
"ªÀÄ°Ö £ÁåµÀ£À¯ï PÀA¥À¤'(CªÉÄjPÁ).
¥Àæ±Éß 7) ¥ÀæºÁèzÀ£À ¥ÀwßAiÀÄ ºÉ¸ÀgÉÃ£ÀÄ?
gÉÃSÁ
¥Àæ±Éß 8) 'gÀÆrüAiÀÄ£ÀÄß PÀlÄÖªÀÅzÀÄ PÀµÀÖ ; ªÀÄÄjAiÀÄÄªÀÅzÀÆ E£ÀÆß PÀµÀÖ ; ªÀÄgÉAiÀÄÄªÀÅzÀAvÀÆ E£ÀÆß PÀµÀÖ ! F ªÀiÁvÀÄ
AiÀiÁªÀ PÀxÉAiÀÄ°è §A¢zÉ?
F ªÀiÁvÀÄ AiÀÄÄUÁ¢ PÀxÉAiÀÄ°è §A¢zÉ.
¥Àæ±Éß 9) UÉÆÃ¥ÀtÚ ªÀiÁ¸ÀÛgÀgÀ «zÁåyð¤AiÀÄ ºÉ¸ÀgÉÃ£ÀÄ?
gÁzsÁ
¥Àæ±Éß 10) PÁ¹A¸Á§£À ªÀÄUÀ AiÀiÁgÀÄ? E¸Áä¬Ä¯ï.

2. ªÉÄUÁ£É JA§ Vjd£À ¥ÀªÀðvÀ

¥Àæ±Éß 1) ªÉÄUÁ£É JA§ Vjd£À ¥ÀªÀðvÀ ¥ÀæªÁ¸À PÀxÀ£ÀªÀ£ÀÄß §gÉzÀ ¯ÉÃRPÀgÀÄ AiÀiÁgÀÄ?
qÁ. ». a. ¨ÉÆÃgÀ°AUÀAiÀÄå
¥Àæ±Éß 2) ºÀA¦ PÀ£ÀßqÀ «±Àé«zÁå®AiÀÄzÀ PÀÄ®¥ÀwAiÀiÁV ¸ÉÃªÉ ¸À°è¹zÀ ¯ÉÃRPÀgÀÄ AiÀiÁgÀÄ?
qÁ. ». a. ¨ÉÆÃgÀ°AUÀAiÀÄå
¥Àæ±Éß 3) ªÉÄUÁ£É JA§ Vjd£À ¥ÀªÀðvÀ ¥ÀæªÁ¸À PÀxÀ£ÀªÀ£ÀÄß AiÀiÁªÀ ¥ÀæªÁ¸À PÀxÀ£À PÀÈw¬ÄAzÀ DAiÀÄÄÝPÉÆ¼Àî¯ÁVzÉ?
'Vjd£À £ÁrUÉ ¥ÀAiÀÄt' JA§ ¥ÀæªÁ¸À PÀxÀ£À PÀÈw¬ÄAzÀ DAiÀÄÄÝPÉÆ¼Àî¯ÁVzÉ.
¥Àæ±Éß 4) eÁ£À¥ÀzÀ CPÁqÉ«ÄAiÀÄ CzÀåPÀëgÀÄ AiÀiÁgÀÄ?
²æÃ J¸ï.PÉ. PÀjÃASÁ£ï
¥Àæ±Éß 5) ¸ÀAVÃvÀ ¥ÀÄgÀªÀÅ F »AzÉ AiÀiÁgÀ HgÁVvÀÄÛ?
eÉÊ£ÀgÀ HgÁVvÀÄÛ.
¥Àæ±Éß 6) £ÁUÀªÀ½î ªÀÄvÀÄÛ ºÁqÀÄªÀ½îUÀ¼À ¸ÀÄvÀÛªÀÄÄvÀÛ°£À zÀlÖ PÁr£À MqÀ¯ÉÆ¼ÀUÉ ªÁ¸ÀªÁVgÀÄªÀ d£ÁAUÀzÀ ºÉ¸ÀgÉ£ÀÄ?
'UÉÆAqÀ d£ÁAUÀ'
¥Àæ±Éß 7) ¯ÉÃRPÀgÀ UÀÄA¦£À ªÀiÁUÀðzÀ±ÀðPÀgÀÄ AiÀiÁgÀÄ?
PÀÄ¥ÀàAiÀÄå ªÀÄvÀÄ PÀjAiÀÄ
¥Àæ±Éß 8) ªÉÄUÁ£É UÁæªÀÄzÀ°è ªÁ¸ÀªÁVgÀÄªÀ §ÄqÀPÀlÄÖ d£ÁAUÀzÀ ºÉ¸ÀgÉÃ£ÀÄ?
'PÀÄt© d£ÁAUÀ'
¥Àæ±Éß 9) PÀÄt© d£ÁAUÀzÀªÀgÀÄ ªÀÄÆ®vÀ; AiÀiÁªÀ gÁdåzÀ »£Éß¯ÉAiÀÄ£ÀÄß ºÉÆA¢zÁÝgÉ?
UÉÆÃªÁ gÁdåzÀªÀgÀÄ

¥Àæ±Éß 10) PÀÄt© d£ÁAUÀzÀªÀgÀ ªÀÄÄRåªÁzÀ ºÀ§â AiÀiÁªÀÅzÀÄ?
"ºÉÆÃ½ ºÀÄtÂÚªÉÄ ºÀ§â"
¥Àæ±Éß 11) ºÁrAiÀÄ (70 ªÀµÀðzÀ) AiÀÄdªÀiÁ£À AiÀiÁgÀÄ?
AiÀÄÄAPÀÄ
¥Àæ±Éß 12) vÁ¼ÀUÀÄ¥ÀàzÀ Vjd£À D±ÀæªÀÄ ±Á¯ÉAiÀÄ ªÀiÁ¸ÀÛgÀ AiÀiÁgÀÄ?
ºÀÄZÀÑ¥Àà ªÀiÁ¸ÀÛgÀ
¥Àæ±Éß 13) 'UÀÆ¨É PÀÆj¸ÀÄ' ¥ÀzÀzÀ CxÀð

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vÀ¥Àà£ÀÄß ºÉÆj¸ÀÄ
¥Àæ±Éß 14) ºÁqÀ½îUÉ »AzÉ AiÀiÁªÀ ºÉ¸Àj¤AzÀ PÀgÉAiÀÄÄwÛzÀÝgÀÄ?
¸ÀAVÃvÀ¥ÀÄgÀ

14.0 University Result

Examination	FCD	FC	SC	% Passing

Prepared by	Checked by		
			
Prof. B. S. Koteppagol	Dr. K. B. Manwade	HOD	Principal

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Subject Title	baLake Kannada		
Subject Code	BKBKK207	CIE Marks	50
		SEE Marks	50
Number of Lecture Hrs / Week	1	Total Marks	100
Total Number of Lecture Hrs	15	Exam Hours	1 H
Credits: 1			

FACULTY DETAILS:		
Name: Smt. B S KOTEPPAGOL	Designation: Asst. Professor	Experience: 05
No. of times course taught:5	Specialization: MA IN KANNADA	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
1	other than kannada medium students		kakk

2.0 Course Objectives

1. To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
2. To enable learners to Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To train the learners for correct and polite conservation

3.0 Course Outcomes

At the end of the Course, The Students will be able

1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
5. To speak in polite conservation.

4.0 Course Content

Module-1

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities
3. Key to Transcription.
4. - Personal Pronouns, Possessive Forms, Interrogative words.

Module-2

Possessive forms of nouns, dubitive question and Relative nouns

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Qualitative, Quantitative and Colour Adjectives,

□□□□ □□□□□□ □□□□□ □□□□□□□ □□□□□□□□□□ - □□□□□□ □□□□□□□ □□□□□□□ - (□, □□□, □□□, □□□□□)

Predictive Forms, Locative Case

Module-3

1. □□□□□□□ □□□□□□□ □□□□□□□□ □□□□ □□□□□ □□□□□□□□□□□□□ -Dative Cases, and Numerals
2. □□□□□□□□□□□□□□□□□ □□□□□ □□□□□□ □□□□□□□□□ - Ordinal numerals and Plural markers
3. □□□□□ / □□□□□□□□□□ □□□□□□□□□□□ □□□□□ □□□□ □□□□□□□□□□ Defective / Negative Verbs and
Colour Adjectives

Module-4

1 □□□□□□ / □□□□□□□□, □□□□□□□□, □□□□□□□□□ □□□ □□□□□□ □□□□□□□ □□□□□ □□□□□ □□□□□□□□

Permission, Commands, encouraging and Urging words (Imperative words and sentences)

2.□□□□□□□ □□□□□□□□□□□□□ □□□□□□□ □□□□□□□ □□□□□□□□□□ □□□□□ □□□□□□□ □□□□□□□□□

Accusative Cases and Potential Forms used in General Communication

3."□□□ □□□□□ □□□□□" □□□□□ □□□□□□□□□□□, □□□□□□□□□□ □□□□□ □□□□□□□□□□ □□□□□□ □□□□□

Helping Verbs"iru and iralla", Corresponding Future and Negation Verbs

4. □□□□□□ (□□□□) , □□□□□ □□□□ □□□□□ □□□□□ □□□□ □□□□□□□□□□ □□□□□ □□□□□□□□□□ □□□□ □□□□

Comparitive, Relationship, Identification and Negation Words

Module-5

1. □□□ □□□□□ □□□□ □□□□ □□□□□□□□□□ □□□□□ □□□□□□□□□

ifferent types of forms of Tense, Time and Verbs

2. □□,-□□,-□□,- □□□, - □□□, -□□□□,-□□,-□□, □□□, □□□□□□ □□□□□□□□□□□□□□□ □□□, □□□□□□□□ □□□□□ □□□□□□□ □□□

□□□□□ □□□□ - Formation of Past, Future and Present Tense Sentences with Verb Forms

3. Kannada Vocabulary List : □□□□□□□□□□□□ □□□□□□□□□ □□□□□ □□□□□ - Kannada Words in Conversation

5.0 Relevance to future subjects

Textbook 1:

Chapter 10:10.2, 10.3, 10.4, Textbook 2:7.10 – 7.12, 7.15 Chapter 1:

Sl NoSl. No.	S Semester	Subject	Topics
			-
			-

6.0 Relevance to Real World

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SL Sl.No	Real World Mapping

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details

8.0 B Books Used and Recommended to Students

Text Books
Balake Kannada
Reference books
Kannada Kali

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

Website and Internet Contents References

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	Website
3		

11.0 Examination Note

12.0 Course Delivery Plan

Module	Lecture No./Practical Session	Content of Lecture	% of Portion
Module-1	L-1	Introduction, Necessity of learning a local language. Methods to learn the Kannada language.	

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	L-2	Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities	20	
	L-3	Key to Transcription.		
	L-4	Personal Pronouns, Possessive Forms, Interrogative words.		
	L-5	Personal Pronouns, Possessive Forms, Interrogative words.		
				L1
Module-2	L-1	Possessive forms of nouns, dubitive question and Relative nouns	20	
	L-2	□□□, □□□□□□ □□□□□ □□□□□□□□ □□□□□□□□□, □□□□□□□□□□□□□ Qualitative, Quantitative and Colour Adjectives,		
	L-3	□□□□ □□□□□□ □□□□□ □□□□□□□ □□□□□□□□□□ - □□□□□□ □□□□□□□ □□□□□□□ - (□, □□□, □□□, □□□□□) Predictive Forms, Locative Case		
	L-4			
	L-5			
Module-3	L-1	□□□□□□□ □□□□□□□ □□□□□□□□ □□□□ □□□□□ □□□□□□□□□□□□□ -Dative Cases, and Numerals	20	
	L-2	□□□□□□□□□□□□□□□□□ □□□□□ □□□□□□ □□□□□□□□□□ - Ordinal numerals and Plural markers		
	L-3	□□□□□ / □□□□□□□□□□ □□□□□□□□□□□ □□□□□ □□□□ □□□□□□□□□□ Defective / Negative Verbs and Colour Adjectives		
	L-4			
	L-5			

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Module-4	L-1	□□□□□□ / □□□□□□□□, □□□□□□□□□, □□□□□□□□□□ □□□ □□□□□□ □□□□□□□□ □□□□□ □□□□□ □□□□□□□□□ Permission, Commands, encouraging and Urging words (Imperative words and sentences)	20
	L-2	□□□□□□□ □□□□□□□□□□□□□ □□□□□□□□ □□□□□□□□ □□□□□□□□□□ □□□□□ □□□□□□□□ □□□□□□□□□□ Accusative Cases and Potential Forms used in General Communication	
	L-3	."□□□ □□□□□ □□□□□" □□□□□ □□□□□□□□□□□□, □□□□□□□□□□□□ □□□□□ □□□□□□□□□□□ □□□□□□□ □□□□□ Helping Verbs"iru and iralla", Corresponding Future and Negation Verbs	
	L-4	□□□□□□□ (□□□□) , □□□□□□ □□□□□ □□□□□□ □□□□□□ □□□□□ □□□□□□□□□□□ □□□□□ □□□□□□□□□□□ □□□□□ □□□□□ Comparitive, Relationship, Identification and Negation Words	
	L-5		
Module-5	L-1	□□□ □□□□□□ □□□□□ □□□□□ □□□□□□□□□□□ □□□□□□ □□□□□□□□□□ ifferent types of forms of Tense, Time and Verbs	20
	L-2	□□,-□□,-□□,- □□□, - □□□□, -□□□□□,-□□,-□□, □□□, □□□□□□□ □□□□□□□□□□□□□□□□□ □□□□, □□□□□□□□□ □□□□□□ □□□□□□□□ □□□□ □□□□□ □□□□□ - Formation of Past, Future and Present Tense Sentences with Verb Forms	
	L-3	Kannada Vocabulary List : □□□□□□□□□□□□□□ □□□□□□□□□□ □□□□□□ □□□□□□ - Kannada Words in Conversation	
	L-4		
	L-5		

13.0 QUESTION BANK

Note: Fill in the blankto translating the given English word to Kannada word.

Q.1) We_____
a)avaru b)ivaru
c)avlud d)naavu
Q.2) She_____
a)avanu b)adu
c)avaLu d)idu
Q.3) It_____

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a)naavu b)adu
c)niivu d)ivaru

Q.4) You_____
a)naavu b)adu
c)niivu d)ivaru

Q.5) They_____
a)avara b)avaru
c)avarind d)ivaru

Note: Substitute the correct word to the under lined words in the following sentences.

Q.6)avaru huuDugar iddare
a)huDugaru b)huDuga
c)huuDaga d)huDuug

Q.7)avaLu huDuugi iddaLe
a)huuDugi b)huDugi
c)Girl d)Lady

Q.8) adu mani iruttade
a)home b)house
c)mane d)college

Q.9) Santosh kaalejige huguttare
a)hoguttaLe b)baruttane
c)hoguttane d)goining

Q.10) Ravi haasTelanalli iruttani
a)iruttaLe b)iruvaru
c)iddare d)iruttane

Q.11) tande_____
a)father b)grand father
c)mother d)brother

Q.12) tangi_____
a) small sister b)sister
c)yonger sister d)elder sister

Note:Write the English word for the given Kannada word.

Q.13) tamma_____
a)brother b)big brother
c)smallbrother d)younger brother

Q.14) snehita_____
a)geLeya b)friend
c)snehite d)best friend

Q.15) shikshaka_____
a)teacher b)lecturer
c)Professor d)Pricipal

Note:Fill in the blank choosing the right word from the group given below.

Q.16) avaLa_____ eenu?
a)hesaru b)hasaru
c)hasiru d)name

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Q.17)manege_____ baa.
a)early b)late
c)beega d)taDavagi

Q.18) niinuiiga_____hogidde?
a)where b)there
c) ellege d)ellige
Q.19) Ravi _____ankagaLannu paDediddane.
a)heccu b)more
c) hecu d) highest

Q.20) niinu snehitarige ____tegedukonDu baa.
a) haNNugaLannu b) haNNagalannu
c) hannugalannu d) haNugalannu

Note:Translate the following Kannada sentences into English.

Q.21) idubyaga ide.
a) It is a bag b)It is a book
c)It is a pen d)It is a compass

Q.22) nimma hesaru eenu?
a)What is it's name? b)What is your name?
c)What is that's name? d)What is his name?

Q.23) niinu haastelage beega baa.
a) you come to hostel early. b) you came to hostel early
c) you must come to hostel early d) you come fast to hostel

Q.24)nanage gaNita pustaka beeku.
a)I need not mathematics book b)I want mathematics book
c) I wanted mathematics book d)I need mathematics book

Q.25)yaaru baruttare ?
a)Who will come? b) Who will be come?
c) Who will be coming? d)Who is coming?

Note: Translate the following English words into Kannada words.

Q.26) Friend
a)snehita b)tamma
c)tangi d)brother

Q.27) Home
a)college b)mane
c)house d)room

Q.28)Who
a)yaruu b)yaarinda
c)yaaravaru d)yaaru

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Q.29)When
a)yaavaaga b)yaavadu
c)yandu d)yandininda

Q.30)What
a)enu b)yantu
c)yantadu d)eenu

Note: Translate the following English sentence into Kannada .

Q.31) May I go there.
a)naanu allige hogabahude b)naanualligehoguttene
c)naan uallige hogalu sadhyavide d)naan uallige hoguvaniddene

Q.32)I am writing an assignment.
a)naanu assignment bareyuvaniddene. b)naanu assignment barediddene.
c)naanu assignment bareyuttene. d)naanu assignment bareyuttiddene.

Q.33)Who told him?
a)avanige yaaru heLidaru? b)avanige yaaru heLiddare
c)avanige yaaru heLuttare d)avanige yaaru heLabahudu

Q.34) He is my friend.
a)avanu nanna snehita iddane b)avanu nanna tamma iddane
c)avaLu nanna tangi iddaLe d)avaLu nanna akka iddaLe

Q.35) She is girl
a)avaLu gruhiNi iddaLe b)avaLu huDugi iddaLe
c)avanu huDuga iddane d)avaLu tangi iddaLe

Note: Change the word as per model given. Example:avana +adu =avanadu.

Q.36)chikka
a)chikkadu b)chakkadu
c)chukkadu d)chokkadu

Q.37)doDDa
a)doDDadu b)doDDudu
c) doDDada d) duDDudu

Q.38)oLLeya
a) oLLayadu b)oLLeeyadu
c)oLeyadu d)oLLeyadu

Q.39) keTTa
a)keTTavanu b)keTTadu
c)keTadu d)keTudu

Q.40)keLagina
a)melinadu b)hindinadu
c)keLaginadu d) mundinadu

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Note : Transform the following words of Kannada as per the given model. Example:kaTTe+-alli kaTTeyalli

Q.41)mane
a)maniyalli b)maneyolage
c)maneyalli d)manegaLalli

Q.42) toTa
a) toTadalli b)holadalli
c) toTadoLage d)huudoTadalli

Q.43) bavi
a)bavigaLalli b)baviyalli
c)baviyoLage d) bavinalli

Q.44) byagu
a) byaginoLage b)byaginalli
c)bogiyalli d)bogiyoLage

Q.45) uuru
a)uuralli b)uurinoLage
c)urinalli d)uriinalli

Note : Transform the following words to Kannada as per the given model Example: -mane-manege

Q.46) uuru
a)uurige b)uurinoLage
c)uurivarige d)uroTTige

Q.47) avanu
a)avanige b)avarige
c)ivarige d)avaLige

Q.48) akka
a)akkanavarige b)akkange
c)avakkage d)akkanige

Q.49) naanu_____
a)nanage b)nimage
c)avarige d)ivarige

Q.50) amma_____
a)ammanavarige b)ammanige
c)am

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14.0 University Result

Examination	FCD	FC	SC	% Passing
NA	-	-	-	-

Prepared by	Checked by		
			
Prof. B. S. Koteppagol	Dr. K. B. Manwade	HOD	Principal

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Subject Title	INNOVATION and DESIGN THINKING		
Subject Code	BIDTK158	**CIE(50)+SEE(50)**	100
Number of Lecture Hrs/Week	1L	**Exam Marks(appearing for)**	100& reduced to 50 for grade
Total Number of Lecture Hrs	15	**Exam Hours**	01 per division
CREDITS – 01			

FACULTY DETAILS:		
Name: Dr.S.N.Topannavar (Divisions D-EEE & E-ME & CE)	**Designation:** Professor & Head	**Experience:** 24 years
No. of times similar course taught: 02	**Specialization:** Thermal Power Engineering	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Any	PUC level	Reasoning, Analytical & Critical thinking abilities

2.0 Course Objectives

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
- To discuss the methods of implementing design thinking in the real world.

3.0 Course Outcomes

CO	Course Outcome	RBTL	POs
C109.1	Appreciate various design process procedure	L2	PO1-PO7, PO9, PO11 & PO12
C109.2	Generate and develop design ideas through differenttechnique	L2	PO1-PO7, PO9, PO11 & PO12
C109.3	Identify the significance of reverse Engineering to Understand products	L2	PO1-PO7, PO9, PO11 & PO12
C109.4	Draw technical drawing for design ideas	L3	PO1-PO7, PO9, PO11 & PO12
C109.5	Empathizing prototyping & testing	L1	PO1-PO7, PO9, PO11 & PO12

4.0 University Course Content

Module-1
PROCESS OF DESIGN
Understanding Design thinking
Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping
Module-2

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Tools for Design Thinking

Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design

Module-3

Design Thinking in IT :

Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping

Module-4

DT For strategic innovations:

Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.

Module-5

Design thinking workshop:

Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test

5.0 Relevance to future Subjects/Lab/Project

Sl. No	Semester	Subject/Lab/Project	Topics
01	All Sem	Subjects, labs and Project include Design & development of engineering systems. Solving of complex engineering problems through innovations through multidisciplinary concepts Business modeling and prototyping	All modules

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Resolving real time problems and issues by innovation and design thinking
02	Solving of complex engineering problems through innovations through multidisciplinary concepts
03	Business modeling and prototyping

7.0 Gap Analysis and Mitigation

Sl. No	Gap/s	Mitigation
01	Ability to think, design and complete project	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.
02	Ability to develop ideas and convert them to product	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.
03	Ability to make prototype and analyze	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.
04	Ability to resolve real-time problems with available resources	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.

8.0 Books Used and Recommended to Students

Text Books
1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013. 2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.

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3. HassoPlattner, ChristophMeinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. IdrisMootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

References

5. YousefHaik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

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

Website and Internet Contents References

1. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Developmen
4. https://www.mindtools.com/brainstm.html
5. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
6. www.vertabelo.com/blog/documentation/reverse-engineering https://support.microsoft.com/en-us/kb/273814
7. https://support.google.com/docs/answer/179740?hl=en
8. https://www.youtube.com/watch?v=2mjSDIBaUlM thevirtualinstructor.com/foreshortening.html
9. https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf
10. https://dschool.stanford.edu/use-our-methods/
11. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
12. http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49
13. https://www.nngroup.com/articles/design-thinking/
14. https://designthinkingforeducators.com/design-thinking/
15. www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
16. http://dschool.stanford.edu/dgift/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Elsevier	https://www.journals.elsevier.com
2	Journal of Composite Materials	http://journals.sagepub.com
3	Journal of Manufacturing Science and Engineering	http://manufacturingscience.asmedigitalcollection.asme.org
4	International Journal of Renewable Energy Research (IJRER)	http://www.ijrer.org

11.0 Examination Note

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Methods of CIE need to be defined topic wise i.e.- Tests, MCQ, Quizzes, Seminar or micro project/Course Project, Term Paper)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 35% of maximum marks in SEE and a minimum of 40% of maximum marks in CIE. Semester End Exam (SEE) is conducted for 100 marks (3 hours' duration) and scaled down to 50 marks. Based on this grading will be awarded.
The student has to score a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

12.0 Course Delivery Plan

Module	Content of Lecturer	Delivery	Cumulative Coverage
41	Understanding Design thinking: Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping	Chalk & Talk & Video of live examples	20%
42	Tools for Design Thinking: Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	Chalk & Talk, Case Studies & Video of live examples	40%
43	Design Thinking in IT: Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping	Case Studies & Simulation	60%
44	DT For strategic innovations: Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	Business Models, Presentation and Live Projects	80%
45	Design thinking workshop: Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test	Presentation	100%

13.0 Continuous Internal Evaluation (CIE)

Module	CIE Method	Marks	Conduction
1,2,3,4 &5	3 IA Tests Duration:1 hour	Conduction for 50 marks & reduced to 20 marks	I IA-5th week, II IA-10th week & III IA-15th week
	2 Assignments	Each assignment evaluation for 25 marks & average of all assignments shall be reduced to 10 marks	I Asignment-4thweek &II Assignment-9th week

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	Report writing or presentation or Seminar or GD	Each activity shall be evaluated for 50 marks with proper rubrics and average of all evaluations shall be reduced to 20 marks	13th week

Module	Topic	CIE Method
1	Understanding Design Thinking	MCQ/Term paper
2	Tools for Design Thinking	MCQ/Case Study Presentation Evaluation/Simulation Evaluation
3	Design Thinking in IT	MCQ/Case Study Presentation Evaluation/Simulation Evaluation
4	DT for Strategic Innovations	Seminar presentation on design/ micro-project on design thinking
5	Design Thinking Workshop	Workshop presentation/Course project

13.0 Semester End Examination (SEE)

Visvesvaraya Technological University will conduct the MCQ SEE for maximum for 50 marks. There will be 50 questions carrying 01mark each. The duration of the SEE will be 1hour.

15.0 QUESTION BANK (to be prepare)

16.0 University Result

VTU Examination	S^+	S	A	B	C	D	E	F	% Passing
Dec.21-Jan.22 VTU SEE									100

Prepared by	Checked by		
			
Dr. S. N. Topannavar	**Module Coordinator**	**HOD**	**Principal**

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Subject Title	**INNOVATION and DESIGN THINKING**		
Subject Code	BIDTK158	**CIE(50)+SEE(50)**	100
Number of Lecture Hrs/Week	1L	**Exam Marks(appearing for)**	50
Total Number of Lecture Hrs	15	**Exam Hours**	01
CREDITS – 01			

FACULTY DETAILS:		
Name: Prof. D. M. Kumbhar (C div)	**Designation:** Assistant Professor	**Experience:** 15 years + 7 years Industry
No. of times similar course taught: 02		**Specialization:** Digital electronics

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Any	PUC level	Reasoning, Analytical & Critical thinking abilities

2.0 Course Objectives

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
- To discuss the methods of implementing design thinking in the real world.

3.0 Course Outcomes

CO	Course Outcome	RBTL	POs
C109.1	Appreciate various design process procedure	L2	PO1-PO7, PO9, PO11 & PO12
C109.2	Generate and develop design ideas through different technique	L2	PO1-PO7, PO9, PO11 & PO12
C109.3	Identify the significance of reverse Engineering to Understand products	L2	PO1-PO7, PO9, PO11 & PO12
C109.4	Draw technical drawing for design ideas	L3	PO1-PO7, PO9, PO11 & PO12
C109.5	Empathizing prototyping & testing	L1	PO1-PO7, PO9, PO11 & PO12

4.0 University Course Content

Module-1
PROCESS OF DESIGN
Understanding Design thinking
Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping
Module-2
Tools for Design Thinking
Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space –

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Empathy for design – Collaboration in distributed Design

Module-3

Design Thinking in IT :

Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping

Module-4

DT For strategic innovations:

Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.

Module-5

Design thinking workshop:

Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test

5.0 Relevance to future Subjects/Lab/Project

Sl. No	Semester	Subject/Lab/Project	Topics
01	All Sem	Subjects, labs and Project include Design & development of engineering systems. Solving of complex engineering problems through innovations through multidisciplinary concepts Business modeling and prototyping	All modules

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Resolving real time problems and issues by innovation and design thinking
02	Solving of complex engineering problems through innovations through multidisciplinary concepts
03	Business modeling and prototyping

7.0 Gap Analysis and Mitigation

Sl. No	Gap/s	Mitigation
01	Ability to think, design and complete project	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.
02	Ability to develop ideas and convert them to product	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.
03	Ability to make prototype and analyze	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.
04	Ability to resolve real-time problems with available resources	Chalk & Talk, Presentations, Activities, Video shows, case studies, simulation, doing project/product etc.

8.0 Books Used and Recommended to Students

Text Books

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1. John. R. Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, ChristophMeinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

References

5. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

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

Website and Internet Contents References

1. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Developmen
4. https://www.mindtools.com/brainstm.html
5. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
6. www.vertabelo.com/blog/documentation/reverse-engineering https://support.microsoft.com/en-us/kb/273814
7. https://support.google.com/docs/answer/179740?hl=en
8. https://www.youtube.com/watch?v=2mjSDIBaUlM thevirtualinstructor.com/foreshortening.html
9. https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf
10. https://dschool.stanford.edu/use-our-methods/
11. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
12. http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49
13. https://www.nngroup.com/articles/design-thinking/
14. https://designthinkingforeducators.com/design-thinking/
15. www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

16. http://dschool.stanford.edu/dgift/

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	Elsevier	https://www.journals.elsevier.com
2	Journal of Composite Materials	http://journals.sagepub.com
3	Journal of Manufacturing Science and Engineering	http://manufacturingscience.asmedigitalcollection.asme.org
4	International Journal of Renewable Energy Research (IJRER)	http://www.ijrer.org

11.0 Examination Note

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Methods of CIE need to be defined topic wise i.e.- Tests, MCQ, Quizzes, Seminar or micro project/Course Project, Term Paper)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 35% of maximum marks in SEE and a minimum of 40% of maximum marks in CIE. Semester End Exam (SEE) is conducted for 50 marks (1 hours' duration) and scaled down to 50 marks. Based on this grading will be awarded.
The student has to score a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

12.0 Course Delivery Plan

Module	Content of Lecturer	Delivery	Cumulative Coverage
46	Understanding Design thinking: Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping	Chalk & Talk & Video of live examples	20%
47	Tools for Design Thinking: Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	Chalk & Talk, Case Studies & Video of live examples	40%
48	Design Thinking in IT: Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping	Case Studies & Simulation	60%
49	DT For strategic innovations: Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	Business Models, Presentation and Live Projects	80%
50	Design thinking workshop: Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test	Presentation	100%

13.0 Continuous Internal Evaluation (CIE)

Module	CIE Method	Marks	Conduction
1,2,3,4 &5	2 IA Tests (1 Improvement test if necessary) Duration:1 hour	Conduction for 30 marks	I IA-5th week, II IA-10th week & III IA-15th week
	2 Assignments	Each assignment evaluation for 25 marks & average of all assignments	I Asignment-4thweek &II Assignment-9th week

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		shall be reduced to 40 marks	
	OR		
	Report writing or presentation or Seminar or GD	Each activity shall be evaluated for 40 marks with proper rubrics	13th week

Module	Topic	CIE Method
1	Understanding Design Thinking	MCQ/Term paper
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3	Design Thinking in IT	MCQ/Case Study Presentation Evaluation/Simulation Evaluation
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5	Design Thinking Workshop	Workshop presentation/Course project

13.0 Semester End Examination (SEE)

Visvesvaraya Technological University will conduct the MCQ SEE for maximum for 50 marks. There will be 50 questions carrying 01mark each. The duration of the SEE will be 1hour.

15.0 QUESTION BANK (to be prepare)

16.0 University Result

VTU Examination	S^+	S	A	B	C	D	E	F	% Passing
Odd-2021-22									100
Even-2021-22									100

Prepared by	Checked by		
			
Prof. D M Kumbhar	**Module Coordinator**	**HOD**	**Principal**