



S J P N Trust's  
**Hirasugar Institute of Technology, Nidasoshi**  
*Inculcating Values, Promoting Prosperity*  
Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU Belagavi.  
**Accredited at 'A' Grade by NAAC**  
**Programmes Accredited by NBA: CSE, ECE, EEE & ME.**

**First Year Engg.**

**Academics**

**Course Plan**

**AY:2019-20(Even)**

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





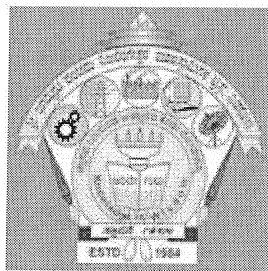
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### INSTITUTE VISION

*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.*





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## 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

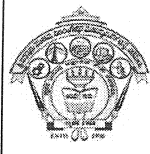
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4.	Departmental Resources & Teaching Faculty Details	
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7.	<b>Theory – Course Plans and Question Bank</b> 18MAT21- Calculus and Linear Algebra 18CHE22- Engineering Chemistry 18CPS23- C Programming for Problem Solving 18ELN24- Basic Electronics 18ME25 -Elements of Mechanical Engineering 18EGH28 -Technical English– II <b>Laboratory – Course Plan and Viva Questions</b> 18CHEL26 -Engineering Chemistry Laboratory 18CPL27 -C Programming Laboratory	

### STUDENT HELP DESK

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







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

**DEPARTMENTAL RESOURCES**

**FACULTY POSITION**

S.N.	Category	No. in position	Average experience
1	Teaching faculty	20	20
2	Technical supporting staff	02	17
3	Helper	02	19

**MAJOR LABORATORIES**

**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

**TEACHING FACULTY DETAILS**

S.N.	Name	Designation	Qualification	Specialization	Teaching Exp. (In yrs.)	Phone No.
1.	Dr. S. N. Topannavar	Asso. Pro	M.Tech .Ph.D	Thermal Engg.	20.0	9482440235
2.	Dr. R. M. Yadahalli	Assco.Prof	M.Tech, Ph.D	Microwave Electronics	27.0	9480388278
3.	Dr. M.S.Hanagadakar	Asso. Pro	M.sc. Ph.D	Physical Chemistry	17.0	9448526988
4.	Mr. S. J. Walki	Asst.Prof.	M.Sc(Ph.D)	Organic Chemistry	4.0	8105787069
5.	Mr.S. L. Patil	Asst.Prof	M.Sc(Ph.D)	Mathematics	9.3	8867664082
6.	Mr.S.S.Thabaj	Asst.Prof.	M.Sc.	Mathematics	8.0	9901398134
7.	Mr. D. B. Madhihalli	Asst.Prof.	M.Tech	Industrial Electronics	11.0	9902854324
8.	Mr. S. G. Gollagi	Asst.Prof.	M.Tech	Computer Science Engg.	21.0	9880383883
9.	Mr. S. V. Manjaragi	Asst.Prof.	M.Tech	Computer Science Engg.	15.0	9986658309
10.	Mr. R. R. Patil	Asst.Prof.	M.Tech	Computer Science Engg.	14.0	9845455422
11.	Mr. C. R. Belvi	Asst.Prof.	M.Tech	Computer Science Engg.	10.06	7829241219
12.	Mr. Jagadeesh Alkur	Asst.Prof.	M.Tech	Thermal Power system Engg	4.4	9902847774





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IQAC

File I-11

2019-20 (Even)

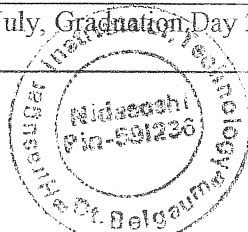
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**CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2019-20 (Even)**

Date	Events	February-2020						
		S	M	T	W	T	F	S
10-02-2020	Commencement of IV/VI/VIII Semester Classes							1
10-02-2020 to 20-02-2020	II Semester Induction Program	2	3	4	5	6	7	8
15-02-2020	Annual Sports Meet	9	10	11	12	13	14	15
29-02-2020	Techno-Vision 2020	16	17	18	19	20	21	22
		23	24	25	26	27	28	29
		21- Maha Shivaratri, 22- Mahadasoha						
14-03-2020	EDP Activities	March-2020						
		S	M	T	W	T	F	S
21-03-2020 to 24-03-2020	First CIE of II/IV/VI/VIII Semester	1	2	3	4	5	6	7
		8	9	10	11	12	13	14
28-03-2020	Feedback 1, Submission of Feedback-1 report to office	15	16	17	18	19	20	21
		22	23	24	25	26	27	28
28-03-2020	HSIT SAMBHRAMA-2020	29	30	31				
		25- Chandraman Ugadi						
11-04-2020	Technical Activities under Professional Bodies	April-2020						
		S	M	T	W	T	F	S
18-04-2020	HSIT Quest - 2020				1	2	3	4
		5	6	7	8	9	10	11
27-04-2020 to 29-02-2020	Second CIE of II/IV/VI/VIII Sem.	12	13	14	15	16	17	18
		19	20	21	22	23	24	25
30-04-2020	Feedback-2, Submission of Feedback-2 report to office	26	27	28	29	30		
		06-Mahaveer Jayanti, 10-Good Friday, 14- Dr. B. R. Ambedkar Jayanti						
26-05-2020 to 28-05-2020	Third CIE of II/IV/VI/VIII Sem.	May-2020						
		S	M	T	W	T	F	S
29-05-2020	Project Exhibition of VIII Semester						1	2
		3	4	5	6	7	8	9
29-05-2020 & 30-05-2020	Lab Internal Assessment of II/IV/VI Semester	10	11	12	13	14	15	16
		17	18	19	20	21	22	23
03-06-2020 to 11-06-2020	SEE of VIII Semester (Theory)	24	25	26	27	28	29	30
		31						
		01- Labours Day, 25- Qutub-E-Ramazan						
01-06-2020	Last Working Day of IV/VI/VIII Semester	June -2020						
		S	M	T	W	T	F	S
03-06-2020 to 13-06-2020	Practical Exams of II/IV/VI Semester		1	2	3	4	5	6
		7	8	9	10	11	12	13
15-06-2020 to 20-06-2020	Project Viva-Voce of VIII Semester	14	15	16	17	18	19	20
		21	22	23	24	25	26	27
15-06-2020 to 20-07-2020	SEE of II/IV/VI Semester (Theory)	28	29	30				

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

*Dr. Shilpa Shrigiri*  
Dr. Shilpa Shrigiri  
IQAC Co-ordinator



*Dr. S. C. Kamate*  
10/2/20  
Dr. S. C. Kamate  
Principal, Technology  
NIDASOSHI 591 236





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**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI**  
**Scheme of Teaching and Examination 2018 – 19**  
**Outcome Based Education(OBE) and Choice Based Credit**  
**System (CBCS) (Effective from the academic year 2018 – 19)**  
**II SEMESTER B.E.(CHEMISTRY GROUP)**

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours/Week			Examination				Credits
					Theory Lectur	Tutorial	Practica /	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT21	Advanced Calculus and Numerical Methods	Mathematics	3	2	--	03	40	60	100	4
2	BSC	18CHE22	Engineering Chemistry	Chemistry	3	2	--	03	40	60	100	4
3	ESC	18CPS23	C Programming for Problem Solving	Computer Science and Engineering	2	2	--	03	40	60	100	3
4	ESC	18ELN24	Basic Electronics	ECE/E and I/TC	2	2	--	03	40	60	100	3
5	ESC	18ME25	Elements of Mechanical Engineering	ME, Auto, IP, IEM, Mfg Engineering	2	2	--	03	40	60	100	3
6	BSC	18CHEL26	Engineering Chemistry Laboratory	Chemistry	--	--	2	03	40	60	100	1
7	ESC	18CPL27	C Programming Laboratory	Computer Science and Engineering	--	--	2	03	40	60	100	1
8	HSMC	18EGH28	Technical English-II	Humanities	--	2	--	03	40	60	100	1
<b>TOTAL</b>					<b>12</b>	<b>10</b>	<b>06</b>	<b>23</b>	<b>380</b>	<b>420</b>	<b>800</b>	<b>20</b>

**Note: BSC: Basic Science, ES: Engineering Science, HSMC: Humanity and Social Science.**

**Definition of Credit:** 1 hour Lecture (L) per week per semester 1 Credit  
 2 hour Tutorial (T) per week per semester 1 Credit  
 2 Hour Practical/Laboratory/Drawing (P) per week per semester 1 Credit.



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		<b>2019-20</b> <b>(Even sem)</b>

### COURSE PLAN

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

#### FACULTY DETAILS:

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

### 1.0 Prerequisite Subjects:

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

### 2.0 Course Objectives

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

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

### 3.0 Course Outcomes

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

	Refined Course Outcome	Cognitive Level	Pos
C109.1	Illustrate the applications of multivariate calculus to understand the Solenoidal and Irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.	L3	1,2,4,12
C109.2	Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.	L3	1,2,4,12
C109.3	Construct a variety of partial differential equations and solution by exact methods/ method of separation of variables.	L3	1,2,4,12
C109.4	Explain the applications of infinite series and obtain series solution of ordinary differential equations.	L3	1,2,4,12
C109.5	Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.	L3	1,2,4,12



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## COURSE PLAN

### 4.0 Course Content

#### Module – 1

##### Vector Calculus:

##### Vector Differentiation:

Scalar and vector fields. Gradient, directional derivatives; curl and divergence-physical interpretation; Solenoidal and Irrotational vector fields-Illustrative problems.

##### Vector Integration:

Line integrals, Theorems of Green, Gauss and Stokes (without proof). Applications to work done by a force and flux. (10Hrs)

#### Module – 2

##### Differential equations of higher order:

Second order linear ODE's with constant coefficients- Inverse differential operators, method of variation of parameters; Cauchy's and Legendre homogeneous equations. Applications to oscillations of a spring and LCR circuits. (10 Hrs)

#### Module – 3

##### Partial Differential equations:

Formulation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDE's involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables. (10 Hrs)

#### Module – 4

##### Infinite Series:

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

##### Power Series solution:

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

#### Module –5

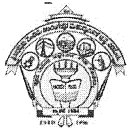
##### Numerical Methods:

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

**Numerical integration:** Simpson's  $(1/3)^{\text{th}}$  and  $(3/8)^{\text{th}}$  rules, Weddle's rule (without proof) –Problems.

(10 Hrs)



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## COURSE PLAN

### 5.0 Relevance to future subjects

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

### 6.0 Relevance to Real World


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

### 7.0 Gap Analysis and Mitigation

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

### 8.0 Books Used and Recommended to Students

Text Books
1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed. (Reprint), 2016.
Reference Books
1. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
2. B.V.Ramana: "Higher Engineering Mathematics" 11 <sup>th</sup> Edition, Tata McGraw-Hill, 2010
3. H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics", S. Chand publishing, 1st edition, 2011.
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" , 6 <sup>th</sup> Edition, 2. McGraw-Hill Book Co., New York, 1995.
5. James Stewart: "Calculus- Early Transcendentals", Cengage Learning India Private Ltd., 2017.
6. Srimanta Pal & Subobh C Bhunia: "Engineering Mathematics", Oxford University Press, 3 <sup>rd</sup> Reprint, 2016.
7. Gupta C.B., Singh S.R. and Mukesh Kumar: "Engineering Mathematics for I & II ", McGraw-Hill Education (India) Pvt. Ltd., 2015.
Additional Study material & e-Books
1. CRC Standard Mathematical Tables and Formulae, 32nd Edition
2. A Student's Guide to the Study, Practice, and Tools of Modern Mathematics- Bindner, Donald
3. P.N. Wartikar & J.N. Wartikar -Applied Mathematics (Volume I & II) Pune Vidyarthi Griha Prakashan, 7 <sup>th</sup> Edition 1994.

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### COURSE PLAN

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

**9.0**

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

#### Website and Internet Contents References

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. <http://www.khanacademy.org/>
3. (MOOCs)
4. <http://academicearth.org/>
5. VTU EDUSAT PROGRAMME-20

### 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	+ Plus Magazine	<a href="https://plus.maths.org/issue44">https://plus.maths.org/issue44.</a>
2	Mathematics Magazine	<a href="http://www.mathematicsmagazine.com">www.mathematicsmagazine.com</a>

### 11.0 Examination Note

#### Internal Assessment: 40 Marks

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

#### Scheme of Evaluation for Internal Assessment (40 Marks)


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

#### SCHEME OF EXAMINATION:

#### Question paper pattern:

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


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

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## COURSE PLAN

### 12.0 Course Delivery Plan

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


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### COURSE PLAN

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

### 13.0 Assignments, Pop Quiz, Mini Project, Seminars

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

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## COURSE PLAN

### 14.0 QUESTION BANK

#### Module-1:

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

#### Module-2:

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




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### COURSE PLAN

- 8) Solve  $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = \log x \sin(\log x)$
- 9) Solve  $(2x + 3)^2 \frac{d^2y}{dx^2} - (2x + 3) \frac{dy}{dx} - 12y = 6x$
- 10) Solve  $(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x) \frac{dy}{dx} + y = \sin[2 \log(1 + x)]$ .
- 11) Solve:  $\frac{d^2y}{dx^2} + 4 \frac{dy}{dx} + 5y = -2 \cosh x$ . Also find  $y$  when  $y = 0$ ,  $\frac{dy}{dx} = 1$  at  $x = 0$ .
- 12) Solve:  $\frac{d^3y}{dx^3} + 2 \frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{-x} + \sin 2x$ .
- 13) Solve:  $(D^2 - 4D + 3)y = \sin 3x \cos 2x$ .
- 14) Solve:  $\frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = e^{2x} - \cos 2x$ .
- 15) Solve:  $\frac{d^2y}{dx^2} + -4y = \cosh(2x - 1) + 3^x$ .
- 16) Solve:  $(D^3 - D)y = 2x + 1 + 4 \cos x + 2e^x$ .
- 17) Solve:  $(D^4 - 1)y = e^x \cos x$ .
- 18) Solve:  $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$
- 19) Solve:  $(D^2 + a^2)y = \tan ax$ .
- 20) Solve:  $\frac{dx}{dt} + y = \sin t$ ,  $\frac{dy}{dx} + x = \cos t$ ; given that  $x = 2$  &  $y = 0$  when  $t = 0$ .
- 21) Solve:  $(D - 1)x + Dy = 2t + 1$ ,  $(2D + 1)x + 2Dy = t$
- 22) A body weighing 10 kg is hung from a spring. A pull of 20 kg. wt. will stretch the spring to 10 cm. The body is pulled down to 20 cm below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position at time  $t$  sec., the maximum velocity and the period of oscillation.
- 23) A spring of negligible weight which stretches 1 inch under tension of 2 lb is fixed at one end and is attached to a weight of  $w$  lb at the other. It is found that resonance occurs when an axial periodic force  $2 \cos 2t$  lb acts on the weight. Show that when the free vibrations have died out, the forced vibrations are given by  $x = ct \sin 2t$ , and find the values of  $w$  and  $c$ .
- 24) In an LCR circuit, the charge  $q$  on a plate of a condenser is given by  $L \frac{d^2q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = E \sin pt$ . The circuit is tuned to resonance so that  $p^2 = \frac{1}{LC}$ . If initially the current  $i$  and the charge  $q$  be zero, show that, for small values of  $R/L$ , the current in the circuit at time  $t$  is given by  $(Et/2L) \sin pt$ .
- 25) An uncharged condenser of capacity  $C$  is charged by applying an e.m.f.  $\frac{E \sin t}{\sqrt{LC}}$  through leads of self inductance  $L$  and negligible resistance. Prove that at any time  $t$ , the charge on one of the plates is  $\frac{EC}{2} \left\{ \sin \frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}} \cos \frac{t}{\sqrt{LC}} \right\}$

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## COURSE PLAN

### Module-3:

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

### Module-4:

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



### COURSE PLAN

#### Module-5:

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

x	0	1	2	5
y	2	3	12	147

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

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

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

x	0	2	3	6
y	-4	2	14	158

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

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

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

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

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

- 16) In the table below the value of y are conjugative terms of a series of which 23.6 are the 6<sup>th</sup> term. Find  
 The first & tenth terms of the series

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





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17) Given the values

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

Find f(15) and f(19)

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

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

19) Given the values

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

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

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

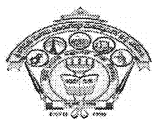
21) If y(1)=3, y(3)=9, (4)=30, y(6)=132, Find Lagrange's interpolation formula &amp; hence find y at x=5.

22) Evaluate  $\int_0^6 \frac{dx}{1+x^2}$  by usingi) Simpson's 1/3<sup>rd</sup> rule, ii) Simpson's 3/8<sup>th</sup> rule, iii) Weddle's rule compare with its actual value.23) Use Simpson's 1/3<sup>rd</sup> rule to find  $\int_0^{0.6} e^{-x^2} dx$  by taking seven ordinates.24) Using Simpson's 3/8<sup>th</sup> rule, evaluate  $\int_0^{0.3} \sqrt{1-8x^3} dx$  by taking 7 ordinates.25) Integrate numerically  $\int_0^{\pi} \sqrt{\cos\theta} d\theta$ **16.0 University Result**

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

Prepared by	Checked by		
Prof. S. L. Patil Prof. S. S. Thabaj Prof. S. A. Patil Prof. S. I. Shivamoggimath	Prof. S. L. Patil	<b>HOD</b>	<b>Principal</b>





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2019-20 (Even)

<b>Subject Title</b>	<b>Engineering Chemistry</b>		
<b>Subject Code</b>	18CHE22	<b>IA Marks</b>	40
<b>Number of Lecture Hrs / Week</b>	05(3+2)	<b>Exam Marks</b>	60
<b>Total Number of Lecture Hrs</b>	50	<b>Exam Hours</b>	03
<b>CREDITS – 04</b>			

**FACULTY DETAILS:**

<b>Name:</b> 1) Dr. M. S. Hanagadakar 2) Mr. S. J. Walki	<b>Designation:</b> 1) Associate Prof. 2) Assistant Prof.	<b>Experience:</b> 1) 15.5 Years 2) 5.0 Years
<b>No. of times course taught:</b> 1) 23 (including Present) 2) 08 (including Present)	<b>Specialization:</b> 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	Common to All branch	II	ENGINEERING CHEMISTRY

**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. Electrochemistry and Energy storage systems.
2. Corrosion & Metal Finishing.
3. Energy Systems
4. Environmental Pollution and Water Chemistry
5. Instrumental methods of analysis and Nanomaterials

**3.0 Course Outcomes**

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

	Course Outcome	POs	RBT Level s
CO1	Use of free energy in equilibria, rationalize bulk properties and processes using thermodynamic considerations, electrochemical energy systems.	1,2,3,4,6 ,9,10&12	L3
CO2	Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electroless plating.	1,2,3,4,6 ,9,10&12	L1 & L2
CO3	Production & consumption of energy for industrialization of country and living standards of people. Electrochemical and concentration cells. Classical, modern batteries and fuel cells. Utilization of solar energy for different useful forms of energy.	11,2,3,4,6 ,9,10&12	L3
CO4	Environmental pollution, waste management and water chemistry.	1,2,3,4,6 ,9,10&12	L3
CO5	Different techniques of instrumental methods of analysis. Fundamental principles of nanomaterials..	1,2,3,4,6 ,9,10&12	L1&L2
<b>Total Hours of instruction</b>		<b>50</b>	

**4.0 Course Content**

Nidasoshi-591 236, Tq.: Hukkeri, Dist.: Belagavi, Karnataka, India.

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2019-20 (Even)

### **MODULE-I: Electrochemistry and Energy storage systems**

**Use of free energy in chemical equilibria:** Thermodynamic functions: Definitions of free energy and entropy. Cell potential, derivation of Nernst equation for single electrode potential, numerical problems on  $E$ ,  $E^0$ , and  $E_{cell}$ .

**Electrochemical Systems:** Reference electrodes: Introduction, construction, working and applications of Calomel electrode. Ion-selective electrode – Definition, construction and principle of Glass electrode, and determination of pH using glass electrode. Electrolyte concentration cells, numerical problems.

**Energy storage systems:** Introduction, classification - primary, secondary and reserve batteries. Construction, working and applications of Ni-MH and Li-ion batteries. (RBT Levels: L3)

### **MODULE-II: Corrosion and Metal finishing**

**Corrosion:** Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity and temperature. Types of corrosion - Differential metal and differential aeration - pitting and water line. Corrosion control: Anodizing – Anodizing of aluminum, Cathodic protection - sacrificial anode and impressed current methods, Metal coatings - Galvanization.

**Metal finishing:** Introduction, Technological importance. Electroplating: Introduction, principles governing electroplating-Polarization, decomposition potential and overvoltage. Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel & copper, distinction between electroplating and electroless plating processes. (RBT Levels: L1 & L2)

### **MODULE-III: Energy Systems**

**Chemical Fuels:** Introduction, classification, definitions of CV, LCV, and HCV, determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems. Knocking of petrol engine – Definition, mechanism, ill effects and prevention. Power alcohol, unleaded petrol and biodiesel.

**Fuel Cells:** Introduction, differences between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with  $H_2SO_4$  electrolyte, and solid oxide fuel cell (SOFCs).

**Solar Energy:** Photovoltaic cells- introduction, construction and working of a typical PV cell. Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells. (RBT Levels: L3)

### **MODULE IV: Environmental Pollution and Water Chemistry**

**Environmental Pollution:** Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and sulphur, hydrocarbons, Particulate matter, Carbon monoxide, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion.

**Waste Management:** Solid waste, e-waste & biomedical waste: Sources, characteristics & disposal methods (Scientific land filling, composting, recycling and reuse).

**Water Chemistry:** Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages - scale and sludge formation, boiler corrosion (due to dissolved  $O_2$ ,  $CO_2$  and  $MgCl_2$ ). Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry). Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis. (RBT Levels: L3)

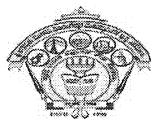
### **MODULE-V: Instrumental methods of analysis and Nanomaterials**

**Instrumental methods of analysis:** Theory, Instrumentation and applications of Colorimetry, Flame Photometry, Atomic Absorption Spectroscopy, Potentiometry, Conductometry (Strong acid with a strong base, weak acid with a strong base, mixture of strong acid and a weak acid with a strong base).

**Nanomaterials:** Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: Top down and bottom up approaches, Synthesis by Sol-gel, precipitation and chemical vapour deposition, Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications. (RBT Levels: L1 & L2)

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**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
<ol style="list-style-type: none"><li>1. B. S. Jai Prakash, R. Venigopal, Shivakumarraiah, PushpaIyengar, Chemistry for Engineering Students, Subhas Stores (Bangalore ), 2014</li><li>2. R. V. Gadag and A. N. Shetty, Engineering Chemistry, IK International Publishing House, New Delhi, Third Edition 2014</li><li>3. P.C. Jain &amp; Monica Jain. "Engineering Chemistry", DhanpatRai Publications, New Delhi (2015 Edition).</li><li>4. S. S. Dara, A textbook of Engineering Chemistry, 10<sup>th</sup> Edition, S Chand &amp; Co., Ltd., New Delhi, 2014.</li><li>5. Physical Chemistry, by P. W. Atkins, Oxford Publications (Eighth edition-2006).</li></ol>
Reference Books
<ol style="list-style-type: none"><li>1. O.G.Palanna, "Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.</li><li>2. G.A.Ozin &amp; A.C. Arsenault, "Nanotechnology A Chemical Approach to Nanomaterials", RSC publishing, 2005.</li><li>3. V. R. Gawariker, N V. Viswanathan, JayadevSreedhar, Polymer Science, New Age International (P) Ltd., New Delhi, 2nd edition 2015.</li></ol>

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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.Vijayasathy, 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	<a href="https://www.journals.elsevier.com/international-journal-of-engineering-science">https://www.journals.elsevier.com/international-journal-of-engineering-science</a>
2	International Journal of Engineering Trends and Technology	<a href="http://ijettjournal.org/">http://ijettjournal.org/</a>
3	Nanotechnology, Science and Applications	<a href="https://www.dovepress.com/nanotechnology-science-and-applications-journal">https://www.dovepress.com/nanotechnology-science-and-applications-journal</a>

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### Examination Note

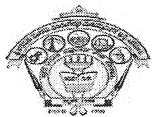
#### SCHEME OF EVALUATION FOR INTERNAL ASSESSMENT (20 Marks)

- i) Answer any two main questions
- ii) Each main question carries equal marks and each main have three (a/b/c) sub questions
- iii) Student has to attempt the answer Q1 (a/b/c) or Q2 (a/b/c) and Q3 (a/b/c) or Q4 (a/b/c)
- iv) Internal Assessment marks- 30Marks
- v) Assignments write up - 10Marks

#### 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<sup>th</sup> question.

Module I- Question 1(a,b,c) or 2(a,b,c) = 20Marks



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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  
 Module V – Question 9(a,b,c) or 10(a,b,c) = 20Marks  
 Total = 100Marks

### INSTRUCTION FOR ENGINEERING CHEMISTRY (18CHE12/22) EXAMINATION

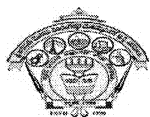
1. The total exam duration is 3 hours.
2. Use black ink pen for writing examination
3. Drawing should be drawn from dark pencil.
4. Read the questions carefully.
5. Answer the questions up to the point.

## 12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	<b>Use of free energy in chemical equilibria:</b> Thermodynamic functions: Introduction, I Law of Thermodynamics, Definitions of energy & free energy. II Law of Thermodynamics, definition of entropy. Cell potential: Meaning of EMF	20.0
	2	Derivation of Nernst equation for single electrode potential and numerical problems	
	3	Nernst equation for a cell, Numerical problems on $E$ , $E^0$ , and $E_{cell}$ .	
	4	<b>Electrochemical energy systems:</b> Introduction, types of electrodes, Meaning of reference electrodes, construction, working, advantages and applications of Calomel electrode.	
	5	Ion-selective electrode – Definition, examples, membrane electrodes, construction and principle of Glass electrode,	
	6	Determination of pH using glass electrode, Concentration cells: Definition, examples, derivation of an equation to find the EMF of concentration cells, Numerical problems on concentration cells	
	7	<b>Energy storage systems:</b> Introduction, classification - primary, secondary and reserve batteries with examples	
	8	Construction, working and applications of Ni-MH and Li-ion batteries	
	9 & 10	<b>Tutorial classes:</b> Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	
2	11	Corrosion: Definition, Wet & Dry corrosion, Electrochemical theory taking corrosion of iron as an example	20.0
	12	Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH (greater than 10, between 3 and 10, lower than 3), conductivity and temperature	
	13	Types of corrosion- Differential metal corrosion and differential aeration corrosion: Pitting and water	
	14	Cathodic protection : Definition, sacrificial anode and impressed current methods, Metal coatings - Galvanization	
	15	Definition and technological importance of metal finishing, Principles governing metal finishing- Polarization, decomposition potential and overvoltage	
	16	Electroplating: Introduction, Electroplating of chromium (hard and	

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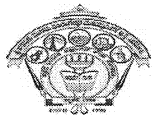
**2019-20 (Even)**

		decorative), its applications	
	17	Electroless plating: Introduction, electroless plating of nickel	
	18	Electroless plating of copper and its applications, distinction between electroplating and electroless plating processes	
	19& 20	<b>Tutorial classes:</b> Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	
3	21	<b>Chemical Fuels:</b> Introduction, classification based on occurrence and state of aggregation, definitions of CV, LCV and HCV	20.0
	22	Determination of calorific value of solid/liquid fuel using bomb calorimeter: Principle, diagram, construction, working and calculation	
	23	Numerical problems on calorific values.	
	24	Knocking of petrol engine – Definition, mechanism, ill effects and prevention, Power alcohol, unleaded petrol and biodiesel	
	25	<b>Fuel Cells:</b> Introduction, differences between conventional cell and fuel cell, limitations & advantages.	
	26	Construction, working & applications of methanol-oxygen fuel cell with H <sub>2</sub> SO <sub>4</sub> electrolyte, and solid oxide fuel cell (SOFCs).	
	27	<b>Solar Energy:</b> Photovoltaic cells- introduction, construction and working of a typical PV cell	
	28	Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells	
	29 & 30	<b>Tutorial classes:</b> Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	
4	31	<b>Environmental Pollution:</b> Introduction, Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and hydrocarbons,	20.0
	32	Oxides of sulphur, Particulate matter, Carbon monoxide, Mercury and Lead.	
	33	Secondary air pollutant: Ozone, Ozone depletion	
	34	<b>Waste Management:</b> Solid waste, e-waste, Biomedical waste: Sources, Characteristics & disposal methods (Scientific land filling, composting, recycling and reuse)	
	35	<b>Water Chemistry:</b> Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages-scale and sludge formation	
	36	Boiler corrosion (due to dissolved O <sub>2</sub> , CO <sub>2</sub> and MgCl <sub>2</sub> ), Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), Determination of COD	
	37	Numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry),	
	38	Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis.	
	39 & 40	<b>Tutorial classes:</b> Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	
5	41	<b>Instrumental methods of analysis:</b> Introduction, principle, advantages and limitations	20.0
	42	Instrumentation and applications of Colorimetry (Estimation of copper in brass), Flame Photometry (estimation of sodium and potassium)	

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2019-20 (Even)

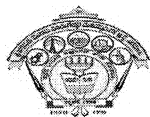
43	Instrumentation and applications of Atomic Absorption Spectroscopy, Potentiometry (estimation of FAS),
44	Instrumentation and applications of Conductometry (Strong acid with a strong base, weak acid with a strong base, mixture of strong acid and a weak acid with a strong base)
45	<b>Nanomaterials:</b> Introduction, size dependent properties: Surface area, Electrical, Optical, Catalytic and Thermal properties
46	Synthesis of nanomaterials: Top down and bottom up approaches, Synthesis by bottom up approach: Sol-gel method.
47	Precipitation and chemical vapour deposition methods with advantages
48	Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications (synthesis not required)
49 & 50	<b>Tutorial classes:</b> Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.

### 13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
MODULE 1	Assignment 1: University Questions on Section of Electrochemistry and Energy storage systems	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 2	Assignment 2: University Questions on Corrosion and Metal Finishing	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 3	Assignment 3: University Questions on Energy Systems	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 4	Assignment 4: University Questions on Environmental Pollution and Water Chemistry	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 5	Assignment 5: University Questions on Instrumental	Students study the Topics and write the Answers. Get practice to solve	Module 5 of the syllabus	10	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference

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	methods of analysis and Nanomaterials	university questions.				list
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### 14.0 Assignment Questions

Assignment No	Questions	Marks
I	<ol style="list-style-type: none"> <li>Define single electrode potential. Derive Nernst's equation for single electrode potential.</li> <li>Define electrochemical cells. Give the differences between Electrolytic and galvanic cells.</li> <li>What is electrolyte concentration cell? A concentration cell was constructed by immersing two silver electrodes in 0.05M and 0.1M AgNO<sub>3</sub> solution. Write cell representation, cell reactions and calculate the EMF of the cell.</li> <li>Define battery. Give the classification of batteries with example.</li> <li>Explain the construction and working of Ni-MH.</li> </ol>	5marks 5marks 5marks 5marks
II	<ol style="list-style-type: none"> <li>What is metallic corrosion? Explain the corrosion of iron based on electrochemical theory.</li> <li>Explain differential metal corrosion with suitable example.</li> <li>Explain the following types of corrosion i) Pitting corrosion ii) Water line corrosion.</li> <li>Explain the process of electroplating of nickel (Watt's bath).</li> <li>Explain the following : i) Decomposition potential ii) over voltage</li> </ol>	5marks 5marks 5marks 5marks
III	<ol style="list-style-type: none"> <li>Define chemical fuels. Explain the classification of Chemical fuels and write characteristics of good fuels.</li> <li>Explain determination of calorific value of a solid/liquid fuel by using Bombs calorimeter.</li> <li>Explain knocking mechanism in IC engine and its ill effects</li> <li>Explain the construction and working of P.V. cell</li> <li>Explain Preparation of solar grade silicon by Union Carbide Process</li> </ol>	5marks 5marks 5marks 5marks
IV	<ol style="list-style-type: none"> <li>Define air pollution. Explain the various causes of air pollution.</li> <li>Explain Ozone depletion.</li> <li>Define dissolved oxygen. Explain with reactions the determination of dissolved oxygen by Winkler's method.</li> <li>What is softening of water? Discuss the softening of water by ion exchange (Deminceralization) process.</li> <li>Describe the method to determine COD of water.</li> </ol>	5marks 5marks 5marks 5marks
V	<ol style="list-style-type: none"> <li>What is flame photometry? Explain the components of flame photometer and their functions.</li> <li>Write a note on atomic absorption spectroscopy.</li> <li>Explain conductometry titration of strong acid with strong base.</li> <li>Explain the synthesis of nano particles by solgel method.</li> <li>What are nanomaterials? Explain the properties (Particle size dependent) of Nanomaterials.</li> </ol>	5marks 5marks 5marks 5marks

15.0

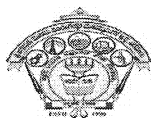
### QUESTION BANK

#### Module-I Electrochemistry and Energy storage systems

- Explain electrode potential and cells.

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

### Module-II Corrosion and Metal Finishing

- Describe the process of corrosion.
- Illustrate the examples of metal corrosion.
- Define chemical corrosion and electrochemical corrosion.
- Explain different types of corrosion.
- Outline the process of controlling the metal corrosion.
- Explain use of corrosion inhibitors in controlling corrosion of metals.
- Outline the different factors affecting the corrosion process.
- Caustic embrittlement is a type of
  - Differential metal corrosion
  - Differential aeration corrosion
  - Stress corrosion
  - None
- Coating of iron with zinc is known as
- A) Galvanization B) Tinning C) Anodizing D) Phosphating
- Explain metal finishing. Outline the technological importance of metal finishing.
- Describe the significance of electro polarization, decomposition potential and hydrogen over voltage in electroplating process.
- Explain the effect of plating variables on the nature of electrodeposite.
- Explain electro deposition process to the chromium and gold.
- Define electroless plating.
- Explain electroless plating to the plating of copper on double sided PCB.

### Module-III Energy Systems

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

### Module-IV Environmental Pollution and Water Chemistry

- What potable water? Describe reverse osmosis.

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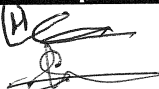
Course Plan

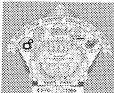
2019-20 (Even)

2. Explain boiler troubles with disadvantages -scale and sludge formation, priming and foaming, boiler corrosion (due to dissolved  $O_2$ ,  $CO_2$  and  $MgCl_2$ ).
3. Determine dissolved oxygen in water by Winkler's method.
4. Describe the method to determine COD of water.
5. Describe the method to determine BOD of water.
6. Explain sewage treatment methods
7.  $25\text{ cm}^3$  of an effluent sample requires for oxidation  $8.3\text{ cm}^3$  of  $0.001M\text{ K}_2\text{Cr}_2\text{O}_7$ . Calculate the COD of the effluent sample
8. Explain gravimetric determination of sulfate content in water.
9. Define air pollution. Explain types of air pollution.
10. Discuss the natural sources, ill effects and  $SO_2$  as pollutant.
11. Write note on ozone depletion.
12. Differentiate between primary and secondary air pollutants with an examples.
13. Explain disposal of solid waste by scientific land filling.
14. Explain sources and characteristics of solid waste.

### Module-V Instrumental methods of analysis and Nanomaterials

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

Prepared by		
		
1. Dr. M. S. Hangadakar 2. Mr. Shashikant Walki	HOD	Principal



Subject Title	C PROGRAMMING FOR PROBLEM SOLVING		
Subject Code	18CPS23	IA Marks	40
Number of Lecture Hrs/Week	02 L+ 02 P	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
<b>CREDITS – 03</b>			

#### FACULTY DETAILS:

Name	Designation	Experience	Specialization:	No. of times course taught
1. Prof. S. G. Gollagi	Asst. Professor	21.8 Years	Computer Engineering	05
2. Prof. S V Manjaragi	Asst. Professor	15.5 Years	Computer Science and Engineering	04

### 1.0 Prerequisite Subjects:

S. No	Branch	Semester	Subject
01	Computer Science & Engg.	II	Computer Fundamentals

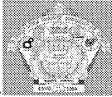
### 2.0 Course Objectives

- Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
- Implement different programming constructs and decomposition of problems into functions.
- Use and implement data structures like arrays and structures to obtain solutions.
- Define and use of pointers with simple applications.

### 3.0 Course Outcomes

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

CO	Course Outcome	Cognitive Level	POs
C103.1	Illustrate simple algorithms from the different domains such as mathematics, physics, etc.	L1,L2	1, 2, 3,8,10
C103.2	Construct a programming solution to the given problem using C.	L1,L2	1, 2, 3,8,10
C103.3	Implementing the basic algorithms using data structures like arrays.	L1,L2,L3	1, 2, 3,8,10
C103.4	Modularize the given problem using functions and recursion.	L1,L2,L3	1, 2, 3,8,10
C103.5	Developing a simple programs in C using structures, pointers and directives	L1,L2,L3	1, 2, 3,8,10
<b>Total Hours of instruction</b>			<b>40</b>



## 4.0 Course Content

### Module – 1

**Introduction to computer Hardware and Software:** Computer generations, computer types, bits, bytes and words, CPU, Primary memory, Secondary memory, ports and connections, input devices, output devices, Computers in a network, network hardware, Software basics, software types.

**Overview of C:** Basic structure of C program, executing a C program, Constants, Variables and data types, Operators and Expressions. **Text 1:** Chapters 1, 2, 3

### Module -2

Managing Input and Output operations, Conditional branching and Loops, Example programs, Finding roots of a quadratic equation, computation of binomial coefficients, plotting of Pascal's triangle.

**Text 1:** Chapters 4, 5, 6

### Module- 3

**Arrays:** Arrays (One dimensional and Two dimensional), Character arrays and Strings, **Basic Algorithms:** Searching and sorting algorithms (Linear search, Binary search, Bubble sort and Selection sort).

**Text 1:** Chapters 7,8

### Module- 4

User defined functions and Recursion, Example programs, finding factorial of a positive integer and Fibonacci series.

**Text 1:** Chapter 9

### Module -5

Structures and Pointers, Preprocessor directives.

**Text1:** Chapters 10, 11,14

## 5.0 Relevance to future subjects

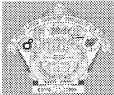
S. No	Semester	Subject	Topics
01	III	Data Structures & Applications	Arrays, Functions, Recursion, Structure, pointers,
02	IV	Algorithms	Implementation of Algorithms
03	VI	System Software and Compiler Design	Implementation of System s/w

## 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 softwares.

## 7.0 Gap Analysis and Mitigation

S. No	Delivery Type	Details
01	Tutorial	Topic: Module I - Module V
02	NPTEL	Problem solving skills- Videos



## 8.0 Books Used and Recommended to Students

Text Books
1. E. Balagurusamy, Programming in ANSI C, 7 <sup>th</sup> Edition, Tata McGraw-Hill 2. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Prentice Hall of India.
Reference Books
1. Sumitabha Das, Computer Fundamentals & C Programming, mc Graw Hill Education. 2. Gary J Bronson, ANSI C programming, 4 <sup>th</sup> Edition, Ceneage Learning. 3. Dey and Ghosh, programming in C, 3 <sup>rd</sup> Edition, Oxford University Press. 4. Vikas Gupta: “Computer Concepts and C Programming”, Dreamtech Press 2013. 5. R. S.Bichkar, Programming with C, University Press, 2012. 6. V. Rajaraman, “Computer Programming in C”, PHI, 2013. 7. Basavaraj S. Anami, Shanmukhappa A Angadi, Sunilkumar S. Manvi, Computer Concepts and C Programming: A Holistic approach to learning C, Second edition, PHI India, 2010.
Additional Study material & e-Books
1. C Tutorials on YouTube

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

Website and Internet Contents References
1) <a href="http://www.google.com">www.google.com</a>

## 10.0 Magazines/Journals Used and Recommended to Students

S.No	Magazines/Journals	website
1	-	-

## 11.0 Examination Note

### SCHEME OF EVALUATION FOR INTERNAL ASSESSMENT (40 Marks)

- Answer any two questions.
- Each main question carries equal marks and each main have three (a/b/c) sub questions.
- Student has to attempt the answer Q1 (a/b/c) or Q2 (a/b/c) and Q3 (a/b/c) or Q4 (a/b/c).
- Internal Assessment marks- 30 Marks.
- Assignments write up -10 Marks.

### SCHEME OF EXTERNAL EXAMINATION:

Ten main questions to be set in question paper. Each main question will carry 20 marks. Student has to answer either 1 or 2 main 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
Module V – Question 9(a,b,c) or 10(a,b,c)	= 20Marks

Total = 100Marks



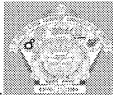
### INSTRUCTIONS FOR C PROGRAMMING FOR PROBLEM SOLVING (18CPS13) EXAMINATION

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.

### 12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecture	% of Portion
		<b>PART - A</b>	
1	1	<b>Introduction to computer Hardware and Software:</b> Computer generations, computer types	20.00
	2	Bits, bytes and words, CPU, Primary memory, Secondary memory	
	3	Ports and connections, input devices, output devices	
	4	Computers in a network, network hardware, Software basics, software types	
	5	<b>Overview of C:</b> History of C, Why C? Features of C Language	
	6	Basic structure of C program, executing a C program	
	7	Constants, Variables and data types	
	8	Operators and Expressions	
2	9	Managing Input and Output operations	20.00
	10	Continued...	
	11	Conditional branching and Loops	
	12	Continued...	
	13	Programming examples and exercises	
	14	Finding roots of a quadratic equation	
	15	Computation of binomial coefficients	
	16	Plotting of Pascal's triangle	
3	17	<b>Arrays:</b> One dimensional arrays	20.00
	18	Two dimensional arrays	
	19	Programming examples and exercises	
	20	Character arrays and Strings	
	21	Programming examples and exercises	
	22	<b>Basic Algorithms:</b> Searching and sorting algorithms	
	23	Linear search and Binary search	
	24	Bubble sort and Selection sort	
4	25	User defined functions	20.00
	26	Programming examples and exercises	
	27	Recursion	
	28	Programming examples and exercises	
	29	Finding factorial of a positive integer	
	30	Programming examples and exercises	
	31	Finding Fibonacci series	
	32	Programming examples and exercises	





5	33	Structures	20.00
	34	Programming examples and exercises	
	35	Programming examples and exercises	
	36	Pointers	
	37	Programming examples and exercises	
	38	Programming examples and exercises	
	39	Preprocessor directives	
	40	Programming examples and exercises	

### 13.0 Assignments, Pop Quiz, Mini Project, Seminars

S. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Computer basics and C structure	Students study the Topics and write the Answers.	Module I of the syllabus	3	Individual Activity. Hand written solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: Branching & looping	Students study the Topics and write the Answers.	Module II of the syllabus	5	Individual Activity. Hand written solution expected.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment 3: Arrays & Searching/ Sorting algorithms	Students study the Topics and write the Answers.	Module III of the syllabus	8	Individual Activity. Hand written solution expected.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4: functions , structures and Pointers	Students study the Topics and write the Answers.	Module IV & V of the syllabus	11	Individual Activity. Hand written Solution expected.	Book 1, 2 of the reference list. Website of the Reference list

### 14.0 QUESTION BANK

#### Module: 1

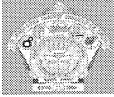
1. What is Computer? List and explain the generations of Computer.
2. List and explain the types of Computer.
3. Draw a neat block diagram of Computer and explain.
4. Differentiate between Primary memory and Secondary memory.
5. What is network? List and explain types of network.
6. What is Software? Explain the two types of software.
7. Write basic structure of C program and explain its different sections. (June/July-2018)
8. What is the purpose of a comment? How does a comment begin and end?
9. What is constant? Explain different types of constants with examples.
10. Define variables. List the rules for naming variables.
11. Why do you declare variables? Explain.
12. Differentiate between variables and constants.
13. What is data type? Explain the basic data types that are supported by C
14. Distinguish between sting constant and character constant with example.
15. What are the rules to be followed to declare an identifier with example? (June/July-2018)
16. Write a note on different types of Type conversions, with an example/program for each.(June/July-2018)



17. Define C- tokens. List and explain different C- tokens. (June/July-2018)
18. Write a C program to convert number of days into months and days. (Hint: Assume a month has 30 days) (For e.g. 45 days = 1 month and 15 days). (June/July-2018)
19. Write a note on operator precedence and Associativity. (June/July-2018)
20. Give classification of operators in C, explain with examples.
21. Explain different unary operators in C.
22. Explain the increment and decrement operators with example
23. Explain the relational operators in C with examples.
24. Explain any three bitwise operators with an example each.
25. Explain the concept of conditional operator and comma operator in C.
26. Explain the precedence and associativity of arithmetic operators with examples.
27. Define expression. Explain different types of Expressions.

#### Module -2

1. What is formatted and unformatted input/output statement? Explain formatted and unformatted input/output statement with syntax and examples.
2. What are the different character groups are used for real numbers?
3. Explain input/output functions used in C?
4. Explain printf function with an example.
5. Explain the format of scanf function with examples.
6. What are the guidelines for printf? Explain.
7. Explain the getch ( ), gets ( ) function with example.
8. Explain the putchar ( ), puts ( ) function with example.
9. Write a C program to print numbers from 4 to 9 and their squares using printf ( ) function.
10. Write a C program that takes the radius of the circle and calculates the area and perimeter of circle.
11. Write a C program that takes from the user and calculates their sum and average.
12. Write a C program that takes text from the user by using gets ( ) and print that text on the screen using puts ( ) function.
13. Write a C program to find out largest of three numbers.
14. Write a C program to find the largest of three numbers using conditional operators.
15. What is type conversion? Explain with example the types of type conversion.
17. What is branching or control statement?
18. Classify the branching or control statement. Explain with suitable examples.
19. Explain with syntax and example the switch case statement.
20. Explain the difference between if...else and switch structure with example.
21. Write a C program to find roots of quadratic equation  $ax^2+bx+c=0$ .
22. Explain the significance of a goto statement in a C program.
23. Write a C program to find largest of three numbers.
24. Write a C program to find roots of quadratic equation using switch statement.
25. Write a C program to find largest of three numbers using conditional operator.
26. Write a C program to arithmetic operations using switch case statement.
27. Write the syntax of the following a) if b) if else c) else if d) Nested if
28. Explain the use of break and continue statement with examples.
29. Write a C program to check whether the entered number is even or odd
30. What is looping? What are the different types of looping? Explain
31. Differentiate between while and do-while loop. Give example for each.
32. Write a C program to print numbers up to 10 using for loop.
33. Explain the use of break and continue statements in a loop. Give examples.
34. Explain the while structure with an example.
35. Write a C program to print numbers upto 10 using goto statement.
36. Write a C program to find the factorial of a given number using while loop.
37. Write a C program to find sum and average of 1 to n natural no's.
38. Write a C program to check whether the entered no. is prime or not.



39. Write a C program to find whether given no. is palindrome or not
40. Write a C program to print prime no.'s between 1 to n
41. Explain the nesting of loops in C with examples.
42. Write a C program to print multiplication table of 4 with n terms.
43. Write a C program that reads two floating point numbers and tests whether they are equal to two decimal places.
44. Write a C program to generate the Fibonacci sequence.
45. Write a C program to find the summation of 'n' natural numbers.
46. Given an integer number, write a C program using while loop to reverse the digits of the number.
47. Write a C program to read N numbers and print biggest and smallest numbers.
48. Write a program to input five numbers through the keyboard. Compute and display the sum of even number and product of odd number.
49. Write a C program to calculate area of circle, rectangle and triangle using switch.
50. Write a C program to compute the binomial coefficients by reading the value of n.
51. Write a C program to plot a Pascal's triangle by reading the value of n.
52. 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)

54. Write the Syntax of different looping control constructs and explains their working. (June/July-2018)
55. Distinguish between the following:
56. i) goto and if ii) break and continue (June/July-2018)
57. Write the syntax of nested if ...else statement and explain its working. (June/July-2018)
58. Write a C program to convert a decimal number to binary form. (June/July-2018)
59. Differentiate between do...while and while loop, with the help of Syntax. (June/July-2018)

### Module- 3

1. What is array? How do you classify arrays? What are the advantages of arrays?
2. What is an array? What are its advantages and disadvantages?
3. Differentiate between array and ordinary variables.
4. Explain the declaration of single and multidimensional arrays with examples.
5. Explain the initialization of single and multidimensional arrays with examples
6. What is an array? How are they declared in C? What are the rules to be followed while using arrays?
7. With an example, explain how the elements of two dimensional arrays stored in row major and column major order.
8. Define string? Explain the string handling functions in C.
9. How are strings processed in C? How are they declared and initialized? Explain with example.
10. Write a C program to calculate the length of the string without using library function.
11. Write a C program to compare two strings without using library function.
12. Explain the following string library functions  
i. strlen() ii. strcpy() iii. strcat()
13. Write a C program that accepts a string at the runtime and reverses the order of characters stored in that string.
14. Write a C program that accepts five names and then displays the entered names in alphabetical order.
15. Write a C program that accepts two strings at the runtime and appends the first 10 characters of first string at the end of second strings.
16. Write a C program that accepts a string at the runtime and checks whether string is palindrome or not.



17. Given a string. Write a C program to count the number of A's in that string. Do not use any built in function.
18. Write a C program to count the number of space in a given string.
19. Write a C program to find the largest element of an array of a given size.
20. Write a C program to find the first occurrence of a given number in an array of given size.
21. Write a C program to find the average of best of three marks from the given four test marks.
22. Write a C program to find the number of positive, negative and zero elements in a given list of integers.
23. Write a C program to find largest of N no.'s using arrays.
24. Write a C program to search the given element in a list using linear search technique.
25. Write a C program to search the given element in a list using binary search technique.
26. Write a C program to sort N elements in ascending/descending order using bubble sort technique.
27. Write a C program to sort N elements in ascending or descending order using selection sort technique.
28. Write a C program to find sum and average of N integer numbers using arrays.
29. Write a C program to find addition of two matrices.
30. Write a C program to find product of two matrices.
31. Write a C program to find largest number in a matrix.
32. Write a C program to read matrix A (P X Q) and find sum of elements in p rows and sum of elements in q columns.
33. 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.
34. Write a C program to search a given number in the list using Linear search.
35. 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)**
36. Write a C program to sort the given numbers in ascending and descending order using Bubble sort.
37. Write a C program to sort the given numbers in ascending and descending order using Selection sort.
38. Distinguish between following types of variables:  
i) Automatic ii) Global iii) Static iv) Register **(June/July-2018)**
- 39 Explain the importance of strcmp( ) and strcat( ) string manipulation functions. **(June/July-2018)**
40. Write a C program to find length of a string without using strlen() function. **(June/July-2018)**
41. Write the Syntax and give example for each: **(June/July-2018)**
  - i) Declaration of One-dimensional array
  - ii) Initialization of One-dimensional array
  - iii) Declaration of Two-dimensional array
  - iv) Initialization of Two-dimensional array

#### Module- 4

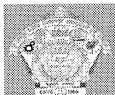
1. What is function? What are the needs of function? What are its advantages?
2. Explain the function declaration with a suitable example.
3. Explain the different types of functions with examples.
4. What are the elements of functions? Explain.
5. Explain the categories of functions with examples.
6. What is user defined function? What is the need of user-defined function? What is the need of user defined? Why user defined functions are required for large and complex problems?
7. What are the different ways of passing parameters to functions? Explain.
8. Explain the difference between "call by value" and "call by reference" with suitable examples.
9. Differentiate between standard and user defined functions.
10. How does function definition differ from function declaration?
11. Distinguish between actual parameter and formal parameter.
12. Distinguish between local and global variables.
13. Write a program to find the sum of odd numbers up to 50 using function.
14. Write a C functions to find sum of individual digits of given a number.
15. What is recursive function? Write a C program to accept two positive integers and compute their GCD using a recursive function.
16. Write a C program to print numbers from 1 to n, which are divisible by 6, using a function.



17. 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 primeness.
18. Write a C program to find standard deviation of n values using functions.
19. Write a C program that uses a function to sort an array of integers.
20. Write a C function to find maximum and minimum elements of one dimensional array.
21. Write a C function to find the product of two matrices.
22. Write a C function to length of string and check whether the entered string is palindrome or not.
23. Write a C function to find sum of specified row, sum of specified column and sum of all the elements of a matrix.
24. Write a C function to search the given element in a list using linear search technique.
25. Write a C function to find sum of specified row, sum of specified column and sum of all the elements of a matrix.
26. Write a C program to find n<sup>th</sup> Fibonacci number in the series using recursion. **(June/July-2018)**
27. Write a C program to find the factorial of a positive integer.


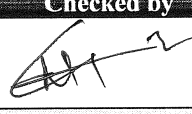
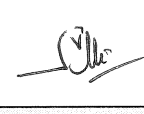
#### Module- 5

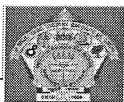
1. What are the structures in C? What is the need of structures?
2. Give syntax to define the structure. Explain with examples.
3. Explain declaring structure variables and initializing structure variables.
4. Explain nested structures with examples.
5. Write a note on the following with as example for each: **(June/July-2018)**
  - i) Array of structures ii) Array within structures iii) Structures within structures
6. Explain array of structures with example.
8. Create a structure st\_record having members 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)**
9. Write a program to find the net salary of an employee if gross salary and deduction are known.
10. Mention syntax and give an example for the following:
11. i) Structure definition ii) Structure variable declaration **(June/July-2018)**
12. 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.
13. Write a program that takes coordinates of the center point and a point on a circle as input and prints the radius and area of circle.
14. 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.
16. Write a short on pointers in C.
17. What is pointer? Explain how to declare a variable as a pointer.
18. Write a C program to demonstrate the usage of pointers.
19. What are the similarities and differences between pointer to an int and pointer to a float?
20. Write a program to display the value of variable and its location using pointer.
21. Write a program to read two integers M and N and swap the content of two variables M and N using pointers.
22. Write a function using pointers to determine the length of a character string.
23. Write a program using pointers in C to print a string in reverse order.
24. Explain file include directives with example.
25. Explain defining macro with example.
26. Explain defining macro with arguments with examples.
27. Explain the using of compiler control directives with examples.
28. Write a C program demonstrating the use of the #if, #else, and #endif preprocessor directives.
29. Write a program demonstrating the use of the #undef preprocessor directives.



### 15.0 University Result

Examination	S	A	B	C	D	E	F	% Passing
JAN-2020								
JUNE-2019	00	00	06	09	44	05	11	85.25

Prepared by	Checked by		
 Prof. S. G. Gollagi Prof. S. V. Manjaragi	 Prof. M. G. Huddar	 HOD	 Principal



Subject Title	BASIC ELECTRONICS		
Subject Code	18ELN14/24	IA Marks	40
Number of Lecture Hrs /	03(02+01 Tutorial)	Exam Marks	60
Total Number of Lecture	40	Exam Hours	03
<b>CREDITS – 03</b>			

FACULTY DETAILS:		
<b>Name:</b> Dr. Ravi M Yadahalli Dr. Shilpa Shrigiri	<b>Designation:</b> Prof. Assoc. Prof.	<b>Experience:</b> 23 Yrs 16 Yrs
<b>No. of times course taught:</b> 12 & 10	<b>Specialization:</b> Microwave Antennas VLSI Design	

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	PUC	I/II	Physics, Chemistry

### 2.0 Course Objectives

The course objective is to make students of all the branches of engineering to understand the fundamentals of electronic principles 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 working of diodes and their applications in rectifiers & regulators.	U	1,2,3,4,6,12
CO2	Explain the working and applications of the devices like SCR, UJT & JFET's.	U D	1,2,3,4,6,12
CO3	Understand the op-amp circuit and its applications.	U	1,2,3,4,6,12
CO4	Understand the BJT applications and concept of feedback amplifier & oscillators.	U	1,2,3,4,6,12
CO5	Describe the digital number system and basic principle of communication system.	U	1,2,3,4,6,12
<b>Total Hours of instruction</b>			<b>40</b>

### 4.0 Course Content

Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
<b>Module 1: Semiconductor Diodes and Applications</b>	<b>08</b>	<b>L1, L2,L3</b>
PN junction diode, Equivalent circuit of diode, Zener Diode as a voltage regulator, Rectification-Half wave rectifier, Full wave rectifier, Bridge rectifier, Capacitor filter circuit. 2.2, 2.3, 2.4 of Text 1. Photo diode, LED, Photo coupler. Refer (2.7.4, 2.7.5, 2.7.6 of Text 1.) 78XX series and 7805 fixed voltage regulator(8.4.4 and 8.4.5 of Text 1)		

<b>Module -2: FET and SCR</b>	<b>08</b>	<b>L1, L2,L3</b>
Introduction, JFET: Construction and operation, JFET Drain Characteristics and Parameters. JFET Transfer Characteristics, Square law expression for $I_D$ , Input resistance, MOSFET: Depletion and Enhancement type MOSFET-Construction, Operation, Characteristics and Symbols,(refer 7.1,7.2,7.4,7.5 of Text 2), CMOS(4.5 of Text 1) Silicon Controlled Rectifier (SCR)-Two transistor model, switching action Characteristics, Phase control application, (Refer 3.4 up to 3.4.5 of Text 1.)		
<b>Module-3: Operational Amplifiers and Applications</b>	<b>08</b>	<b>L1,L3</b>
Introduction to OP-AMP,OP-AMP Input modes, Op-Amp Parameters- CMRR. Input Offset Voltage and Current, Input Bias Current, Input and Output Impedance, Slew Rate,(12.1,12.2 of Text 2) Applications of OP-AMP-Inverting amplifier, Non Inverting amplifier, Summer, Voltage follower, Integrator, Differentiator, Comparator (6.2 of Text1)		
<b>Module-4: BJT Applications, Feedback Amplifier and Oscillators</b>	<b>08</b>	<b>L1, L2,L3</b>
BJT as an amplifier, BJT as a switch, Transistor switch circuit to switch ON/OFF an LED and a lamp in a power circuit using relay(refer 4.4 and 4.5 of Text 2) Feedback Amplifier- Principle, Properties and advantages of Negative Feedback, Types of feedback, Voltage series feedback, Gain stability with feedback, (7.1-7.3 of Text 1). Oscillators-Barkhausen's criteria for oscillator, RC Phase Shift oscillator, Wein Bridge Oscillator using IC555(17.2 and 17.3 of Text1)		
<b>Module-5: Digital Electronics Fundamentals</b>	<b>08</b>	<b>L1, L2</b>
Difference between analog and digital signals, Number system-Binary, Hexadecimal, conversion-Decimal to Binary, Hexadecimal to decimal and vice-versa. Boolean algebra, Basic and Universal Gates, Full adder, Multiplexer, Decoder, SR and JK flip-flops. Shift registers, 3 bit ripple Counters. (Refer 10.1-10.7 of text 1). Basic Communication systems, Principal of operation of Mobile phone-(Refer 18.2and 18.18 of Text1).		

## 5.0 Gap Analysis and Mitigation

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

## 6.0 Books Used and Recommended to Students

Text Books
1. D.P Kothari, I. J. Nagarath, "Basic Electronics", 2 <sup>nd</sup> edn, Mc Graw Hill 2018.
2. Thomas Floyd, Electronic Devices, 'Pearson Education' 9 <sup>th</sup> edition 2012.
Reference Books
1. D.P.Kothari, I.J.Nagarath, "Basic Electronics", 1st edn, McGraw Hill, 2014.
2. Boylestad, Nashelskey, "Electronic Devices and Circuit Theory", Pearson Education, 9 <sup>th</sup> Edition, 2007/11 <sup>th</sup> edition, 2013.
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
4. Muhammad H. Rashid, "Electronics Devices and Circuits", Cengage Learning, 2014.



## 7.0

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

### Website and Internet Contents References

- 1) [www.electronics-tutorials.ws](http://www.electronics-tutorials.ws)
- 2) VTU e-learning notes
- 3) [engineering.nyu.edu/gk12/amps-cbri/pdf/Basic%20Electronics.pdf](http://engineering.nyu.edu/gk12/amps-cbri/pdf/Basic%20Electronics.pdf)
- 4) [nptel.ac.in/courses/117103063](http://nptel.ac.in/courses/117103063)

## 8.0

## Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Electronics for You	<a href="http://www.efymag.com/magazine">www.efymag.com/magazine</a>

## 9.0

## Examination Note

### Internal Assessment: 40 Marks

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

### Scheme of Evaluation for Internal Assessment (30 Marks)

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

### SCHEME OF EXAMINATION:

#### Question paper pattern:

The question paper will have **ten** full questions carrying equal marks.

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

## 10.0

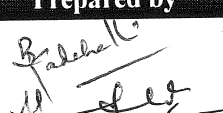

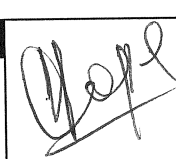

## Course Delivery Plan


Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	<b>Semiconductor Diode &amp; Applications:</b> PN junction diode, Characteristics & Parameters, Equivalent Circuit of diode.	20
	2	Zener diode and Zener diode as voltage regulators	
	3	Half-wave rectifier, Two-diode Full-wave rectifier.	
	4	Bridge Rectifier, Rectifiers with capacitor filter circuit.	
	5	Photo diodes, LED's	
	6	Photo couplers.	
	7	78XX based fixed IC regulator circuits	
	8	Numerical Problems.	
	9	<b>FET and SCR:</b> Introduction	
	10	JFET-Construction and Operation	
	11	Drain Characteristics and parameters	
	12	Square law expression for $I_D$	

2	13	MOSFET-Construction and working	20
	14	SCR-Two transistor model	
	15	Switching and Characteristics	
	16	Phase control applications.	
3	17	<b>Operational Amplifier and Applications:</b> Introduction and input mode.	20
	18	OP-AMP parameters-CMRR, Input offset voltage and current	
	19	Input Bias current and output impedance, Slew rate	
	20	Application of OP-AMP-Inverting and Non-Inverting amplifiers	
	21	Summer and Voltage Follower	
	22	Integrator	
	27	Differentiator	
	23	Comparators	
4	25	<b>BJT Applications, Feedback amplifier and Oscillator:</b> BJT as an amplifier	20
	26	BJT as a switch to switch ON/OFF an LED.	
	27	Feedback principles, properties, advantages of Negative feedback.	
	28	Types of Feedback, Voltage series feedback.	
	29	Gain and Stability with feedback	
	30	Barkhausen's criteria for oscillation, RC phase shift and Wein Bridge oscillator	
	31	IC 555 Timer	
	32	Astable Oscillator mode using Timer.	
5	33	<b>Digital Electronics Fundamentals:</b> Number systems-Binary, Octal, Hexadecimal.	20
	34	Conversion from one system to another	
	35	Adders-Half and Full adders	
	36	Multiplexers and Decoders	
	37	Flip-Flop's-SR and JK	
	38	Shift registers and 3 bit ripple counters	
	39	Basic communication system	
	40	Principles of Mobile phones	

## 11.0 University Result

Examination	S	A	B	C	D	E	F	% Passing

Prepared by	Checked by		
			
Dr. Ravi M Yadahalli Dr. Shilpa Shrigiri	Prof. S B Akkole	First Year Coordinator	Dr. S C Kamate Principal

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			Academics
			Course Plan
			2019-20 (Odd)

<b>Subject Title</b>	<b>ELEMENTS OF MECHANICAL ENGINEERING</b>		
<b>Subject Code</b>	18ME25	<b>IA Marks(30)+Assignments(10)</b>	40
<b>Number of Lecture Hrs/Week</b>	2L+2T =4	<b>Exam Marks (appearing for)</b>	100 conversion to 60 for grade
<b>Total Number of Lecture Hrs</b>	50	<b>Exam Hours</b>	03
<b>CREDITS – 04</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b>	<b>Designation:</b>	<b>Experience:</b>
1) Dr.S.N.Topannavar (B div.)	1) Assoc. Professor	1) 21 years
2) Prof.Jagadeesh Alkur (A div.)	2) Asst. Professor	2) 7 years
<b>No. of times course taught:</b> 1) 06 2) 04	<b>Specialization:</b>	
	1) Thermal Power Engineering	
	2) Thermal Power Engineering	

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Not Applicable	11 <sup>th</sup> & 12 <sup>th</sup> level	Up to 12 <sup>th</sup> level Mathematics, Physics and Chemistry

### 2.0 Course Objectives

Students able to:

1. Learn the fundamental concepts of energy, its sources and conversions
2. Comprehend the basic concepts of thermodynamics
3. Understand the concepts of boilers, turbines, pumps, internal combustion engines and refrigeration
4. Distinguish different metal joining techniques
5. Enumerate the knowledge of working with conventional machine tools and their specifications

### 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	RBTL	POs
C105.1	Interpret the concepts of energy, its sources and conversions and comprehend the basic concepts of thermodynamics & its properties during the steam formation	L1 & L2	PO1, PO2, PO6, PO7
C105.2	Understand and differentiate the working principle of boilers, turbines and pumps	L1	PO1
C105.3	Differentiate the working principle of internal combustion engines and refrigeration systems and analysis of primary variables in respective machines	L1 & L2	PO1, PO2
C105.4	Understand the compositions, properties & applications of common engineering materials, metal joining processes and power transmission systems	L1 & L2	PO1
C105.5	Understand the conventional metal removing principles, processes and advanced manufacturing systems and their machines	L1	PO1, PO5, PO12
<b>Total Hours of instruction</b>			<b>50</b>

### 4.0 Course Content

#### Module - 1

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

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

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		<b>Academics</b>
		<b>Course Plan</b>
		<b>2019-20 (Odd)</b>

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

**8 Hour**

**Module- 2**

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

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

**8 Hours**

**Module- 3**

**Internal Combustion Engines**

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

**Refrigeration and Air conditioning Refrigeration –**

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

**8 Hours**

**Module- 4**

**Properties, Composition and Industrial Applications of engineering materials Metals –**

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

**Joining Processes: Soldering, Brazing and Welding**

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

**Belt drives**

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

**Gear drives**

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

**8 Hours**

**Module- 5**

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

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

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

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


**8 Hours**

**5.0 Relevance to future Subjects/Lab/Project**

Sl. No	Semester	Subject/Lab/Project	Topics
01	VII/VIII	Interdisciplinary mechanical engineering and science concepts to design/ construct models, prototypes and projects	All modules
02	III/IV to V/VI	Interdisciplinary mechanical engineering and science gaps to understand higher semester subjects/labs	All modules

**6.0 Relevance to Real World**

SL.No	Real World Mapping
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01	Importance of renewable energy and their conversions in the context of environmental pollution and country's economy
02	Advanced manufacturing systems in the competitive world
03	Role of elements of mechanical engineering in the interdisciplinary systems

## 7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Concept realization through NPTEL materials	Videos on Renewable energy conversion systems, operation of IC engines, working of Turbines, Refrigeration systems
02	Concept realization through lab visits	Operation of IC engines, working of Turbines, Power transmission systems, Metal removal processes & machines and Refrigeration systems
03	Concept realization through models & charts	Steam Formation, Engineering materials and metal joining processes

## 8.0 Books Used and Recommended to Students


Text Books	
1.	Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
2.	Elements of Mechanical Engineering, Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.
3.	A Text Book of Elements of Mechanical Engineering", S. Trymbaka Murthy, 3rd revised edition 2006, I. K. International Publishing House Pvt. Ltd., New Delhi.
Reference Books	
1.	Elements of Mechanical Engineering, R.K. Rajput, Firewall Media, 2005.
2.	Elements of Mechanical Engineering, Dr. A. S. Ravindra, Best Publications, 7th edition, 2009.
3.	CAD/CAM/CIM, Dr. P Radhakrishnan, 3rd edition, New Age International Publishers, New Delhi.
4.	Introduction to Robotics: Mechanics And Control, Craig, J. J., 2nd Ed. Addison-Wesley Publishing Company, Readong, MA, 1989.
5.	Introduction to Engineering Materials", B.K. Agrawal, Tata McGraHill Publication, New Delhi
6.	Thermal Science and Engineering", Dr. D.S. Kumar, S.K. Kataria & sons Publication, New Delhi
Additional Study material & e-Books	
Prototype Models and charts	
Lab visits	
NPTEL materials	
Industry visits	

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

Website and Internet Contents References	
1)	<a href="https://vimeo.com">https://vimeo.com</a> › Boilermaker Videos › Videos, <a href="https://www.youtube.com/watch?v=zqXgmVnI3L8&amp;list=PLE2DA184A2E479885">https://www.youtube.com/watch?v=zqXgmVnI3L8&amp;list=PLE2DA184A2E479885</a>
2)	<a href="https://www.youtube.com/watch?v=zwiFp3uQb5g">https://www.youtube.com/watch?v=zwiFp3uQb5g</a> , <a href="http://www.triveniturbines.com/downloads-video-gallery.html">www.triveniturbines.com/downloads-video-gallery.html</a> , <a href="https://www.youtube.com/watch?v=-4XNXDheMAo">https://www.youtube.com/watch?v=-4XNXDheMAo</a> , <a href="https://www.youtube.com/watch?v=sq6QjaNXoDE">https://www.youtube.com/watch?v=sq6QjaNXoDE</a> , <a href="https://www.youtube.com/watch?v=x5OD2KZXd54">https://www.youtube.com/watch?v=x5OD2KZXd54</a> , <a href="https://www.youtube.com/watch?v=NIXsBcADDEk">https://www.youtube.com/watch?v=NIXsBcADDEk</a>
3)	<a href="http://www.uobabylon.edu.iq/uobColeges/ad_downloads/4_26634_460.pdf">http://www.uobabylon.edu.iq/uobColeges/ad_downloads/4_26634_460.pdf</a>
4)	<a href="https://en.wikipedia.org/wiki/Robotics">https://en.wikipedia.org/wiki/Robotics</a> , <a href="https://www.youtube.com/watch?v=pLC4ISCBouM">https://www.youtube.com/watch?v=pLC4ISCBouM</a> , <a href="https://www.youtube.com/watch?v=br-ezdmEq7A">https://www.youtube.com/watch?v=br-ezdmEq7A</a>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	Elsevier	<a href="https://www.journals.elsevier.com">https://www.journals.elsevier.com</a>
2	Journal of Composite Materials	<a href="http://journals.sagepub.com">http://journals.sagepub.com</a>

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3	Journal of Manufacturing Science and Engineering	<a href="http://manufacturingscience.asmedigitalcollection.asme.org">http://manufacturingscience.asmedigitalcollection.asme.org</a>
4	International Journal of Renewable Energy Research (IJRER)	<a href="http://www.ijrer.org">http://www.ijrer.org</a>

## 11.0 Examination Note

### Internal Assessment (30 Marks)

Questions shall be answered in Internal Assessment books (blue book). Internal assessment book shall be submitted.

### Scheme of Evaluation for Internal Assessment (30 Marks)

Internal Assessment test in the same pattern as that of the main examination (Better of the three Tests): 30 marks.

### Assignments (10 Marks)

Assignments for each module are to be submitted and evaluated for 10 marks for each. Average of five modules is to be considered.

**SCHEME OF EXAMINATION:** Two full questions (with a maximum of four sub questions) of twenty mark each to be set from each module. Each question should cover all the contents of the respective module. Students have to answer five full questions choosing one full question from each module. From each module out of two full questions one full question to be answered and each carries 20 Marks. Five full question to be answered  $5 \times 20 = 100$  Marks. Later after evaluation total marks are reduced to 60 marks.

## 12.0 Course Delivery Plan


Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Introduction and application of energy sources like fossil fuels,	20%
	2	Hydel, solar, wind,	
	3	Nuclear fuels and bio-fuels	
	4	Environmental issues like global warming and ozone depletion	
	5	Basic concepts of Thermodynamics	
	6	States, concept of work, heat, temperature; Zeroth,	
	7	1st, 2nd and 3rd laws of thermodynamics. Concept of internal energy, enthalpy and entropy (simple numerical).	
	8	Formation of steam and thermodynamic properties of steam (simple numericals).	
2	9	Introduction to boilers, classification,	40%
	10	Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories (no sketches).	
	11	Hydraulic Turbines – Classification and specification	
	12	Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine (elementary treatment only).	
	13	Hydraulic Pumps: Introduction, classification and specification of pumps	
	14	Reciprocating pump	
	15	Centrifugal pump,	
	16	Concept of cavitations and priming	
3	17	Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines	60%
	18	P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency,	
	19	Brake thermal efficiency, mechanical efficiency and specific fuel consumption.	
	20	Refrigeration - Definitions - Refrigerating effect,	
	21	Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration	
	22	Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Principle and working of vapor compression refrigeration	
	23	Vapor absorption refrigeration. Domestic refrigerator.	
	24	Principles and applications of air conditioners, window and split air conditioners.	
4	25	Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics - Glass	80%



	26	Optical fiber glass, cermets. Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials –	
	27	Piezoelectric materials, shape memory alloys, semiconductors and insulators.	
	28	Definitions. Classification and methods of soldering, brazing and welding.	
	29	Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.	
	30	Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive,	
	31	ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts,	
	32	Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio	
5	33	Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe	100%
	34	Principle of milling, types of milling machines.	
	35	Working of horizontal and vertical milling machines.,	
	36	Milling processes - plane milling, end milling, slot milling, angular milling, form milling straddle milling, and gang milling.	
	37	Computer Numerical Control (CNC): Introduction, components of CNC	
	38	open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning center	
	39	Robot anatomy, joints and links, common robot configuration	
	40	Applications of Robots in material handling, processing and assembly and inspection	

### 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	Interpret the concepts of energy, its sources and conversions and comprehend the basic concepts of thermodynamics & its properties during the steam formation	--	2	--	Text books & Reference books
2	Assignment-2	Understand and differentiate the working principle of boilers, turbines and pumps	--	4	--	Text books & Reference books
3	Assignment-3	Differentiate the working principle of internal combustion engines and refrigeration systems and analysis of primary variables in respective machines	--	6	--	Text books & Reference books
4	Assignment-4	Understand the compositions, properties & applications of common engineering materials, metal joining processes and power transmission systems	--	8	--	Text books & Reference books
5	Assignment-5	Understand the conventional metal removing principles,	--	10	--	Text books & Reference books


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	26	Optical fiber glass, cermets. Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials –	
	27	Piezoelectric materials, shape memory alloys, semiconductors and insulators.	
	28	Definitions. Classification and methods of soldering, brazing and welding.	
	29	Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.	
	30	Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive,	
	31	ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts,	
	32	Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio	
5	33	Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe	100%
	34	Principle of milling, types of milling machines.	
	35	Working of horizontal and vertical milling machines.,	
	36	Milling processes - plane milling, end milling, slot milling, angular milling, form milling straddle milling, and gang milling.	
	37	Computer Numerical Control (CNC): Introduction, components of CNC	
	38	open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning center	
	39	Robot anatomy, joints and links, common robot configuration	
	40	Applications of Robots in material handling, processing and assembly and inspection	

### 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	Interpret the concepts of energy, its sources and conversions and comprehend the basic concepts of thermodynamics & its properties during the steam formation	--	2	--	Text books & Reference books
2	Assignment-2	Understand and differentiate the working principle of boilers, turbines and pumps	--	4	--	Text books & Reference books
3	Assignment-3	Differentiate the working principle of internal combustion engines and refrigeration systems and analysis of primary variables in respective machines	--	6	--	Text books & Reference books
4	Assignment-4	Understand the compositions, properties & applications of common engineering materials, metal joining processes and power transmission systems	--	8	--	Text books & Reference books
5	Assignment-5	Understand the conventional metal removing principles,	--	10	--	Text books & Reference books



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		processes and advanced manufacturing systems and their machines				
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## 15.0

## QUESTION BANK

### Module 1:


1. What are conventional and non-conventional energy sources? Name them. Also list the differences between conventional & non-conventional energy sources.
2. What is a calorific value of a fuel?
3. Discuss calorific value of solid liquid and gaseous fuels.
4. Define solar constant.
5. Explain clearly solar thermal energy harvesting.
6. write a short note of the following
  - a) Principles of electric power generation from hydro power plants.
  - b) Principle of operation of a typical windmill.
7. Explain zeroth law of thermodynamics.
8. Define entropy, enthalpy and heat.
9. With suitable sketches explain the formation of steam at constant pressure.
10. Define the following terms with reference to steam:
  - a) Sensible heat b) Latent heat c) Wet steam d) Dry saturated steam
  - e) Superheated steam f) Dryness fraction g) Degree of superheat.
11. Define the following properties of steam and also write their expressions for wet steam; dry saturated steam & superheated steam
12. Specific volume, i) Enthalpy, ii) Internal energy, iii) External work of evaporation, iv) Saturation temperature.

### Module 2:

1. List the benefits of super heated steam.
2. Give the detailed classification of boilers.
3. Sketch and explain working principle of Babcock and Will Coxs boiler.
4. How Steam Turbines are classified? Explain working of Impulse and Reaction, Steam Turbines.
5. Explain working of Open and Closed Gas Turbines.
6. Explain the working of Pelton wheel with neat sketches.
7. Explain the working of Francis & Kaplan turbines with neat sketches.

### Module 3:

1. What is an internal combustion engine? Classify I.C. Engines With reference to an IC Engine define the following terms with a neat sketch. a) Bore b) Stroke c) Top or Inner dead center d) Bottom or Outer dead center e) Clearance volume f) Swept volume g) Compression ratio.
2. With a neat sketch of an IC Engine list its major components and state their function.
3. With a pressure-volume diagram explain the operation of an Otto cycle.
4. With a pressure-volume diagram explain the operation of a Diesel cycle.
5. Explain the working of a four-stroke cycle petrol engine, with a neat sketch.
6. Explain the working of a four-stroke cycle Diesel engine, with a neat sketch.
7. Explain the working of a two-stroke cycle Diesel engine, with a neat sketch.
8. Distinguish between two-stroke and four-stroke cycle Engines.
9. What is refrigeration? Explain. Name different types of refrigeration system.
10. Discuss the concepts (principles) involved in working of a refrigeration system.
11. Define coefficient of performance of a refrigerator.
12. Explain the unit of refrigeration.
13. With neat sketches explain the working of vapor compression refrigeration cycle. Indicate the states of the refrigerant and its direction of flow.
14. With neat sketches explain the working of vapor absorption refrigeration cycle.
15. Discuss differences between vapor compression & vapor absorption refrigeration system.
16. What is a refrigerant? Name different refrigerants commonly used.
17. Discuss desirable properties of an ideal refrigerant.
18. What do you mean by air conditioning? Name different methods of air conditioning.
19. With a neat sketch explain summer air conditioning system for hot and wet weather.
20. With a neat sketch explain summer air conditioning system for cold and dry weather.
21. Define the followings i) Refrigerating effect, ii) Ton of Refrigeration, iii) Ice making capacity, iv) COP, v) Relative COP, vi) Refrigeration, vii) Refrigerator, viii) refrigerant.

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#### Module 4:



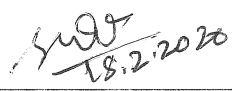

1. Define ferrous and non ferrous materials.
2. Explain thermosetting and thermo plastics.
3. Define composites.
4. Define MMC, FRP and piezo electric materials.
5. Classify ferrous and non ferrous metals. Give their applications.
6. What are composites? Give Examples with applications.
7. Discuss in brief the methods of joining of two metal pieces and explain its significance in fabrication.
8. What is flux with reference to metal joining process? Explain its significance.
9. Explain briefly the method of brazing. Discuss various types of solders and fluxes used.
10. Explain briefly the method of brazing. Discuss various types of filler materials and fluxes use.
11. Explain in brief principle of electric arc welding method with a simple sketch.
12. Name different types of fluxes used in electric arc welding.
13. With a simple sketch explain the construction of arc welding electrode.
14. Explain in brief principle of oxy-acetylene gas welding method with a simple sketch.
15. With sketches explain the features of: Neutral flame, Oxidizing flame & reducing flames.
16. Define open and closed belt drives.
17. Derive expression for length of open belt drives.
18. Mention advantages and disadvantages of belt drives.
19. Classify the types of gears.
20. Explain spur gear arrangement.

#### Module 5:

1. Explain the following machine tool operations with neat sketch
2. Turning, facing, knurling, Thread cutting, Taper Turning by swiveling the compound rest, Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter Boring, -Plane milling, End milling,
3. Give the classification of robots based on their configuration.
4. Discuss the advantages and disadvantages of polar and cylindrical robots with their applications
5. What is automation?
6. Explain programmable automation.
7. Explain CNC machine with block diagram.
8. Define lathe.
9. Explain robot configurations.
10. Explain anatomy of robots.
11. Explain different links of robot.
12. Applications of robots.

## 16.0 University Result

VTU Examination	S <sup>+</sup>	S	A	B	C	D	E	F	% Passing
Dec18-Jan19 (Odd sem)	0	5	12	19	29	00	7	5	98.96
June-July19 (Even sem)	0	7	21	27	18	00	0	2	97.72

<b>Prepared by</b>  <b>Dr. S.N. Topannavar</b>	<b>Checked by</b>  <b>Prof. Jagadeesh Alkur</b>	 <b>HOD</b>	 <b>Principal</b>
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<b>Subject Title</b>	<b>Engineering Chemistry Lab</b>		
<b>Subject Code</b>	18CHEL26	<b>IA Marks</b>	40
<b>Number of Lecture Hrs / Week</b>	02	<b>Exam Marks</b>	60
<b>Total Number of Lecture Hrs</b>	42	<b>Exam Hours</b>	03
<b>CREDITS – 01</b>			

**FACULTY DETAILS:**

<b>Name:</b> 1) Dr. M. S. Hanagadakar 2) Mr. S. J. Walki	<b>Designation:</b> 1) Associate Prof. 2) Assist. Prof	<b>Experience:</b> 1) 15.5 Years 2) 6.0 Years
<b>No. of times course taught:</b> 1) 23 (including Present) 2) 08 (including Present)	<b>Specialization:</b> 1) Physical Chemistry 2) Organic Chemistry	

**1.0 Prerequisite Subjects:**

They should have the knowledge of basic science and chemistry.

Sl. No	Branch	Semester	Subject
01	Common to all branch	II	Engineering Chemistry Lab

**2.0 Course Objectives**

To provide students with practical knowledge of

- Quantitative analysis of materials by classical methods of analysis.
- Instrumental methods for developing experimental skills in building technical competence.

**3.0 Course Outcomes**

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

	Course Outcome	POs
CO1	Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.	1,2,3,6,9,10 & 12
CO2	Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.	1,2,3,6,9,10 & 12
<b>Total Hours of instruction</b>		3(2 hrs lab+ 1hr Tutorial)

**4.0 Course Content****Instrumental Experiments**

1. Potentiometric estimation of FAS using standard  $K_2Cr_2O_7$  solution.
2. Conductometric estimation of acid mixture.
3. Determination of Viscosity co-efficient of the given liquid using Ostwald's viscometer.
4. Colorimetric estimation of Copper.
5. Determination of pKa of the given weak acid using pH meter.
6. Flame photometric estimation of sodium and potassium.

**Volumetric Experiments**

1. Estimation of Total hardness of water by EDTA complexometric method.
2. Estimation of CaO in cement solution by rapid EDTA method.

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3. Determination of percentage of Copper in brass using standard sodium thiosulphate solution.
4. Determination of COD of waste water.
5. Estimation of Iron in haematite ore solution using standard  $K_2Cr_2O_7$  solution by external indicator method.
6. Estimation of percentage of available chlorine in the given sample of bleaching powder (Iodometric method)

### 5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	I/II	Chemical analysis, EE, ECE, ME, CS	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	Industrial Chemical analysis
02	Development of analytical knowledge
03	Developing experimental skills in building technical competence

### 7.0 Gap Analysis and Mitigation

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

### 8.0 Books Used and Recommended to Students

#### Reference Books

1. G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denney, "Vogel's Text Book of Quantitative Chemical Analysis"
2. O.P.Vermani&Narula, "Theory and Practice in Applied Chemistry", New Age International Publisers.
3. Gary D. Christian, "Analytical chemistry", 6th Edition, Wiley India.

#### Additional Study material & e-Books

1. Engineering chemistry lab manual by sudha rani
2. Applied Chemistry: Theory and Practice by O.P. Vermani and A.K. Narula.
3. Laboratory Manual on Engg. Chemistry by S.K. Bhasin and Sudha Rani.

### 9.0

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

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### Website and Internet Contents References

- 1) <http://www.iannauniversity.com/2012/06/engineering-chemistry-lab-manual-i-ii.html>
- 2) [http://www.bvrit.ac.in/Freshman\\_Lab\\_Manuals/freshman\\_engineering\\_chemistry/Engineering%20Chemistry.pdf](http://www.bvrit.ac.in/Freshman_Lab_Manuals/freshman_engineering_chemistry/Engineering%20Chemistry.pdf)
- 3) <http://www.gitam.edu/eresource/images/Engineering-Chemistrylab-Manual-GU.pdf>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Analytical Chemistry	<a href="http://pubs.acs.org/journal/ancham">http://pubs.acs.org/journal/ancham</a>
2	Journal of Analytical Chemistry	<a href="http://www.springer.com/chemistry/analytical+chemistry/journal/10809">http://www.springer.com/chemistry/analytical+chemistry/journal/10809</a>
3	International Journal of Chemical and Analytical science	<a href="http://www.sciencedirect.com/science/journal/09761209">http://www.sciencedirect.com/science/journal/09761209</a>
4	Water Research	<a href="https://www.journals.elsevier.com/water-research/">https://www.journals.elsevier.com/water-research/</a>

## 11.0 Examination Note

### Internal Assessment: 40 Marks

Internal Assessment is done by continuous evaluation for each experiment will be given 10 marks and the average of all experiments for 10marks.

1. Lab performance is evaluated by continuous assessment of each Experiment: 30Marks.
2. Student has to write the procedures of one volumetric and one instrumental experiment. Performing volumetric/ instrumental experiment: 10marks.

### Scheme of Evaluation for Internal Assessment (40 Marks)

3. Lab performance is evaluated by continuous assessment of each Experiment: 30Marks.(Average of all the experiments)
4. Write up the procedures (Two experiments)-03 Marks, Conduction of experiment (Volumetric/ Instrumental)-03 Marks, Outcome and conclusion- 02 Marks and Viva-voce-02 Marks: Total 10marks.

### SCHEME OF EXAMINATION:

Description	Marks for first Experiment	Marks for Second Experiment
Procedure write up	08	07
Conduction	26	26
Graph works, Calculation, and Results	09	09
Viva	07	08

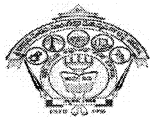
Total 50+50=80

### INSTRUCTION FOR ENGINEERING CHEMISTRY (18CHEL16) EXAMINATION

1. Use black ink pen for writing the examination and diagram should be drawn from dark pencil.
2. In the first ten minutes, student should write the outline of the procedure of both the experiment in main answer sheet. And perform both part A and part B on supplement.
3. Students allowed take maximum three titrations readings.
4. **Overwritten values** are not considered for evaluation.
5. Students should take initials of examiner for first reading compulsorily.

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### 12.0 Course Delivery Plan

Week	Expt. No.	Name of the Experiment	% of Portion
1	1	Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.	8.3
2	2	Conductometric estimation of acid mixture.	8.3
3	3	Determination of Viscosity co-efficient of the given liquid using Ostwald's viscometer.	8.3
4	4	Colorimetric estimation of Copper.	8.3
5	5	Determination of pKa of the given weak acid using pH meter.	8.3
6	6	Flame photometric estimation of sodium and potassium.	8.3
7	7	Estimation of Total hardness of water by EDTA complexometric method.	8.3
8	8	Estimation of CaO in cement solution by rapid EDTA method.	8.3
9	9	Determination of percentage of Copper in brass using standard sodium thiosulphate solution.	8.3
10	10	Determination of COD of waste water.	8.3
11	11	Estimation of Iron in haematite ore solution using standard $K_2Cr_2O_7$ solution by external indicator method.	8.3
12	12	Estimation of percentage of available chlorine in the given sample of bleaching powder (Iodometric method)	8.3

### 15.0 QUESTION BANK

#### Experiment- I

1. What is the formula of FAS? What is oxidation state of Fe in FAS?
2. What is meant by redox titration?
3. What is an oxidizing agent & reducing agent.
4. Give Nernst Equation.
5. Define Potentiometric titration.
6. What are the things required for potentiometric titration?
7. Explain the reactions that occur between FAS and  $K_2Cr_2O_7$
8. Why there is jump or sudden increase at the Equivalence Point.
9. Explain the nature of graph
10. What is single electrode potential?
11. What is standard electrode potential?
12. What is meant by e.m.f?
13. What is a potentiometer?
14. Give the principle of potentiometric titration?
15. What are the electrodes used in potentiometric titration?
16. Why  $H_2SO_4$  is added to FAS solution?
17. Why the beaker solution gradually changes to green during the course of titration?
18. What are the advantages of potentiometric titration?

#### Experiment – II

1. What is conductance?
2. What is conductivity?
3. What is the unit of conductance?

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4. What is meant by specific, equivalent and molar conductance?
5. What factors determine the conductivity of a solution?
6. Give the principle of conductometric titration?
7. What are the advantages of conductometric titration?
8. How is the equivalence point obtained in conductometric titration?
9. What is cell constant?
10. Explain the nature of graph.

### Experiment –III

1. What is viscosity?
2. What is viscosity coefficient of a liquid?
3. What is density of a liquid?
4. What is the SI unit of viscosity coefficient?
5. What are the factors influencing viscosity of a liquid?
6. Give Poiseuille's equation
7. How does viscosity vary with temperature?
8. Why viscometer should be dry before the measurements?
9. Why acetone is used for cleaning viscometer?
10. Why do you require laboratory temperature for viscosity determination?
11. How to arrive at relative viscosity formula?

### Experiment – IV

1. What is colorimetry?
2. What is the basic principle of colorimetric measurement?
3. What are filters? Why they are used?
4. What is wavelength?
5. State Beer-Lamberts law.
6. What is transmittance?
7. What is absorbance or optical density?
8. What is absorptivity? What is the unit of absorptivity?
9. What are the advantages of colorimetric determinations?
10. What is a blank solution? Why it is used?
11. Why is ammonia added? Why same volume of ammonia is added to different volumes of  $\text{CuSO}_4$  solution?
12. Name the complex formed between copper ions and ammonia?
13. Why is the estimation of copper done at 600 nm wavelength?
14. State Lambert's Law
15. State Beer's Law
16. Why set of standard solutions to be prepared?
17. How can we select proper wavelength for particular species?
18. Why calibration curve is plotted?
19. What is the difference between colorimeter and spectrophotometer?

### Experiment –V

1. What is a weak acid?
2. What is pka of a weak acid?
3. What is meant by pH of a solution?
4. Why is glass electrode called as ion selective electrode?
5. How pH and pKa are related?

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6. How are pKa and strength of a weak acid related?
7. What are the electrodes used in the measurement of pH for the determination of pKa?
8. Why pH value suddenly jumps at the equivalence point?
9. How is pKa value evaluated from the graph?
10. Why pKa should be determined?
11. Can pKa of a strong acid be determined?
12. Why there is variation in pH value when base is added?
13. What does half equivalence point indicate?
14. Why at  $\frac{1}{2}$  eq. pt  $\text{pH} = \text{pKa}$ ?
15. What are the types of electrodes?
16. What are the different types of ion selective electrodes?
17. What is a reference electrode?

### Experiment –VI

1. What is flame photometry?
2. How it is used in chemical analysis?
3. How do you draw the calibration curve for the estimation of potassium / sodium?
4. What is flame photometer?
5. What color flame does potassium/ sodium ions produce in a flame emission?
6. What is principle of flame photometry?

### Experiment –VII

1. What is hard water?
2. What is hardness?
3. Mention types of hardness.
4. Name the salts which cause temporary & permanent hardness
5. What are the differences between temporary and permanent hardness?
6. What is total hardness?
7. What is EDTA?
8. How is temporary hardness removed?
9. How is permanent hardness removed?
10. What are the drawbacks of hardness of water?
11. How is hardness of water caused?
12. What is complexometric titration?
13. Give the titration procedure
14. Why buffer solution is used?
15. Why color changes from wine red to blue at end point of the titration?
16. Why hardness is expressed in terms of equivalents of  $\text{CaCO}_3$ ?
17. What is volumetric or titrimetric analysis?
18. What is a standard solution?
19. Differentiate between end point and equivalence point?
20. What is normality and molarity of a solution?
21. Why is disodium salt of EDTA preferred to EDTA?
22. Give the structure of EDTA & how it acts as hexadentate ligand?
23. To 1 liter of distilled water if few grams of  $\text{CaCO}_3$  is added, which type of hardness is observed?
24. What is the hardness of distilled water?

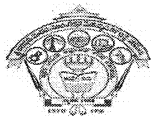
### Experiment -VIII

1. What is Cement?
2. What are the constituents of cement?
3. What is the role of gypsum?

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4. What is the BIS standard for CaO in cement?
5. How is cement solution prepared?
6. What is the role of following reagents? a) NaOH b) Diethyl amine c) Glycerol.
7. Why EBT indicator cannot be used in this experiment?
8. Name the indicator used in this experiment and why?

### Experiment –IX

1. What is brass?
2. What is alloy?
3. Name other alloys of copper
4. Why alloying is carried out?
5. What are the constituents of brass?
6. How is brass solution prepared?
7. Define Iodometry & Iodimetry.
8. Which gas is produced after adding conc. nitric acid?
9. What is the purpose of addition reagents such as KI,  $\text{Na}_2\text{CO}_3$ ,  $\text{CH}_3\text{COOH}$  and starch?
10. What is the need to neutralize the mineral acid?
11. Why do you get blue color on adding starch indicator?
12. How is iodine liberated estimated?
13. What is the reaction that occurs between iodine and sodium thiosulphate?
14. Why is starch added at the end point?
15. What is the white precipitate left at the end point?

### Experiment –X

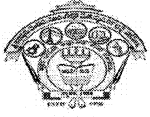
1. Define COD and BOD
2. What is the role of  $\text{HgSO}_4$ ?
3. What is the role of  $\text{Ag}_2\text{SO}_4$ ?
4. What is the oxidizing agent used in this titration?
5. Mention the indicator used in this titration?
6. What is the composition of ferroin?
7. Why  $\text{H}_2\text{SO}_4$  is added?
8. What is the color change at the end point?
9. What do you mean by Blank and Back titrations?
10. Why concentration of  $\text{K}_2\text{Cr}_2\text{O}_7$  is not included in the calculation?
11. Explain the reactions involved
12. Explain the color changes encountered during the reaction
13. What is the unit of COD?
14. Why COD is greater than BOD?

### Experiment –XI

1. What is an ore?
2. What are different ores of iron?
3. How ore solution is prepared?
4. Why stannous chloride is used? What will happen if it is added in excess?
5. What is the role of mercuric chloride in this titration?
6. Why potassium ferric cyanide cannot be used as an internal indicator?
7. Why the color of the indicator drop remains unchanged at the end point?
8. Name the complex formed when  $\text{Fe}^{+2}$  ions react with the indicator?

Nidasoshi-591 236, Tq.: Hukkeri, Dist.: Belagavi, Karnataka, India.

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S J P N Trust's

## Hirasugar Institute of Technology, Nidasoshi.

*Inculcating Values, Promoting Prosperity*

Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU, Belagavi.

Accredited at 'A' Grade by NAAC

Programmes Accredited by NBA: CSE, ECE, EEE & ME.

First Year Engg. Dept.

Academics


Course Plan

2019-20 (Even)

### 9. Experiment –XII

1. What do you mean by available chlorine?
2. What do you mean by iodometric titration?
3. Name the indicator used in iodometric titration.
4. What is hypo? Write down name and formula?
5. What is the chemical name of bleaching powder?
6. Gives the two commercial uses of bleaching powder.
7. Define Iodometry & Iodimetry.
8. What oxidation state of chlorine in bleaching powder?
9. What is the percentage of available chlorine in bleaching powder?
10. What is the reaction that occurs between iodine and sodium thiosulphate?
11. Mention the indicator used in this titration?

16.0

Prepared by		
		
Prepared by 1) Dr. M. S. Hanagadakar 2) Mr. S. J. Walki	HOD(First Year)	Principal



<b>Subject Title</b>	<b>C Programming Laboratory</b>		
<b>Subject Code</b>	18CPL27	<b>IA Marks</b>	40
<b>Number of Lecture Hrs / Week</b>	02	<b>Exam Marks</b>	60
<b>Total Number of Lecture Hrs</b>	40	<b>Exam Hours</b>	03
<b>CREDITS – 01</b>			

<b>FACULTY DETAILS:</b>			
<b>Name:</b> Prof. Ravindra R Patil	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 15 Years	
<b>Name:</b> Prof. C.R. Belavi		<b>Experience:</b> 11 Years	
<b>Name:</b> Prof. M. A. Gholap		<b>Experience:</b> 05 Years	
<b>No. of times course taught:</b> 02		<b>Specialization:</b> Computer Science & Engineering	

### 1.0 Pre-requisite Subjects:

They should have the knowledge of basic of mathematics & C programming language.

Sl. No	Branch	Semester	Subject
01	Common to all branch	I / II	Computer Programming Lab

### 2.0 Course Objectives

This course will enable students to:

- Write flowcharts, algorithms and programs.
- Familiarize the processes of debugging and execution.
- Implementation basics of C programming language.
- Illustrate solutions to the laboratory programs.

### 3.0 Course Outcomes

On completion of this course, students should be able to:

	Course Outcome	RBT Level	POs
C107.1	Write algorithms, flowcharts and program for simple problems.	L2	1,2,3,8,10,12
C107.2	Correct syntax and logical errors to execute a program.	L2	1,2,3,8,10,12
C107.3	Write iterative and wherever possible recursive programs.	L2	1,2,3,8,10,12
C107.4	Demonstrate use of functions, arrays, strings, structures and pointers in problem solving.	L2	1,2,3,8,10,12
<b>Total Hours of instruction</b>		<b>02 Hrs</b>	

### 4.0 Course Content

#### Descriptions/ Instructions:

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

#### Laboratory Programs:



1. Familiarization with computer hardware and programming environment, concept of naming the program files, storing, compilation, execution and debugging, taking any simple C-code.

#### PART A

2. Develop a program to solve simple computational problems using arithmetic expressions and use of each operator leading to simulation of a commercial calculator. (No built-in math function)
3. Develop a program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
4. Develop a program to find the reverse of a positive integer and check for palindrome or not. Display appropriate messages.
5. An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.
6. Introduce 1D Array manipulation and implement Binary search.
7. Implement using functions, a program to check whether the given number is prime and display appropriate messages. (No built-in math function)

#### PART B

8. Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked.
9. Compare Develop a program to compute Sin(x) using Taylor series approximation. Compare your result with the built-in Library function. Print both the results with appropriate messages.
10. Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.
11. Develop a program to sort the given set of N numbers using Bubble sort.
12. Develop a program to find the square root of a given number N and execute for all possible inputs with appropriate messages. Note: Don't use library function sqrt(n).
13. Implement structures to read, write and compute average- marks and the students scoring above and below the average marks for a class of N students.
14. Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.
15. Implement Recursive functions for Binary to Decimal Conversion.

### 5.0 Relevance to future subjects

S. No	Semester	Subject	Topics
01	I/II/III IV/VII	C, C++, Data Structure, Design and Analysis of Algorithms, JAVA, C# .NET	Introduction to fundamental aspects of basic programming skills in I/II semester, data structure and analysis of algorithms in III/IV semester, JAVA, C# .NET for the later years of the course.

### 6.0 Relevance to Real World

S. No	Real World Mapping
01	Industrial application development and automation.
02	Design and development of software.
03	Developing programming skills in building technical competence

### 7.0 Gap Analysis and Mitigation

S. No	Delivery Type	Details
01	C Programming	Topic: Basic concepts, Functions, Arrays, Strings, Structures and File handling.



02	Tutorial NPTEL	Video Tutorials for self learning and skill development.
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## 8.0 Books Used and Recommended to Students

<b>Reference Books</b>
1. Brian W. Kernighan and Dennis M. Ritchie: The C Programming Language, 2 <sup>nd</sup> Edition, PHI, 2012.
2. Jacqueline Jones & Keith Harrow: Problem Solving with C, 1 <sup>st</sup> Edition, Pearson 2011
<b>Additional Study material &amp; e-Books</b>
1. Vikas Gupta: Computer Concepts and C Programming , Dreamtech Press 2013.
2. R S Bichkar, Programming with C, University Press, 2012.
3. V Rajaraman: Computer Programming in C, PHI, 2013.

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

<b>Website and Internet Contents References</b>
1) <a href="http://www.learn-c.org/">http://www.learn-c.org/</a>
2) <a href="https://www.tutorialspoint.com/cprogramming/">https://www.tutorialspoint.com/cprogramming/</a>
3) <a href="http://nptel.ac.in/courses/106105085/4">http://nptel.ac.in/courses/106105085/4</a>
4) <a href="http://elearning.vtu.ac.in/elearning/">http://elearning.vtu.ac.in/elearning/</a>

## 10.0 Magazines/Journals Used and Recommended to Students

S. No	Magazines/Journals	website
1	IEEE Journals & Magazines	<a href="https://www.ieee.org/">https://www.ieee.org/</a>
2	C/C++ Users Wiki Journal	<a href="https://en.wikipedia.org/">https://en.wikipedia.org/</a>
3	Electronics For You	<a href="https://electronicsforu.com/">https://electronicsforu.com/</a>

## 11.0 Examination Note

### Internal Assessment: 40 Marks

- Internal Assessment is done by continuous evaluation for each experiment will be given 30 marks and the average of all experiments for 30marks.
- Practical Test for 10 Marks will be conducted at the end of semester.

### Scheme of Evaluation for Internal Assessment (40 Marks)

- Lab performance is evaluated by continuous assessment of each Experiment: 30Marks. (Average of all the experiments). Write-up (One Experiment):10 Marks, Conduction & Outcome: 15 Marks, Viva-Voce: 05 Marks.
- Practical Test for 10 Marks. Write-up & procedures (One experiment):02 Marks, Conduction of experiment: 06 Marks, and Viva-voce: 02 Marks.

**External Lab Examination:** External Lab Examination will be conducted for 100 Marks and Scaled down to 60 Marks.

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



- i. Part A - Procedure + Execution + Viva = 4+21+5 = 30 Marks  
ii. Part B - Procedure + Execution + Viva = 10+49+11 = 70 Marks

**Instructions on Conduction of Practical Examination:**

- Students should use exam with black ink pen.
- All laboratory experiments ( nos ) are to be included for practical examination.
- Students are allowed to pick one experiment from the lot.
- In the first thirty minutes, student should write the flowchart / algorithm and the program for allotted experiment in main answer sheet.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

**12.0 Course Delivery Plan**

Week	Expt. No.	Name of the Experiment	% of portion
1	1	Familiarization with computer hardware and programming environment, concept of naming the program files, storing, compilation, execution and debugging, taking any simple C-code.	6.67
<b>Part A</b>			
2	2	C program to solve simple computational problems using arithmetic expressions and use of each operator leading to simulation of a commercial calculator. (No built-in math function).	6.67
3	3	C program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.	6.67
4	4	C program to find the reverse of a positive integer and check for palindrome or not. Display appropriate messages.	6.67
5	5	C program to read the name of the user, number of units consumed and to print out the charges under following circumstances: An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged.	6.67
6	6	Demonstration of one dimensional Array manipulation and C program to implement Binary search algorithm.	6.67
7	7	C program using functions, to check whether the given number is prime and to display appropriate messages. (No built-in math function)	6.67
<b>Part B</b>			
8	8	Demonstration of two dimensional Array manipulation and C program to implement Matrix multiplication by ensuring that the rules of multiplication are checked.	6.67
9	9	C program to compute Sin(x) using Taylor series approximation. Compare your result with the built- in Library function. Print both the results with appropriate messages.	6.67
10	10	C program using functions, to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.	6.67
11	11	C program to sort the given set of N numbers using Bubble sort.	6.67
12	12	C program to find the square root of a given number N and execute for all possible inputs with appropriate messages. <i>Note: Don't use library function sqrt(n).</i>	6.67
13	13	C program to 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.	6.67
14	14	C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.	6.67
15	15	C program to implement Recursive functions for Binary to Decimal Conversion.	6.67

**15.0 QUESTION BANK**

1. Define computer.	24. What is break instruction?
2. What is the size of standard Monitor?	25. What is the difference between while & do-while loop?
3. What do you mean by SMPS?	



<p>4. What are the types of digital computer?          5. What are the characteristics of digital computer?          6. What is operating system?          7. What are the functions of operating system?          8. What is network?          9. What are the types of network?          10. What is algorithm?          11. What is flow chart?          12. What is symbol to represent if condition?          13. Who is founder of C programming language?          14. What are the characteristics of C programming language?          15. What do you mean by keyword?          16. What is identifier?          17. What do you mean by data type?          18. What is operator?          19. What are the types of operators?          20. What is conditional operator?          21. What are control statements?          22. What is the use of switch statement?          23. What is looping?</p>	<p>26. What is palindrome number?          27. What is prime number?          28. What is array?          29. What are the types of arrays?          30. How do you initialize the one-dimensional array?          31. What is string?          32. What is local variable?          33. What is global variable?          34. What is actual parameter?          35. What is formal parameter?          36. What are the ways to define the functions?          37. What are the built-in functions available in string.h header file?          38. What is function?          39. What are the advantages of functions?          40. What is function prototyping?          41. What are the built-in functions available in string.h header file?          42. What is function?          43. What are the advantages of functions?          44. What is function prototyping?</p>
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## 16.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
Jan-19(ME)	14	15	6	4	4	0	0	5	89.58
Jan-19(EE)	5	11	3	1	3	0	0	2	92.00
June -2018	00	41	20	05	05	00	00	04	94.63
January 2016-17	57	32	09	07	16	00	00		100
January 2015-16	25	40	13	11	08	00	00		99.04

Prepared by	Checked by		
Prof. Ravindra R Patil Prof. C.R. Belavi Prof. M. A. Gholap	Prof. Mahesh Huddar	HOD(First Year)	Principal





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

**FACULTY DETAILS:**

<b>Name:</b>	<b>Designation:</b>	<b>Experience:</b> 1
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**1.0 Prerequisite Subjects:**

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

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

**2.0 Course Objectives**

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

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

To enhance with English vocabulary and language proficiency

**3.0 Course Outcomes**

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

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

**4.0 Course Content**

**MODULE- I: Introduction to technical communication**

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

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

(RBT Levels: L1 , L2 & L3)

**MODULE-II Introduction to listening skills and Phonetics**

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

Articles; Use of Articles- Indefinite and Definite Articles

(RBT Levels: L1, L2 & L3)

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

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

(RBT Levels: L1, L2 & L3)

**MODULE IV: Speaking Skills (Grammar and Vocabulary)**

Syllable, Structures, Strong and weak forms of words, Words formations- Prefixes and suffixes, Contractions and abbreviations. Spelling Rules and words often Miss pelt. Exercise on it. Word pairs . the sequences of sentence of tenses and Rules.

(RBT Levels: L1, L2 & L3)

**MODULE-V: Speaking Skills (Grammar and Vocabulary)**

Extempore/ Public Speaking, Difference between Extempore and Public speaking, and Guidelines for Practice. Mother Tongue influence- South Indian Speakers, Various Techniques for Neutralization of mother Tongue influence – Exercises. Information Transfer: oral Presentations. Examples. Common Errors in Pronunciation.

(RBT Levels: L1, L2 & L3)

<b>5.0 Relevance to future subjects</b>			
Sl No	Semester	Subject	Topics
01	I/II	<b>Technical English Listening skills and phonetics Grammar and vocabulary</b>	Fundamentals of technical communication, improving interpersonal communication skills, correct pronunciation of the words. Practice of vowels and consonants,

**6.0 Relevance to Real World**

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

**7.0 Books Used and Recommended to Students**

<b>Text Books</b>	
1. <b>Communication Skills</b> by Sanjay Kumar and Phuspa Lata, Oxford- University Press- 2018. (Workbook)	
2. <b>English Language Communication Skills</b> , Engage learning India Pvt Limited- 2018	
<b>Reference Books</b>	
1. English for Technical Communication by N.P Sudharashan and C. Sativa, Cambridge University press-2016	
2. Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited- 2018	
3. Practical English Usage by Michael Swan oxford University press	
4. High School Grammar and Composition by Wren and Martin s.	

**8.0 Relevant Websites (Reputed Universities and Others) for**

## Notes/Animation/Videos Recommended

### Website and Internet Contents References

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

## 12.0 Course Delivery Plan

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

		cell, limitations & advantages.	
	25	Construction, working & applications of methanol-oxygen fuel cell with H <sub>2</sub> SO <sub>4</sub> electrolyte	
	26	Construction, working & applications of solid oxide fuel cell (SOFCs).	
	27	<b>Solar Energy:</b> Photovoltaic cells- introduction, construction and working of a typical PV cell.	
	28	Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells.	
	29	<b>Environmental Pollution:</b> Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide,	
	30	Air pollutants: Sources, effects and control of Oxides of nitrogen and sulphur, hydrocarbons, Particulate matter, Carbon monoxide, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion.	
4	31	<b>Waste Management:</b> Solid waste, e-waste & biomedical waste: Sources, characteristics	20.0
	32	Disposal methods (Scientific land filling, composting, recycling and reuse).	
	33	<b>Water Chemistry:</b> Introduction, sources and impurities of water Boiler feed water, boiler troubles with disadvantages -scale and sludge formation,	
	34	Boiler corrosion (due to dissolved O <sub>2</sub> , CO <sub>2</sub> and MgCl <sub>2</sub> ). Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD)	
	35	Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD.	
	36	Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry).	
	37	Sewage treatment: Primary, secondary (activated sludge) and tertiary methods.	
	38	Softening of water by ion exchange process. Desalination of sea water by reverse osmosis.	
	39	<b>Instrumental methods of analysis:</b> Theory, Instrumentation and applications of Colorimetry	
	40	Theory, Instrumentation and applications of Flame Photometry,	
5	41	Atomic Absorption Spectroscopy.	20.0
	42	Theory, Instrumentation and applications of Potentiometry	
	43	Theory, Instrumentation and applications Conductometry(Strong acid with a strong base, weak acid with a strong base	
	44	Theory, Instrumentation and applications Conductometry (mixture of strong acid and a weak acid with a strong base)	
	45	<b>Nanomaterials:</b> Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties).	
	46	Top down and bottom up approaches, Synthesis by Sol-gel method	
	47	Synthesis by- precipitation and chemical vapour deposition,	
	48	Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications.	
	49		
	50		

### 13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website
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						/Paper
MODULE 1	Assignment 1: University Questions on Section of Electrochemistry and Energy storage systems	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 2	Assignment 2: University Questions on Corrosion and Metal Finishing	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 3	Assignment 3: University Questions on Energy Systems	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 4	Assignment 4: University Questions on Environmental Pollution and Water Chemistry	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list
MODULE 5	Assignment 5: University Questions on Instrumental methods of analysis and Nanomaterials	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity. Printed solution expected.	Books of the reference list. Website of the Reference list

## 14.0 Assignment Questions

Assignment No	Questions	Marks
I	<ol style="list-style-type: none"> <li>1. Define single electrode potential. Derive Nernst's equation for single electrode potential.</li> <li>2. Define electrochemical cells. Give the differences between Electrolytic and galvanic cells.</li> <li>3. What is electrolyte concentration cell? A concentration cell was constructed by immersing two silver electrodes in 0.05M and 0.1M <math>\text{AgNO}_3</math> solution. Write cell representation, cell reactions and calculate the EMF of the cell.</li> <li>4. Define battery. Give the classification of batteries with example.</li> <li>5. Explain the construction and working of Ni-MH.</li> </ol>	5marks 5marks 5marks 5marks
II	<ol style="list-style-type: none"> <li>1. What is metallic corrosion? Explain the corrosion of iron based on electrochemical theory.</li> <li>2. Explain differential metal corrosion with suitable example.</li> <li>3. Explain the following types of corrosion i) Pitting corrosion ii) Water line corrosion.</li> <li>1. Explain the process of electroplating of nickel (Watt's bath).</li> <li>2. Explain the following : i) Decomposition potential ii) over voltage</li> </ol>	5marks 5marks 5marks 5marks
III	<ol style="list-style-type: none"> <li>1. Define chemical fuels. Explain the classification of Chemical fuels and write characteristics of good fuels.</li> </ol>	5marks

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

15.0

**QUESTION BANK**

**Module-I Electrochemistry and Energy storage systems**

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

**Module-II Corrosion and Metal Finishing**

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

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

### Module-III Energy Systems

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

### Module-IV Environmental Pollution and Water Chemistry

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

### Module-V Instrumental methods of analysis and Nanomaterials

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

**16.0 University Result**

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

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

Prepared by	Checked by		
Prepared by			