Website: www.jntuk.edu.in
Email: dap@jntuk.edu.in

Phone: 0884-2300991

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. DAP/RAC/ II,III & IV Year /B. Tech/B. Pharmacy/2021 *Date 08.10.2021*

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Revised Academic Calendar for II, III, IV Year - B. Tech/B. Pharmacy for the AY 2021-22
(As per G.O. Rt. No. 242, Higher Education (U.E) Dept., dated 13.09.2021)

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**01.10.2021**		
I Unit of Instruction	01.10.2021	20.11.2021	7W
I Mid Examinations	22.11.2021	27.11.2021	1W
II Unit of Instructions	29.11.2021	15.01.2022	7W
II Mid Examinations	17.01.2022	22.01.2022	1W
Preparation & Practicals	24.01.2022	29.01.2022	1W
End Examinations	31.01.2022	12.02.2022	2W
Commencement of II Semester Class Work	**14.02.2022**		
II SEMESTER			
I Unit of Instructions	**14.02.2022**	02.04.2022	7W
I Mid Examinations	04.04.2022	09.04.2022	1W
II Unit of Instructions	11.04.2022	28.05.2022	7W
II Mid Examinations	30.05.2022	04.06.2022	1W
Preparation & Practicals	06.06.2022	11.06.2022	1W
End Examinations	13.06.2022	25.06.2022	2W
Commencement of next Year Class Work			
Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period			

R. Srinivasa Rao
Director Academic Planning

Director
Academic Planning
JNTUK Kakinada

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK
Copy to Rector, Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated to JNTUK, Kakinada
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ACADEMIC CALENDAR - 2021-22

S.NO.	DATE	EVENT
		OCTOBER
1	01-10-2021	Commencement of Class Work for B.Tech II,III,IV – I semester - I Unit of Instructions starts
2	25-10-2021 to 30-10-2021	Faculty Development Programs / Seminars / Workshops
		NOVEMBER
1	01-11-2021	Commencement of Class Work for MBA/MCA II-I semester - I Unit of Instruction starts
2	20-11-2021	B.Tech II,III&IV - I semester - I Unit of Instructions ends
3	22-11-2021	Commencement of Class Work for B.Tech I-I semester
4	22-11-2021 to 27-11-2021	I Mid Examinations for B.Tech II,III,IV – I semester, Induction Classes for B.Tech I-I semester
5	29-11-2021	B.Tech II,III & IV – I semester – II Unit of Instructions starts, B.Tech I-I semester - I Unit of Instructions starts
		DECEMBER
1	18-12-2021	MBA/MCA II-I semester - I Unit of Instruction ends
2	20-12-2021 to 25-12-2021	I Mid Examinations for MBA/MCA II-I semester
3	25-12-2021	Christmas
4	27-12-2021	MBA/MCA II-I semester – II Unit of Instruction starts
		JANUARY
1	03-01-2022	Commencement of Class Work for MBA/MCA I-I sem - I Unit of Instruction starts
2	14-01-2022 to 16-01-2022	Sankranti / Pongal Holidays
3	15-01-2022	B.Tech II,III&IV – I semester – II Unit of Instructions ends, B.Tech I-I semester - I Unit of Instructions ends
4	17-01-2021 to 22-01-2022	II Mid Examinations for B.Tech II,III,IV – I semester, I Mid Examinations for B.Tech I-I semester
5	24-01-2022	B.Tech I-I semester – II Unit of Instructions starts
6	24-01-2022 to 29-01-2022	Preparations and Practicals for B.Tech II,III,IV – I semester
7	26-01-2022	Republic Day
8	31-01-2022	End Examinations for B.Tech II,III,IV – I semester starts
		FEBRUARY
1	12-02-2022	End Examinations for B.Tech II,III,IV-I semester ends, MBA/MCA II-I semester - II Unit of Instruction ends
2	14-02-2022	Commencement of Class Work for B.Tech II,III,IV – II semester - I Unit of Instructions starts, II Mid Examinations for MBA/MCA II-I semester starts
3	21-02-2022	I Mid Examinations for MBA/MCA I-I semester starts
4	21-02-2022 to 26-02-2022	Preparations and Practicals for MBA/MCA II-I semester
5	26-02-2022	MBA/MCA I-I semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-I semester ends
6	28-02-2022	MBA/MCA I-I semester - II Unit of Instruction starts, End Examinations for MBA/MCA II-I semester starts

MARCH		
1	01-03-2022	Maha Sivaratri
2	12-03-2022	B.Tech I-I semester – II Unit of Instructions ends, End Examinations for MBA/MCA II-I semester ends
3	14-03-2022	Commencement of Class Work for MBA/MCA II-II semester – I Unit of Instruction starts
4	18-03-2022	Holi
5	14-03-2022 to 19-03-2022	II Mid Examinations for B.Tech I-I semester
6	21-03-2022 to 26-03-2022	Preparations and Practicals for B.Tech I-I semester
7	28-03-2022	End Examinations for B.Tech I-I semester starts
APRIL		
1	02-04-2022	Ugadi
2	02-04-2022	B.Tech II,III&IV/IV – II Sem – I Unit of Instructions ends
3	04-04-2022 to 09-04-2022	I Mid Examinations for B.Tech II,III,IV – II semester
4	05-04-2022	Babu Jagjivan Ram Jayanthi
5	09-04-2022	End Examinations for B.Tech I-I semester ends
6	10-04-2022	Sri Rama Navami
7	11-04-2022	B.Tech II,III&IV/IV – II semester – II Unit of Instructions starts, Commencement of Class Work for B.Tech I-II semester - I Unit of Instructions starts
8	14-04-2022	Dr B R Ambedkar Jayanthi
9	15-04-2022	Good Friday
10	18-04-2022	II Mid Examinations for MBA/MCA I-I semester starts
11	23-04-2022	MBA/MCA I-I semester - II Unit of Instruction ends, II Mid Examinations for MBA/MCA I-I semester ends
12	25-04-2022 to 30-04-2022	Preparations and Practicals for MBA/MCA I-I semester
13	30-04-2022	MBA/MCA II-II semester – I Unit of Instruction ends
MAY		
1	02-05-2022	End Examinations for MBA/MCA I-I semester starts, I Mid Examinations for MBA/MCA II-II semester starts
2	03-05-2022	Ramzan
3	07-05-2022	I Mid Examinations for MBA/MCA II-II semester ends
4	09-05-2022	MBA/MCA II-II semester – II Unit of Instruction starts
5	14-05-2022	End Examinations for MBA/MCA I-I semester ends
6	23-05-2022	MBA/MCA I-II semester – I Unit of Instruction starts
7	28-05-2022	B.Tech II,III & IV/IV – II semester – II Unit of Instructions ends, B.Tech I-II semester - I Unit of Instruction ends
8	30-05-2022	II Mid Examinations for B.Tech II,III,IV – II semester starts, I Mid Examinations for B.Tech I-II semester starts

	JUNE	
1	04-06-2022	II Mid Examinations for B.Tech II,III,IV - II semester ends,I Mid Examinations for B.Tech I-II semester ends
2	06-06-2022	B.Tech I-II semester - II Unit of Instructions starts
3	06-06-2022 to 11-06-2022	Preparations and Practicals for B.Tech II,III,IV-II semester
4	13-06-2022 to 25-06-2022	End Examinations for B.Tech II,III,IV-II semester
5	25-06-2022	MBA/MCA II-II semester - II Unit of Instruction ends
6	27-06-2022	II Mid Examinations for II year MBA/MCA II semester starts
	JULY	
1	02-07-2022	II Mid Examinations for MBA/MCA II-II semester ends
2	04-07-2022 to 09-07-2022	Preparations and Practicals for MBA/MCA II-II semester
3	10-07-2022	Bakrid
4	11-07-2022	I Mid Examinations for MBA/MCA I-II semester starts, End Examinations for MBA/MCA II-II semester starts
5	16-07-2022	MBA/MCA I-II semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-II semester ends
6	18-07-2022	MBA/MCA I-II semester - II Unit of Instruction starts
7	23-07-2022	B.Tech I-II semester - II Unit of Instructions ends, End Examinations for MBA/MCA II-II semester ends
8	25-07-2022 to 30-07-2022	II Mid Examinations for B.Tech I-II semester
	AUGUST	
1	01-08-2022 to 06-08-2022	Preparations and Practicals for B.Tech I-II semester
2	08-08-2022	End Examinations for B.Tech I-II semester starts
3	09-08-2022	Muharram
4	15-08-2022	Independence Day
5	19-08-2022	Krishna Janmashtami
6	20-08-2022	End Examinations for B.Tech I-II semester ends
7	31-08-2022	Vinayaka Chavithi
	SEPTEMBER	
1	05-09-2022	Teacher's day
2	10-09-2022	MBA/MCA I-II semester - II Unit of Instruction ends
3	12-09-2022 to 17-09-2022	II Mid Examinations for MBA/MCA I-II semester
4	19-09-2022 to 24-09-2022	Preparations and Practicals for MBA/MCA I-II semester
5	26-09-2022	End Examinations for MBA/MCA I-II semester starts
	OCTOBER	
1	08-10-2022	End Examinations for MBA/MCA I-II semester ends

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CIVIL ENGINEERING
Department Academic Calendar 2021 – 2022 Semester II

S. No	Activity	Year/Class	Date
1	Notice	Time Table	07-02-2022 (II,III,IV/IV)
		Roll Call List	
		Elective Confirmation List	
		Project Review Committee	
		Mentor – Mentee list	
2	Principal and Faculty Meeting	All Faculty Members	After releasing of university results
3	HOD and Faculty meeting	All Faculty Members	Every Saturday
4	HOD and CR meeting	HOD and CR's	Before I MID Term test
5	Parents and Teacher meeting	Parents and Faculty	After releasing of university results
6	Commencement of Class work	II/IV B.Tech	14-02-2022
		III/IV B.Tech	14-02-2022
		IV/IV B.Tech	14-02-2022
7	I Mid-term test/Online Examinations	II/IV B.Tech	04-04-2022 to 09-04-2022
		III/IV B.Tech	04-04-2022 to 09-04-2022
		IV/IV B.Tech	04-04-2022 to 09-04-2022
8	B.Tech Project Evaluations - I	B.Tech	One week before I MID Examinations
9	Feedback on Faculty	II/IV, III/IV, IV/IV B.Tech	10-04-2022 to 13-04-2022
10	Internal Lab Examinations	II/IV B.Tech	12-04-2022 to 15-04-2022
		III/IV B.Tech	
		IV/IV B.Tech	
11	II Mid-term test/Online Examinations	II/IV B.Tech	30-05-2022 to 04-06-2022
		III/IV B.Tech	30-05-2022 to 04-06-2022
		IV/IV B.Tech	30-05-2022 to 04-06-2022
12	B.Tech Project Evaluations - II	B.Tech	One week before II MID Examinations
13	Practical examinations	II/IV B.Tech	06-06-2022 to 11-06-2022
		III/IV B.Tech	06-06-2022 to 11-06-2022
		IV/IV B.Tech	06-06-2022 to 11-06-2022
14	Semester End Examinations	II/IV B.Tech	13-06-2022 to 25-06-2022
		III/IV B.Tech	13-06-2022 to 25-06-2022
		IV/IV B.Tech	13-06-2022 to 25-06-2022
15	Feedback on Curriculum	IV/IV B.Tech	Last week of second semester
16	Program Exit Survey	IV/IV B.Tech	End of second semester
17	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month

Signature of HoD

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
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CIVIL ENGINEERING
Department Academic Calendar 2021 – 2022 Semester I

S. No	Activity	Year/Class	Date
1	Notice	Time Table	27-09-2021 (II,III,IV/IV)
		Roll Call List	
		Elective Confirmation List	
		Project Review Committee	
		Mentor – Mentee list	
2	Principal and Faculty Meeting	All Faculty Members	First week of commencement of class work for I semester
3	HOD and Faculty meeting	All Faculty Members	Every Saturday
4	HOD and CR meeting	HOD and CR's	Before I MID Term test
5	Parents and Teacher meeting	Parents and Faculty	After releasing of university results
6	Commencement of Class work	II/IV B.Tech	01-10-2021
		III/IV B.Tech	01-10-2021
		IV/IV B.Tech	01-10-2021
7	I Mid-term test/Online Examinations	II/IV B.Tech	22-11-2021 to 27-11-2021
		III/IV B.Tech	22-11-2021 to 27-11-2021
		IV/IV B.Tech	22-11-2021 to 27-11-2021
8	Principal and Faculty Meeting	All Faculty Members	After releasing of university results.
9	Feedback on Faculty	II/IV, III/IV, IV/IV B.Tech	4-10-2021 to 9-10-2021(III, IV/IV) 28-11-2021 to 30-11-2021(II/IV)
10	Internal Lab Examinations	II/IV B.Tech	28-11-2021 to 02-12-2021
		III/IV B.Tech	
		IV/IV B.Tech	
11	II Mid-term test/Online Examinations	II/IV B.Tech	17-01-2022 to 22-01-2022
		III/IV B.Tech	17-01-2022 to 22-01-2022
		IV/IV B.Tech	17-01-2022 to 22-01-2022
12	Practical examinations	II/IV B.Tech	24-01-2022 to 29-01-2022
		III/IV B.Tech	24-01-2022 to 29-01-2022
		IV/IV B.Tech	24-01-2022 to 29-01-2022
13	Semester End Examinations	II/IV B.Tech	31-01-2022 to 12-02-2022
		III/IV B.Tech	31-01-2022 to 12-02-2022
		IV/IV B.Tech	31-01-2022 to 12-02-2022
14	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month
15	Commencement of Second Semester of Academic Year 2021-2022	B.Tech	14-02-2022 (II,III,IV/IV)

Signature of HoD

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Civil Engineering** **RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES**	**SRKIT / CE / 09**

Academic year: 2021-22 **Semester: I**

S. No	Name of the Faculty	Theory subjects		Labs		Work Load	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
1	**Dr.T. Satyanarayana**	GWD	CE-IV	-	-	14	HOD, All Department Activities Department Activities, NAAC- 4th Criteria Head	
2	**Dr. VasanthKarthik**	WRE II	CE-IV	-	-	12	Department Activities, ISO, NAAC	
3	**Mrs. E.UshaSree**	SA	CE-III	-	-	13	Department Activities, ISO, CF And Cadd Lab In-Charge, NAAC	
		FM	CE-II					
4	**Ms. N.KranthiRekha**	EE-II	CE-IV	-	-	18	Department Activities, ISO- In-Charge, EE Lab In-Charge, NAAC	
		EE-II	CE-III					
5	**Mr. K Kiran**	WRE I	CE-III	HE LAB	CE-II	24	Department Activities, ISO , TE Lab In-Charge, NAAC	
		HE	CE-II	SURVEYING FIELD WORK II LAB	CE-II			

HOD/ Date 1/10/21

S. Sri Gowri
IQAC Coordinator/ Date 1/10/21

Principal / Date 1/10/21

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Civil Engineering

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

SRKIT / CE / 09

7		SM I	CE-II	-	-	17	Department Activities, ISO , SM Lab In-Charge, NAAC	
8	**Mrs. A.KrishnaPriya**	CT	CE- III	CT LAB	CE-III	24	Department Activities, ISO, CT Lab In-Charge, NAAC, ISO- In-Charge	
		GTE II	CE-IV					
9	**Mr. A Anoop Kumar**	SG	CE- II	SURVEY FIELD WORK I LAB	CE II	17	Department Activities, ISO work, Survey Lab In-Charge, NAAC	
		CTM	CE-III					
10	**Mrs.A.Tanu Sree**	EPC	CE-III	CT LAB	CE-II	12	Department Activities, ISO and NAAC, GTE lab in-charge	
11	**Mr.J.Purna Chandra Rao**	-	-	IDD LAB	CE-IV	12	Department Activities, ISO and NAAC	
12	**Mrs.G.Anuradha**	-	-	STAAD & GIS LAB	CE-IV	12	Department Activities, ISO and NAAC	
				CT LAB	CE-II			
13	**K.Chandra Padmakar**	EG	CE- I	EG lab	CE-I	09	Department Activities, ISO and NAAC	

14 M. Karthik Kumar

T. Lavanya
HOD/ Date 7

S. Srigowri
IQAC Coordinator/ Date

Principal / Date
1/10/21

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Civil Engineering** **CLASS TIME TABLE**	**SRKIT / CE / 10.1**

Academic Year: 2021-22 **Class:II** **Semester:I** **W.E.F:01-10-2021**

Section I

Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25	LUNCH	1:10 to 2:00	2:00 to 2:45	2:50 to 3:35	3:35 to 4:20
Period	**1**	**2**	**3**	**4**		**5**	**6**	**7**	**8**
MON	SUR	M-III	SM-I	FM (T)		COI	-------HE LAB/CT LAB-----		
TUE	HE	SUR	M-III	SUR		SM-I(T)	--------HE LAB/SUR LAB------		
WED	FM	HE	M-III	SUR		HE (T)	------Skill Oriented course----		
THU	M-III	SUR (T)	HE	SM-I		FM	-------CT LAB/SUR LAB------		
FRI	SM-I	FM	HE	M-III		COI	M-III (T)	SM-I	FM
SAT	HE	SM-I	M-III	FM		SM-I	FM	SUR	******

Name of the Subject		**Name of the Faculty**
Mathematics III	----------	**Mr.K.Basava Raju**
Strength of Materials-I	----------	**Mrs.G.Sahithi**
Fluid mechanics	----------	**Mrs.E.Ushasree**
Surveying and Geometrics	----------	**Mr.A.Anoop Kumar**
Highway Engineering	----------	**Mr.K.Kiran**
Surveying Field Work-I	----------	**Mr.A.Anoop Kumar**
Concrete Technology Lab	----------	**Mrs.G.Anuradha&Mrs.A.Thanusree**
Highway Engineering Lab	----------	**Mr.K.Kiran**
Constitution of India	----------	**Mrs.N.Gayatri**
Skill Oriented course	----------	**Mr.M.Karthik kumar**

HOD/Date 1/10/21

IQAC Coordinator/Date 1/10/21

PRINCIPAL/Date 1/10/21

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Civil Engineering** **FACULTY INDIVIDUAL TIME TABLE**	**SRKIT / CE / 10.2**

Academic Year: 2021-22 **Semester: I**

FACULTY NAME: Mrs.G.SAHITHIWL:17

Period	1	2	3	4		5	6	7	8
Day	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:45	2:50 to 3:35	3:35 to 4:20
MON	GIT-IV B-SEC		SM-I			GIT A-SEC			
TUE		GIT B-SEC		GIT A-SEC		SM-I			
WED		GIT B-SEC		GIT A-SEC	LUNCH				
THU	GIT A-SEC			SM-I					
FRI	SM-I		GIT B-SEC			GIT B-SEC			
SAT		SM-I	GIT A-SEC			SM-I			SM-I

G.Sahithi 1/10/2021.
Faculty signature with date

HOD /Date 1/10/21

Faculty Name: Mr.M.KARTHI KUMAR **WL: 12**

Period	1	2	3	4		5	6	7	8
Day	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:45	2:50 to 3:35	3:35 to 4:20
MON			RS & GIS IV-A					RS & GIS IV-A	RS & GIS IV-B
TUE			RS & GIS IV-A						
WED					LUNCH				
THU			RS & GIS IV-B				RS & GIS IV-B		
FRI				RS & GIS IV-B SEC			RS & GIS IV-A SEC		RS & GIS IV-B
SAT	RS & GIS IV-A	RS & GIS IV-B				RS & GIS IV-A			******

Karthi 1/10/21
Faculty signature with date

HOD /Date 1/10/21

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Civil Engineering** **TEACHING PLAN CUM REALIZATION**	**SRKIT / CE /12**

Name of faculty: **Gogineni Sahithi** Year/ Semester: **II/I** Academic Year: **2021-2022** Subject: **Strength of Materials-I**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
1	**Unit-I** Introduction to elasticity and plasticity –Types of stresses	From: 1/10/2021 To: 15/10/2021.	21|10|21.	Due to Semester	
2	Types of strains – Hooke's law		22|10|21.		Exams.
3	Stress – strain diagram for mild steel		23|10|21		
4	Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain		25|10|21.		
5	Problems related to stress,strain and elongation		26|10|21		
6	Problems on relation between stress strain and youngs modulus		28|10|21		
7	Elastic moduli and the relationship between them		29|10|21.		
8	Problems on relation between elastic constants		29|10|21.		
9	Bars of varying section		30|10|21		
10	Problems on bars of varying cross section		1|11|21		
11	Description of composite bars		2|11|21.		
12	Problems on composite bars		5|11|21.		

G. Sahithi 1/10/21
Faculty/ Date

T. [illegible] 1/10/21
HOD/Date

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Civil Engineering** **TEACHING PLAN CUM REALIZATION**	**SRKIT / CE /12**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
13	Temperature stresses, problems		5/11/21		
14	**Strain Energy** – Resilience – Gradual, sudden, impact and shock loadings		6/11/21		
15	Problems on strain energy (T)		8/11/21.		
16	**Unit-II** Definition of beam – Types of beams		9/11/21		
17	Concept of shear force and bending moment		11/11/21		
18	Diferrent types of loadings		12/11/21		
19	Conversion of udl,uvl into point loads	**From: 16/10/2021**	12/11/21		
20	S.F and B.M diagrams for simply Supported subjected to point loads, u.d.l loadings	**To: 3/11/2021**	15/11/21.		
21	S.F and B.M diagrams for simply Supported subjected to u.v.l loadings		16/11/21		
22	S.F and B.M diagrams for cantilever subjected to point loads, u.d.l loadings		18/11/21.		

G.Sabitha
Faculty/ Date 1/10/21

HOD/Date 1/10/21

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Civil Engineering** **TEACHING PLAN CUM REALIZATION**	**SRKIT / CE /12**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
23	S.F and B.M diagrams for cantilever subjected to u.v.l loadings	From: 16/10/2021 To: 3/11/2021	19/11/21		
24	overhanging beams, Relation between S.F., B.M and rate of loading at a section of a beam		20/11/21		
25	Problems on calculation of SFD,BMD for S.S.B subjected to point load		22/11/21		
26	Problems on calculation of SFD,BMD for S.S.B subjected to u.d.l		23/11/21		
27	Problems on calculation of SFD,BMD for S.S.B subjected to combination loadings		25/11/21		
28	Problems on calculation of SFD,BMD for cantilever subjected to u.d.l		26/11/21		
29	Problems on calculation of SFD,BMD for cantilever subjected to combination load		27/11/21		
30	Problems on calculation of SFD,BMD for over hanging beams		29/11/21		
31	Problems on calculation of SFD,BMD for over hanging subjected beams subjected to combination loading beams (T).		30/11/21		

G. Sahith
Faculty/ Date 1/10/21

HOD/Date 1/10/21

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Civil Engineering** **TEACHING PLAN CUM REALIZATION**	**SRKIT / CE /12**

S. No	Unit / Topic		Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
32	**Unit-III** Theory of simple bending	From: 4/11/2021 To: 20/11/2021	2/12/21		
33	Assumptions of simple bending		3/12/21		
34	Derivation of bending equation: M/I = f/y = E/R,		3/12/21		
35	Defnition of bending stresses		4/12/21		
36	Section Modulus		4/12/21.		
37	Section modulus of rectangular and circular sections		6/12/21		
38	Section modulus of I,T sections		7/12/21		
39	Section modulus of angle sections		9/12/21		
40	Section modulus of channel sections		10/12/21.		
41	Problems on section modulus for standard sections		10/12/21.		
42	Problems on section modulus for standard sections		13/12/21		
43	Problems on bending stresses		14/12/21		
44	Problems on bending stresses		16/12/21		
45	Problems on bending stresses		17/12/21.		

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S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
46	Derivation of formula for shear stress	From: 4/11/2021 To: 28/11/2021	17/12/21		
47	Introduction to Shear stress distribution		18/12/21		
48	Shear stress distribution across various beam sections like rectangular section		18/12/21		
49	Shear stress distribution across various beam sections like cicular section		20/12/21		
50	Shear stress distribution across various beam sections like triangular section.		20/12/21		
51	Shear stress distribution across I section		23/12/21		
52	Shear stress distribution across T section		24/12/21		
53	Shear stress distribution across built up section		27/12/21		
54	Problems on S.S.D across various standard sections		28/12/21		
55	Problems on S.S.D across various standard sections		30/12/21		
56	Determination of S.S.D in T section		31/12/21		

G. Sahithi
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Y. Latha
HOD/Date 1/10/21

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S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
57	Determination of S.S.D in I section		10/1/22		
58	Determination of S.S.D in built up sections (T)		10/1/22		
59	**Unit-IV** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam		11/1/22		
60	Double integration Method		17/1/22		
61	Determination of slope and deflection for cantilever subjected to point loads,	**From: 29/11/2021.**	17/1/22		
62	Determination of slope and deflection for cantilever subjected to u.d.l	**To: 23/12/2021**	15/1/22		
63	Determination of slope and deflection for cantilever subjected to u.v.l		18/1/22		
64	Determination of slope and deflection for S.S.B subjected to point loads		20/1/22		
65	Determination of slope and deflection for S.S.B subjected to u.d.l		21/1/22		
66	Determination of slope and deflection for S.S.B subjected to u.v.l		21/1/22		

Gsahith.
Faculty/ Date 1/10/4

HOD/Date 1/10/21

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S. No	Unit / Topic		Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
67	Macaulay's methods and problems on it		22/1/22		
68	Mohrs theorem and Moment area method (T)		22/1/22		
69	**Unit:V** Introduction to Thin and thick cylinders	**From: 24/12/2021** **To: 10/1/2022**	24/1/22		
70	Derivation of formula for hoop and longitudinal stress		25/1/22		
71	Volumetric strain		27/1/22		
72	Changes in diameter volume in cylinders		28/1/22		
73	Introduction to thin spherical shells and derivation		28/1/22		
74	Lames theory derivation		28/1/22		
75	Hoop and radial stress		31/1/22		
76	Design of thick cylinders		1/2/22		
77	Compound cylinders and problems		3/2/22		
78	Thick spherical shells		3/2/22		
79	Problems on cylinders		4/2/22		

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S. No	Unit / Topic		Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
80	Problems on cylinders		4/2/22		
81	Problems on cylinders		4/2/22		
82	Revision of previous papers		4/2/22	1 Revision done in 1hour.	
83	Revision of previous papers		4/2/22		
84	Revision of previous papers		4/2/22		
85	Revision of previous papers		4/2/22		
86	Revision of previous papers		4/2/22		

G. Sakuntha
Faculty/ Date 1/10/21

T. Latha
HOD/Date 1/10/21

Unit - I

Simple stresses And Strains

Introduction:- When an external force acts on a body, the body tends to undergo some deformation. Due to cohesion between the molecules, the body resists deformation. This resistance by which material of the body opposes the deformation is known as Strength of material.

Elasticity:- It is the ability of a material to regain to its original shape and size after the removal of the external force.
The body will regain its original shape & size only when the deformation caused by the external force is within the elastic limit.

Plasticity:- It is the ability of a material to undergo some degree of permanent deformation with rupture (or) failure at constant load.
Ex: clay is plastic at room temperature.

Stress:- The stress at any point may be defined as the internal resistance developed against deformation per unit area.
Stress is denoted with 'σ' (Sigma)

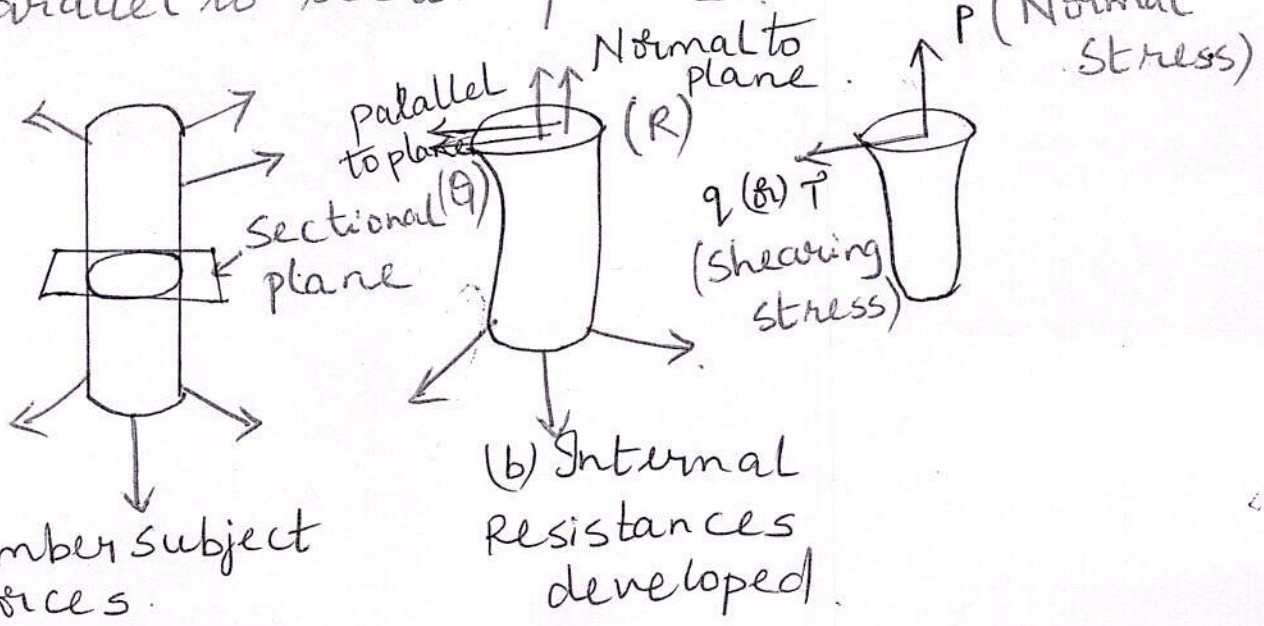
$$\text{Stress } \sigma = \frac{\text{External Force (or) load}}{\text{Cross sectional Area}}$$

$1KN = 10^3 N$	$1m = 1000mm$
$1MN = 10^6 N$	$1m = 100\,cm$
$1GN = 10^9 N$	$1cm = 10mm$
$1TN = 10^{12} N$	

General Meaning of stress:

When a member is subjected to loads it develops resisting forces. Inorder to find the resisting forces developed a section plane is passed through the member and equilibrium of one part is considered. Then the resisting forces are split into two parts

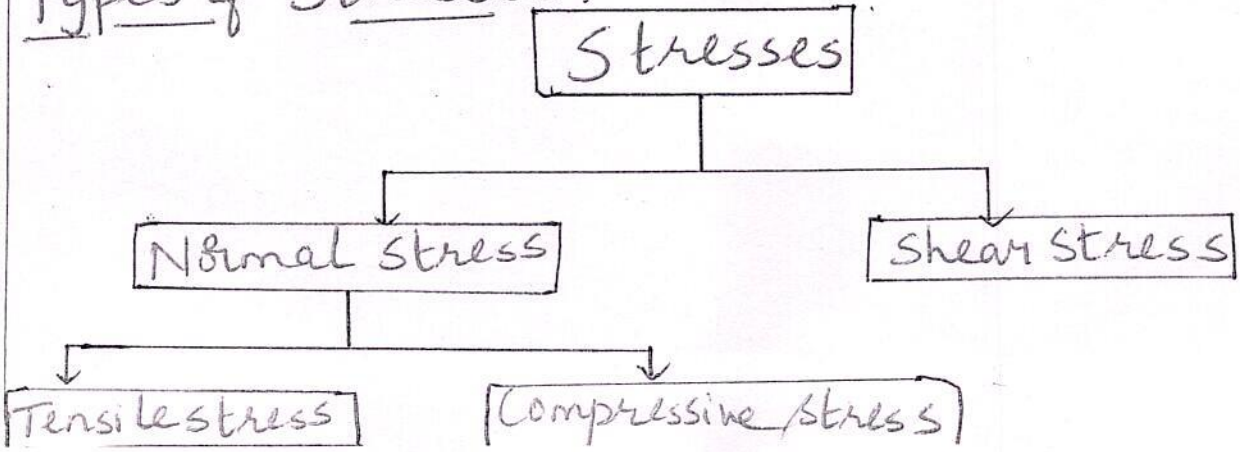
1) Normal to section plane
2) Parallel to section plane



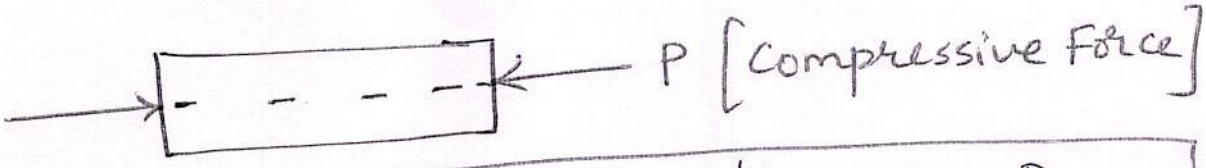
(a) Member subject to forces.

(b) Internal Resistances developed.

Types of Stresses:



2) Compressive stress:- The stress induced in a body when subjected to 2 equal & opposite pushes and as a result there is decrease in length of the material is known as compressive stress.



$$\text{Compressive stress} = \frac{\text{Compressive force}}{\text{Area}} = \frac{P}{A}.$$

The units of Tensile stress & compressive stress are N/m^2 (or) N/mm^2.

Strain (e)

When a body is subjected to some external force, there is some change of dimension of the body. The ratio of change of dimension of the body to the original dimension is known as strain. denoted with 'e'

$$\text{Strain} = \frac{\text{change in dimension}}{\text{Original dimension}}.$$

Unit of strain :- Strain has no units

Types of strains

1) Linear strain
2) Lateral strain
3) Volumetric strain.
4) Shear strain

where

δb = change in breadth

b = original breadth

δd = change in diameter

d = original diameter.

3) Volumetric strain :- The ratio of change in volume to its original volume is known as volumetric strain. It is denoted with e_v

$$\text{Volumetric strain} = \frac{\text{change in volume}}{\text{Original volume}}$$

$$e_v = \frac{\delta V}{V}$$

where

δV = change in volume

V = Original volume

e_v = Volumetric strain.

4) Shear strain (ϕ) :- The strain produced by shear stress is known as shear strain. It is denoted with ϕ

$$\text{Shear strain} = \frac{\text{shear stress}}{\text{Modulus of rigidity}}$$

$$\phi = \frac{q}{G}$$

where ϕ = shear strain ; q = shear stress

G = Modulus of rigidity.

Experimental Procedure:

1) The mild steel test specimen is gripped into the universal testing machine (UTM).
2) Extensometer is fitted to test specimen which measures the extension over the length L_1 as shown in figure.
3) The length over which the extension is measured is called gauge length
4) The load is applied gradually and at regular interval of loads extension is measured.
5) After certain load, extension increases at a faster rate that which cannot be measured by the extensometer. & hence extensometer is removed.
6) Later the extension is measured from scale on the universal testing machine (UTM)
7) Load is increased gradually till the specimen breaks.
8) Load divided by original cross sectional area is called stress
9) By dividing extensometer reading by the gauge length (original length) we get the values of strain.
10) As the values of stress, strain are obtained the following graph is plotted.

Stress values → Y axis

Strain values → X axis

The following values are calculated using the formulas

1) Stress = $\frac{\text{Force/Load}}{\text{Area.}}$ in N/mm^2

$$\boxed{\text{Stress} = \frac{P}{A}}$$

2) Strain = $\frac{\text{change in dimension}}{\text{Original dimension}}$ (No units)

3) Young's Modulus / Modulus of Elasticity (E)

$$\boxed{E = \frac{\text{Stress}}{\text{Strain}}}$$ unit N/mm^2

4) Percentage Elongation

$$\% \text{ elongation} = \left(\frac{\text{change in length}}{\text{Original length}}\right) \times 100$$

$$\boxed{\text{Change in length} = l_2 - l_1}$$

where l_1 = initial length

l_2 = final length.

5) percentage Reduction in Area.

Working stress :- If the maximum stress to which any member is designed is much less than the ultimate stress, that stress is known as working stress.

Factor of safety :-

1) The material taken may not be 100% good; it may contain spots (or) flaws. (defects)
2) The deformation may obstruct the performance of component.
3) Loads taken by the designer are only the estimated loads. Some time there may be overloading.
4) Hence the above considerations are taken and factor of safety is formulated.

Factor of safety (Definition) :- The ratio of ultimate stress to working stress is called factor of safety.

$$\text{Factor of safety} = \frac{\text{Ultimate stress}}{\text{Working stress}}$$

Some factor of safety values for different materials generally taken are

1) For steel - 1.85
2) For concrete - 3
3) For timber - 4 to 6

Volumetric strain :- It is defined as the ratio of change in volume to its original volume. It is denoted with e_v

$$\text{Volumetric strain} = \frac{\text{Change in volume}}{\text{Original Volume}}$$

$$e_v = \frac{\delta V}{V}$$

where

δV = change in volume

V = Original volume

Formula for Extension / Shortening of a Bar (Δ)

In order to calculate the formula for extension (or) shortening of bar consider the Hooke's Law

$$\text{Stress} \propto \text{strain}$$

$$\text{Stress} = E\,(\text{strain})$$

$$E = \frac{\text{stress}}{\text{strain}} \rightarrow \text{eq}^{n}\,(1)$$

But $\text{stress} = \frac{P}{A}$ $\qquad$ $\text{strain} = \frac{\Delta}{L}$

Substitute the values of stress, strain in eq^{n} (1)

$$E = \frac{\left(\frac{P}{A}\right)}{\left(\frac{\Delta}{L}\right)} \Rightarrow E = \frac{P}{A} \times \frac{L}{\Delta}$$

$$E = 200 \times 10^3 \text{ N/mm}^2 \Rightarrow E = \underline{2 \times 10^5 \text{ N/mm}^2}$$

a) Stress $= \dfrac{\text{Force/load}}{\text{Area}} = \dfrac{P}{A}$

$$A = \frac{\pi d^2}{4} \quad \text{(circular section)}$$

$$A = \frac{\pi \times (20)^2}{4} = \underline{314.159 \text{ mm}^2}$$

$$\text{Stress} = \frac{45 \times 10^3}{314.159} = \underline{143.24 \text{ N/mm}^2} \text{ (Ans)}$$

b) $\text{Strain} = \dfrac{\text{stress}}{E}$

$$\Rightarrow \text{Strain} = \frac{143.24}{2 \times 10^5} = \underline{7.162 \times 10^{-4}} \text{ (Ans)}$$

c) Elongation / extension of bar (Δ) :-

$$\boxed{\Delta = \frac{PL}{AE}}$$

$$\Delta = \frac{45 \times 10^3 \times 500}{314.159 \times 2 \times 10^5}$$

$$\boxed{\Delta = 0.358 \text{ mm}} \quad \text{Ans.}$$

Stress at elastic limit $= \frac{160 \times 10^3}{\text{Area}}$

$$\text{Area} = \frac{\pi d_1^2}{4} = \frac{\pi \times (25)^2}{4} = 490.874 \text{ mm}^2$$

Stress at elastic limit $= \frac{160 \times 10^3}{490.87} = \underline{325.95 \text{ N/mm}^2}$ (Ans)

2) Young's Modulus (E):

$$E = \frac{\text{Stress}}{\text{Strain}}$$

$$\text{Stress} = \frac{P}{A} = \frac{80 \times 10^3}{490.87} = 162.97 \text{ N/mm}^2$$

$$\text{Strain} = \frac{\Delta}{L} = \frac{0.16}{200} = 8 \times 10^{-4}$$

$$E = \frac{162.97}{8 \times 10^{-4}} = \underline{203712.5 \text{ N/mm}^2} \text{ (Ans)}$$

3) % elongation:

$$\% \text{ elongation} = \left(\frac{\text{Total extension}}{\text{Original length}}\right) \times 100$$

$$= \left(\frac{56}{200}\right) \times 100$$

$$= 28\% \text{ (Ans)}$$

3) The ultimate stress for a hollow steel column which carries an axial load of 1.9 MN is 480 N/mm^2. If the external diamete is 200mm. Determine internal diameter. Take factor of safety = 4.

solution.

Given data.

Axial load = 1.9 MN $= 1.9 \times 10^6$ N

Ultimate stress $= 480 N/mm^2$

External diameter D = 200mm.

Internal diameter d = ?

Factor of safety = 4.

We know that

$$\text{Factor of safety} = \frac{\text{Ultimate stress}}{\text{Working stress}}$$

$$4 = \frac{480}{\text{Working stress}}$$

$$\text{Working stress} = \frac{480}{4} = 120 N/mm^2$$

$$\text{Working stress} = \frac{\text{Load}}{\text{Area}} = \frac{P}{\frac{\pi[D^2 - d^2]}{4}}$$

$$\Rightarrow \frac{1.9 \times 10^6}{\frac{\pi[(200)^2 - d^2)}{4}} = 120$$

$$\text{Stress} = \frac{\text{Load}}{\text{Area}} = \frac{60\times10^3}{\frac{\pi\times(30)^2}{4}} = 84.88\ N/mm^2$$

$$\text{Strain} = \frac{\Delta l}{l} = \frac{0.1}{200} = 5\times10^{-4}$$

$$E = \frac{\text{stress}}{\text{strain}} = \frac{84.88}{5\times10^{-4}} = 169760\ N/mm^2$$

Young's Modulus $E = 169760\ N/mm^2$ (Ans)

2) Linear strain

$$\text{Linear strain} = \frac{\Delta l}{l} = \frac{0.1}{200} = 5\times10^{-4}\ \text{(Ans)}$$

3) Lateral strain.

$$\text{Lateral strain} = \frac{\delta d}{d} = \frac{0.004}{30} = 1.33\times10^{-4}\ \text{(Ans)}$$

4) poisson's Ratio

$$\text{poisson's Ratio} = \frac{\text{Lateral strain}}{\text{Linear strain}}$$

$$\text{poisson's Ratio} = \frac{1.33\times10^{-4}}{5\times10^{-4}}$$

$$\boxed{\mu = 0.266}\ \text{Ans.}$$

Elastic moduli & the relation between them

The different elastic moduli are

1) Modulus of Elasticity (E)
2) Modulus of Rigidity (G (or) C)
3) Bulk Modulus (K)

1) **Modulus of Elasticity (E)**:- The ratio of stress to strain is known as the Modulus of Elasticity (or) young's modulus. It is denoted with letter 'E'.

$$E = \frac{\text{Stress}}{\text{Strain}}$$

2) **Modulus of Rigidity (G (or) C)**:- The ratio of shear stress to the shear strain within the elastic limit is known as the modulus of rigidity. This is denoted by G (or) C.

$$\text{Modulus of Rigidity} = \frac{\text{Shear stress}}{\text{Shear strain}}$$

$$G = \frac{q}{\phi}$$

where
q = shear stress
ϕ = shear strain.

3) **Bulk Modulus (K)**:- It is defined as the ratio of identical pressure 'p' acting in three mutually perpendicular directions to corresponding volumetric strains. It is denoted with 'K'.

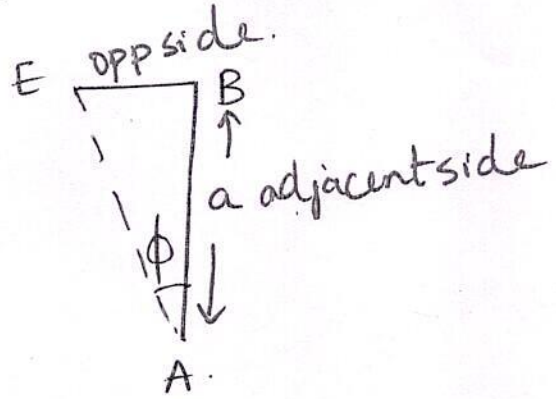
$$K = \frac{\text{Pressure}}{e_v}$$

where
e_v = Volumetric strain

Substitute eq^n ② in eq^n ① we get

$$\text{Strain in diagonal BD} = \frac{BE\cos 45^\circ}{BD} \rightarrow \text{eq}^n\ (3)$$

Consider Δ^{le} BAE.



$$\tan\phi = \frac{\text{opp side}}{\text{adjacent side}} \Rightarrow \tan\phi = \frac{BE}{BA}.$$

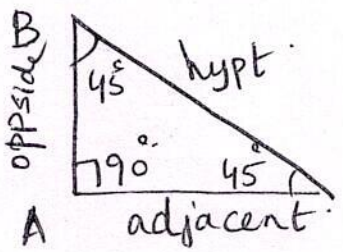
But side BA = a.

$$\Rightarrow \tan\phi = \frac{BE}{a} \Rightarrow BE = a\tan\phi \rightarrow \text{eq}^n\ (4)$$

Substitute eq^n ④ in eq^n ③ we get

$$\text{Strain in diagonal BD} = \frac{a\tan\phi\cos 45^\circ}{BD} \rightarrow \text{eq}^n\ (5)$$

Consider Δ^{le} ABD.



But AB = a

$$\sin 45^\circ = \frac{\text{opp side}}{\text{hypotenuse}} = \frac{AB}{BD}.$$

$$\sin 45^\circ = \frac{a}{BD} \Rightarrow BD = \frac{a}{\sin 45^\circ}. \rightarrow \text{eq}^n\ (6)$$

$$\Rightarrow \boxed{E = 2G(1+\mu)}$$

where

E = young's Modulus / Modulus of Elasticity.

G = Modulus of rigidity

μ = poisson's ratio.

Relation between Modulus of Elasticity & Bulk Modulus

Consider a cubic element subjected to stress p in 3 mutually perpendicular directions x, y, z.

Strain in x direction

$$e_x = \frac{P}{E} - \mu\frac{P}{E} - \mu\frac{P}{E}$$

$$e_x = \frac{P}{E}[1-2\mu]$$

Ily $e_y = \frac{P}{E}[1-2\mu]$

$$e_z = \frac{P}{E}[1-2\mu].$$

Volumetric strain $e_v = e_x + e_y + e_z$

$$e_v = \frac{P}{E}[1-2\mu] + \frac{P}{E}[1-2\mu] + \frac{P}{E}[1-2\mu]$$

$$e_v = \frac{P}{E}(1-2\mu)[1+1+1]$$

$$\boxed{e_v = \frac{3P}{E}[1-2\mu].}$$

6) A bar of 20mm diameter is tested in tension. When load of 37.7KN is applied an extension measured over a gauge length of 200mm is 0.12mm & contraction in diameter is 0.0036mm. Find.

a) Poisson's ratio

b) E (young's Modulus)

c) G (Modulus of Rigidity)

d) K (Bulk Modulus).

Solution

Given data.

diameter $d = 20mm$.

Load $P = 37.7KN = 37.7 \times 10^3 N$

$L = 200mm$.

$\delta L = 0.12mm$.

$\delta d = 0.0036mm$

$$Area = \frac{\pi d^2}{4} = \frac{\pi \times (20)^2}{4}$$

$$A = 314.16 mm^2$$

a) poisson's Ratio

$$\mu = \frac{\left(\frac{\delta d}{d}\right)}{\left(\frac{\delta L}{L}\right)} = \frac{\left(\frac{0.0036}{20}\right)}{\left(\frac{0.12}{200}\right)} = 0.3.$$

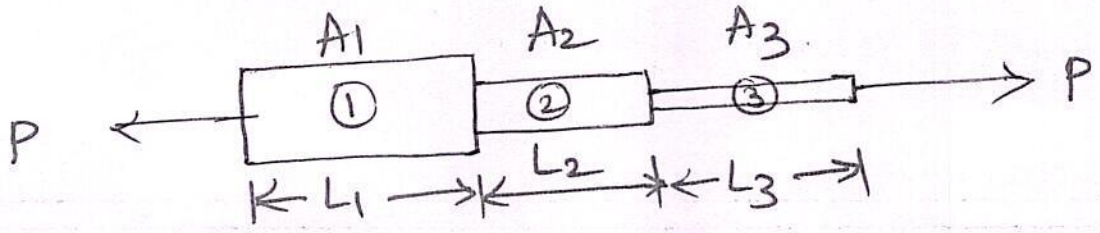
$\mu = 0.3$ Ans.

b) young's Modulus

$$\Delta = \frac{PL}{AE} \Rightarrow E = \frac{PL}{A\Delta}$$

Bars of Varying section

Consider a typical bar with cross sections varying in steps & subjected to axial load P. Let the length of three portions be L_1, L_2 & L_3 and cross sectional areas be A_1, A_2 & A_3 & E is the young's modulus of the material respectively.



Bar	Stress = $\frac{\text{Load}}{\text{Area}}$	Strain = $\frac{\text{Stress}}{E}$	Extension (Δ)
1	$\frac{P}{A_1}$	$\frac{P}{A_1 E}$	$\Delta_1 = \frac{PL_1}{A_1 E}$
2	$\frac{P}{A_2}$	$\frac{P}{A_2 E}$	$\Delta_2 = \frac{PL_2}{A_2 E}$
3	$\frac{P}{A_3}$	$\frac{P}{A_3 E}$	$\Delta_3 = \frac{PL_3}{A_3 E}$

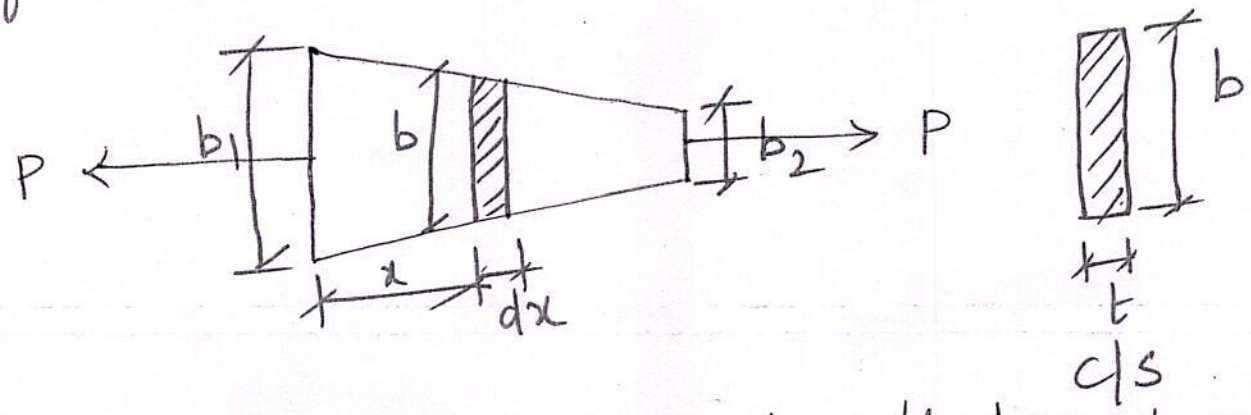
Hence total extension

$$\Delta = \Delta_1 + \Delta_2 + \Delta_3$$

$$\boxed{\Delta = \frac{PL_1}{A_1 E} + \frac{PL_2}{A_2 E} + \frac{PL_3}{A_3 E}}$$

Bars with Continuously Varying Cross Section

1) A bar of uniform thickness 't' tapers uniformly from a width of b_1 at one end to b_2 at other end in a length L. find the expression for the change in length of the bar when subjected to axial load P.



Sol: Consider a element of length dx at a distance x from larger end. Rate of change of breadth w.r.t length is $\frac{b_1-b_2}{L}$

hence width at section x is $b_1 - \left(\frac{b_1-b_2}{L}\right)x$

$= b_1 - Kx$.

where $\boxed{K = \frac{b_1-b_2}{L}}$ K is constant.

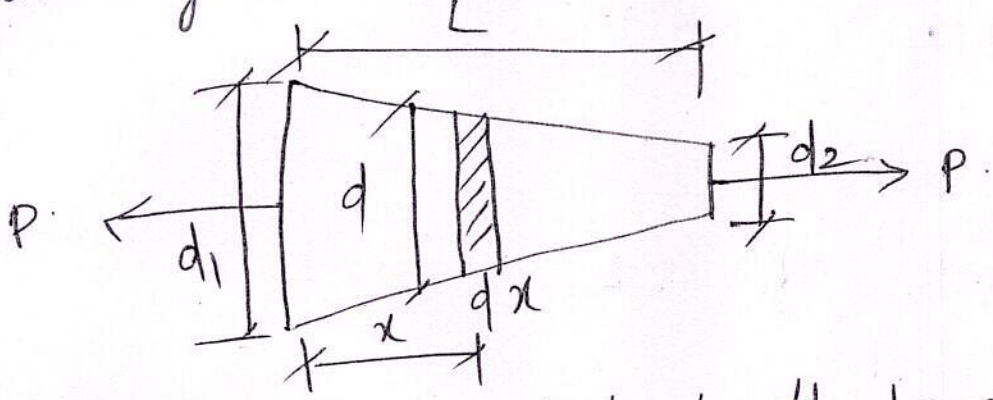
cross section area of element $A = t \times (b_1 - Kx)$

Extension $\Delta = \frac{PL}{AE}$.

where $L = dx$ & $A = t \times (b_1 - Kx)$

$$\Delta = \frac{P \times dx}{t \times (b_1 - Kx) \times E}$$

9) A tapering rod has diameter d_1 at one end & it tapers uniformly to a diameter d_2 at other end in a length L. If modulus of elasticity is E. find the extension/change in length when subjected to axial force P



Consider a elemental length dx at a distance x from larger diameter side. Rate of change in diameter along length $= \left(\frac{d_1 - d_2}{L}\right)$

The diameter at 'x'

$$d = d_1 - \left(\frac{d_1 - d_2}{L}\right) x$$

$$\boxed{d = d_1 - Kx}$$ K = constant.

where $$\boxed{K = \frac{d_1 - d_2}{L}}$$

cross sectional area

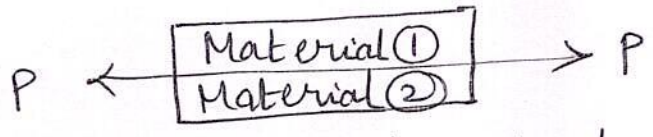
$$A = \frac{\pi \times (d_1 - Kx)^2}{4}$$

Total extension of bar

$$A = \int_{x=0}^{x=L} \frac{P \times dx}{\frac{\pi}{4}(d_1 - Kx)^2 \times E}$$

Stresses in Composite Bars / Compound Bars

Composite Bars:- The Bars that are made up of more than one material is known as the composite Bars. (or) Compound bars



If P_1 & P_2 are two loads applied then the total load $\boxed{P = P_1 + P_2}$

Let Δ_1, Δ_2 are the extensions then the total extension

$$\boxed{\Delta = \Delta_1 + \Delta_2}$$

By compatibility conditions

$$\boxed{\Delta_1 = \Delta_2}$$

$$\boxed{\frac{P_1 L_1}{A_1 E_1} = \frac{P_2 L_2}{A_2 E_2}}$$

10) A compound bar of length 500mm consists of a strip of aluminium 50mm wide × 20mm thick & a strip of steel 50mm wide × 15mm thick rigidly jointed at ends. If it is subjected to load of 50KN. find the stresses developed in each material & the extension of the bar. Take $E_{aluminium} = 1 \times 10^5$ N/mm^2 & $E_{steel} = 2 \times 10^5$ N/mm^2.

Substitute eq^n ③ in eq^n ① we get.

$$Pa + 1.5\,Pa = 50\times10^3$$

$$2.5\,Pa = 50\times10^3$$

$$Pa = \frac{50\times10^3}{2.5}$$

$$\boxed{Pa = 20000\ N.}$$

From eq^n ③

$$Ps = 1.5\,Pa$$

$$Ps = 1.5\times20000$$

$$\boxed{Ps = 30000\ N}$$

$$\text{Stress in aluminium strip} = \frac{Pa}{Aa}$$

$$= \frac{20000}{1000} = \underline{20\ N/mm^2}\ (\text{Ans})$$

$$\text{Stress in steel strip} = \frac{Pst}{Ast}$$

$$= \frac{30000}{750} = \underline{40\ N/mm^2}\ (\text{Ans})$$

Extension.

$$\Delta a = \frac{Pa\,La}{Aa\,Ea} = \frac{20000\times500}{1000\times1\times10^5} = \underline{0.1mm}\ (\text{Ans})$$

$$\Delta s = \frac{Ps\,Ls}{Ac\,Es} = \frac{30000\times500}{750\times2\times10^5} = \underline{0.1mm}\ (\text{Ans})$$

$\Rightarrow P_s = -P_c$.

$\Rightarrow \boxed{P_s = P_c}$ [As load cannot be negative value].

$\Rightarrow \boxed{P_s = P_c = P}$

Area of steel bolt

$$A_s = \frac{\pi d^2}{4} = \frac{\pi \times (16)^2}{4} = 201.062 mm^2$$

Area of copper tube

$$A_c = \frac{\pi \left(D^2 - d^2\right)}{4} = \frac{\pi \left[(30)^2 - (20)^2\right]}{4} = 392.699 m$$

But we know

$$\Delta = \Delta_s + \Delta_c$$

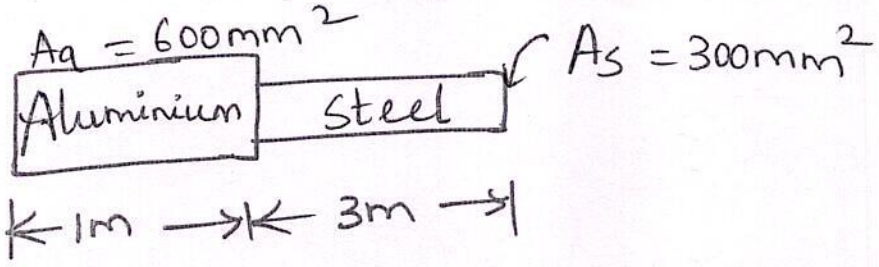
$$0.5 = \frac{P_s L_s}{A_s E_s} + \frac{P_c L_c}{A_c E_c}$$

$$0.5 = \frac{P \times 500}{201.062 \times 2 \times 10^5} + \frac{P \times 500}{392.699 \times 1.2 \times 10^5}$$

$$0.5 = P \left[\frac{(500)}{(201.062 \times 2 \times 10^5)} + \frac{(500)}{(392.699 \times 1.2 \times 10^5)} \right]$$

$\Rightarrow \boxed{P = 21697.331 N.}$

12) A composite bar is rigidity fitted at the supports. Determine the reaction at supports when temperature rises by 20°C. Take $E_a = 7 \times 10^4 \text{ N/mm}^2$, $E_s = 2 \times 10^5 \text{ N/mm}^2$; $\alpha_a = 11 \times 10^{-6}/^\circ\text{C}$ & $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$.



Sol

Given data.

$t = 20^\circ\text{C}$

$E_a = 7 \times 10^4 \text{ N/mm}^2$; $\alpha_a = 11 \times 10^{-6}/^\circ\text{C}$

$E_s = 2 \times 10^5 \text{ N/mm}^2$; $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$.

$A_a = 600\text{mm}^2$; $L_a = 1\text{m} = 1000\text{mm}$

$A_s = 300\text{mm}^2$; $L_s = 3\text{m} = 3000\text{mm}$.

We know

$$\Delta = \Delta_a + \Delta_s$$

$$\Delta = \alpha_a t L_a + \alpha_s t L_s$$

$$\Delta = (11 \times 10^{-6} \times 20 \times 1000) + (12 \times 10^{-6} \times 20 \times 3000)$$

$$\boxed{\Delta = 0.94\text{mm}}$$

Let P is support reaction.

Total extension $\boxed{\Delta = \Delta_a + \Delta_s}$

$$\Delta = \frac{PL_a}{A_a E_a} + \frac{PL_s}{A_s E_s}$$

$10^\circ C$ there is no longitudinal stress. Calculate the stresses in rod & tube when the temperature raised to $200^\circ C$. Take $E_{steel} = 2.1 \times 10^5 N/mm^2$ & $E_{copper} = 1 \times 10^5 N/mm^2$.

$\alpha_{steel} = 11 \times 10^{-6}/^\circ C$; $\alpha_{copper} = 18 \times 10^{-6}/^\circ C$.

[∵ Take load on copper = load on steel].

01. Given data

steel tube — external dia $D = 30mm$

— Internal dia $d = 20mm$.

Copper rod dia $= 15mm$.

$t_1 = 10^\circ C$ $t_2 = 200^\circ C$. $\Rightarrow t = t_2 - t_1 = 200 - 10 = 190^\circ C$

$E_{steel} = 2.1 \times 10^5 N/mm^2$; $E_{copper} = 1 \times 10^5 N/mm^2$.

$\alpha_{steel} = 11 \times 10^{-6}/^\circ C$; $\alpha_{copper} = 18 \times 10^{-6}/^\circ C$.

Area of steel tube $= \frac{\pi[D^2 - d^2]}{4} = \frac{\pi[(30)^2 - (20)^2]}{4} = 392.69 mm^2$

Area of copper rod $= \frac{\pi d^2}{4} = \frac{\pi \times (15)^2}{4} = 176.71 mm^2$

As given load on copper = load on steel.

$$\boxed{P_c = P_s = P} \quad [\text{Assume as } P].$$

By using compatability conditions considering the thermal stress.

$$\Delta_s = \Delta_c$$

As length is not given take $L_s = L_c = L$

Stress in steel tube $= \frac{P_s}{A_s}$

$= \frac{19354.95}{392.69}$

Stress in steel tube $= 49.288\ N/mm^2$ [Ans]

Stress in copper rod $= \frac{P_{cu}}{A_{cu}}$

$= \frac{19354.95}{176.71}$

Stress in copper rod $= 109.52\ N/mm^2$ (Ans).

Strain Energy: The energy stored in a body due to straining of the body is known as the strain energy.

$$\text{Strain Energy} = \frac{1}{2} \times \text{stress} \times \text{strain} \times \text{Volume}$$

$$\left\{\text{Strain} = \frac{\text{stress}}{E}\right\}$$

$$\text{Strain Energy} = \frac{1}{2} \times \text{stress} \times \frac{\text{stress}}{E} \times \text{Volume}$$

$$\{\text{Volume} = \text{Area} \times \text{length}\}$$

$$\text{Strain Energy} = \frac{1}{2} \times \frac{(\text{stress})^2}{E} \times \text{Area} \times \text{length}$$

Workdone $= \frac{P}{2} \times e \times L$

Workdone = Strain Energy

$\frac{P \times e \times L}{2} = \frac{1}{2} \times \text{stress} \times \text{strain} \times \text{Area} \times \text{Length}$

$$\text{stress} = \frac{P}{\text{Area}}$$

where
$P \rightarrow$ load applied

2) Sudden Load:- Incase of suddenly applied load the value of load is directly taken as 'P'. Consider a bar of length 'L' & cls A subjected to load P & the extension is Δ.

Work done by load $= P \times \Delta$

strain = e

$\Delta = eL$

Work done by load $= P \times e \times L \rightarrow$ eqn (1)

Strain Energy $= \frac{1}{2} \times \text{stress} \times e \times \text{Area} \times \text{Length}$

[$\because$ Volume = Area × Length]

$\rightarrow$ eqn (2)

Now eqn (1) = eqn (2)

$P \times e \times L = \frac{1}{2} \times \text{Stress} \times e \times \text{Area} \times \text{Length}$

$$\Rightarrow \text{Stress} = \frac{2P}{\text{Area}}$$

where
$P \rightarrow$ Applied load.

$$\Rightarrow S.E = \frac{(\text{stress})^2 \times \text{Area} \times \text{length}}{2E} \rightarrow eq^n (4)$$

Now equate.

equation (3) = eq^n (4).

$$P \times \left[h + \frac{(\text{stress}) L}{E} \right] = \frac{(\text{stress})^2 \times AL}{2E}$$

$$\Rightarrow \frac{2PE}{AL} \left[h + \frac{(\text{stress}) L}{E} \right] = (\text{stress})^2$$

$$\Rightarrow \frac{2PEh}{AL} + \frac{2PEL}{A \times L \times E} (\text{stress}) = (\text{stress})^2.$$

$$\Rightarrow (\text{stress})^2 - \left(\frac{2P}{A}\right)(\text{stress}) - \frac{2PEh}{AL} = 0.$$

It is in the form of

$$ax^2 + bx + c = 0$$

where x = stress. The constants are

$a = 1$; $b = -\frac{2P}{A}$ $c = -\frac{2PEh}{AL}$

The roots of equation $ax^2 + bx + c$ is found by using $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Hence by solving we get the value of

5.) A tensile load of 60KN is gradually applied to a circular bar of 4cm diameter & 5m long. If the value of $E = 2.0 \times 10^5 N/mm^2$ Determine

1) Stress due to gradual load.
2) Strain
3) Strain Energy.

Solution

Given data.

Load $P = 60KN = \underline{60 \times 10^3 N}$.

diameter $= 4cm = 40mm$.

$$\text{Area} = \frac{\pi d^2}{4} = \frac{\pi \times (40)^2}{4} = \underline{1256.63 mm^2}$$

Length $= 5m = 5000mm$.

$E = 2.0 \times 10^5 N/mm^2$

1) Stress due to gradual load.

$$\text{Stress} = \frac{P}{A} = \frac{60 \times 10^3}{1256.63} = \underline{47.746 N/mm^2} \text{ (Ans)}$$

2) $$\text{Strain} = \frac{\text{Stress}}{E} = \frac{47.746}{2.0 \times 10^5} = \underline{2.38 \times 10^{-4}} \text{ (Ans)}$$

3) Strain Energy $= \frac{1}{2} \times \text{stress} \times \text{strain} \times \text{Area} \times \text{Length}$

$$= \frac{1}{2} \times 47.746 \times 2.38 \times 10^{-4} \times 1256.63 \times 5000$$

$$\underline{\text{Strain Energy} = 35699.43 \text{ N-mm (Ans)}}$$

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory / **Drawing** / **Practical**

II Year I Semester B.Tech Course Civil Branch S.H.I Subject

Name of Teacher (s) 1. G. Sahithi **2.** **Academic Year :** 2021–2022.

Sl. No.	Periods			Topic Covered
	Day	Time	Date	
(1)	(2)	(3)	(4)	(5)
1	Thursday	11:35AM–12:25PM	21/10/21	Unit-I Introduction to elasticity & plasticity types of stresses.
2	Friday	9:00AM–9:50AM	22/10/21	Types of strains-Hooke's Law.
3	Saturday	10:45AM–11:35AM	23/10/21	Stress-strain diagram for mild steel.
4	Monday	10:45AM–11:35AM	25/10/21	Working stress-F.O.S-Lateral strain poisson's ratio & its values
5	Tuesday	1:10PM–2:00PM	26/10/21.	Problems related to stress strain & elongation
6	Thursday	11:35AM–12:25PM	28/10/21	Problems on relation b/w stress strain &
7	Friday	9:00AM–9:50AM	29/10/21	Elastic modulii & relationship.
8	Friday	2:50PM–3:35PM	29/10/21	Problems on relation b/w elastic constants
9	Saturday	10:45AM–11:35AM	30/10/21.	Bars of varying c/s.
10	Monday	10:45AM–11:35AM	1/11/21	Problems on bars of varying c/s
11	Tuesday	1:10PM–2:00PM	2/11/21.	Description of composite bars.
12	Friday	9:00AM–9:50AM	5/11/21.	Problems on composite bars.
13	Friday	2:50PM–3:35PM	5/11/21.	Temparature stresses, problems
14	Saturday	10:45AM–11:35AM	6/11/21	Strain energy-Resilience-Gradual Sudden, impact, shock loads.
15	Monday	10:45AM–11:35AM	8/11/21.	Problems on strain energy-Tutorial
16	Tuesday	1:10PM–2:00PM	9/11/21	Unit-II Definition of beam-Types of beams.
17	Thursday	11:35AM–12:25PM.	11/11/21	Concept of shear force & Bending moment
18	Friday	9:00AM–9:50AM	12/11/21	Different types of loadings.
19	Friday	2:50PM–3:35PM.	12/11/21	Conversion of udl, uvl into point loads
20	Monday	10:45AM–11:35AM	15/11/21.	S.F & BM diagrams for SSB subjected to point loads, udl, loadings.
21	Tuesday	1:10PM–2:00PM.	16/11/21	S.F & BMD for SSB subjected to udl loadings
22	Thursday	11:35AM–12:25PM	18/11/21	S.F.D & BMD for cantilever subjected to point loads, udl, uvl loading
23	Friday	9:00AM–9:50AM	19/11/21	S.F.D & B.M.D for cantilever subjected to uvl
24	Saturday	10:45AM–11:35AM	20/11/21	Overhanging beams, Relation b/w S.F, B.M, rate of loading.
25	Monday	10:45AM–11:35AM	22/11/21	Problems on calculation of SFD, BMD for SSB with point loads
26	Tuesday	1:10PM–2:00PM	23/11/21	SFD, BMD for SSB udl.
27	Thursday	11:35AM–12:25PM	25/11/21	SFD, BMD for cantilever subjected to combination load
28	Friday	9:00AM–9:50AM.	26/11/21.	SFD & BMD for cantilever subjected to udl
29	Saturday	10:45AM–11:35AM	27/11/21	SFD & BMD for cantilever combination loads
30	Monday	10:45AM–11:35AM	29/11/21	SFD, BMD for overhanging beams
31	Tuesday	1:10PM–2:00PM.	30/11/21.	Problems on calculation of SFD BMD for overhanging subjected beams (tutorial)
32	Thursday	11:35AM–12:25PM	2/12/21	Unit-III Theory of simple bending.
33	Friday	9:00AM–9:50AM	3/12/21	Assumptions of simple bending
34	Friday	2:50PM–3:35PM	3/12/21	Derivation of $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$
35	Saturday	10:45AM–11:35AM	4/12/21	Definition of bending stresses
36	Saturday	1:10PM–2:00PM	4/12/21.	Section modulus.
37	Monday	10:45AM–11:35AM	6/12/21	Section modulus for rectangular circular sections (solid, Hollow)
38	Tuesday	1:10PM–2:00PM	7/12/21	Z for I, T sections.
39	Thursday	11:35AM–12:25PM	9/12/21.	Z for angle sections
40	Friday	9:00AM–9:50AM	10/12/21	Z for channel sections

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓ Drawing Practical

II Year I Semester B.Tech Course Civil Branch S.N-T Subject

Name of Teacher (s) 1. G. Sahitha

2.

Academic Year

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Friday	9:00AM – 9:50AM	10/12/21	Problems on Z-fs standard sections	61	Thursday	11:35AM – 12:25PM	20/1/22	slope, deflection SSB point load
42	Monday	10:45AM – 11:35AM	13/12/21	Problems on Z-fs standard sections	62	Friday	9:00AM – 9:50AM	21/1/22	slope, deflection SSB udl.
43	Tuesday	1:10PM – 2:00PM	14/12/21	Problems on bending stresses.	63	Friday	2:50PM – 3:35PM.	21/1/22	slope deflection SSB UVL.
44	Thursday	11:35AM – 12:25PM	16/12/21.	problems on bending stresses	64	Saturday	10:45AM – 11:35AM	22/1/22	Macaulay's methods, Momentare method
45	Friday	9:00AM – 9:50AM	17/12/21	Problems on bending stresses	65	Saturday	1:10PM – 2:00PM	22/1/22	Mohr's theorem (Tutorial)
46	Friday	2:50PM – 3:35PM	17/12/21	Derivation of formula fs shear stress	66	Monday	10:40AM – 11:35AM.	24/1/22	Introduction to thin thick cylinde
47	Saturday	10:45AM – 11:35AM	18/12/21	Introduction to shear stress distribution	67	Tuesday	1:10PM – 2:00PM	25/1/22	Derivation fs hoop, Longitudinal str.
48	Saturday	1:10PM – 2:00PM	18/12/21	shear stress across various beam sections i.e rectangular	68	Thursday	11:35AM – 12:25PM	27/1/22	Volumetric strain
49	Monday	10:45AM – 11:35AM	20/12/21	Circular section	69	Friday	9:00AM – 9:50AM	28/1/22	changes in dia, thin spherical
50	Tuesday	1:10PM – 2:00PM	21/12/21	Triangular section.	70	Friday	2:50PM – 3:35PM	28/1/22	Lames theory derivation
51	Thursday	11:35AM – 12:25PM	23/12/21	I section.	71	Monday	10:40AM – 11:35AM	31/1/22	Hoop & radial stress
52	Friday	9:00AM – 9:50AM	24/12/21	T section.	72	Tuesday	1:10PM – 2:00PM	1/2/22	Design of thick cylinders
53	Monday	10:45AM – 11:35AM	27/12/21.	SSD fs built up section	73	Thursday	11:35AM – 12:25PM	3/2/22	Compound cylinders sum, thick spherical
54	Tuesday	1:10PM – 2:00PM	28/12/21	SSD fs various standard sections	74	Friday	9:00AM – 9:50AM	4/2/22	Problems on cylinders
55	Thursday	11:35AM – 12:25PM	30/12/21	SSD fs various standard sections	75	Friday.	2:50PM – 3:35PM	4/2/22	Revision. 4/2/22
56	Friday	9:00AM – 9:50AM	31/12/21	SSD in T section	76				
57	Monday	10:45AM – 11:35AM	10/1/22	S.S.D in T, built up sections (4)	77				
58	Tuesday	1:10PM – 2:00PM	11/1/22	Unit-IV Bending & integration, slope, deflections, radius of curvature	78				
59	Monday	10:45AM – 11:35AM	17/1/22	Double integration, determination of slope, deflection (cantilever, point E	79				
60	Tuesday	1:10PM – 2:00PM	18/1/22	slope, deflection cantilever udl, UVL.	80				

5/2/22

Website: www.jntuk.edu.in
Email: dap@jntuk.edu.in

Phone: 0884-2300991

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. DAP/RAC/ II,III & IV Year /B. Tech/B. Pharmacy/2021 *Date 08.10.2021*

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Revised Academic Calendar for II, III, IV Year - B. Tech/B. Pharmacy for the AY 2021-22
(As per G.O. Rt. No. 242, Higher Education (U.E) Dept., dated 13.09.2021)

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**01.10.2021**		
I Unit of Instruction	01.10.2021	20.11.2021	7W
I Mid Examinations	22.11.2021	27.11.2021	1W
II Unit of Instructions	29.11.2021	15.01.2022	7W
II Mid Examinations	17.01.2022	22.01.2022	1W
Preparation & Practicals	24.01.2022	29.01.2022	1W
End Examinations	31.01.2022	12.02.2022	2W
Commencement of II Semester Class Work	**14.02.2022**		
II SEMESTER			
I Unit of Instructions	**14.02.2022**	02.04.2022	7W
I Mid Examinations	04.04.2022	09.04.2022	1W
II Unit of Instructions	11.04.2022	28.05.2022	7W
II Mid Examinations	30.05.2022	04.06.2022	1W
Preparation & Practicals	06.06.2022	11.06.2022	1W
End Examinations	13.06.2022	25.06.2022	2W
Commencement of next Year Class Work			
Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period			

R. Srinivasa Rao
Director Academic Planning

Director
Academic Planning
JNTUK Kakinada

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK
Copy to Rector, Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Electrical and Electronics Engineering

SRKIT / EEE / 09

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

Academic year: 2021 - 22

Semester: II

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
1	Mr. M. Sathis Kumar	--	--	SEMINAR, PROJECT	--	18+3=21	Poject Coordinator	
2	Mr. S. Nageswara Rao	DCS,BEE	EEE, ECE	ISM, PE	EEE, EEE	6+6+6+3=21	PRC Member, ISO Work, ISM Lab In-Charge	
3	Mr. K. Narendra Babu	ISM, PSA,	EEE	ISM,BEE, PROJECT	EEE,	6+6+6+3+4=25	PRC Member, ISO Work, DCMT Lab In-Charge	
4	Mr. K. Satyanarayana	DCS, ECA-I	EEE	IoT, PE PROJECT	EEE	6+6+6+3+4=25	PRC Member, ISO In-charge, CS, IoT Lab In-Charge	K. Satyanar
5	Mr. P. Bhavana	Study Leave						
6	Ms. T. Maha Lakshmi	PP, BEE	EEE, ECE	PP, BEEE, PROJECT	EEE, ECE	6+6+6+6+4=28	PRC Member, ISO Work, II EEE class teacher, EC Lab In-Charge	
7	Mr. N.E.K. Chanadra	FACTS, PS-I	EEE	BEE SEMINAR	ECE	6+6+6+6+4=28	PRC Member, ISO Work, IV EEE class teacher, PS Lab In-Charge	N.E.K. Cha
8	Mr. B. Indraja	EDS,ED	EEE	IoT, ISM, PROJECT	EEE	6+6+6+3+4=25	PRC Member, ISO Work, III EEE class teacher, PE Lab In-Charge	T.S.I.
9	Mr. T. Venkateswara Rao	BEEE	ME	BEEE, PROJECT	ME	6+3+4=13	ISO Work	
10	Ms. Vijayasri	HVDC,NA	EEE, ECE	PROJECT	EEE	6+6+6+4=22	PRC Member, ISO Work	

HOD/ Date 9/2/22

Principal / Date

	SRK INSTITUTE OF TECHNOLOGY **Enikepadu, Vijayawada 521108** **Department of Electrical and Electronics Engineering** **CLASS TIME TABLE**	**SRKIT / EEE / 10.1**

Academic Year: 2021-22 **Class: III/IV B.TECH EEE** **Semester: II**

Time Table w.e.f : 14/2/2022

Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:45	2:50 to 3:35	3:35 to 4:20
Period	1	2	3	4		5	6	7	8
MON	ED	DICA	PSA	DCS		ES	C++	PSA	DS
TUE	DCS	PSA	C++	DS		MPMC LAB			
WED	PSA	C++	DCS	ED		PE LAB			
THU	DCS	ED	DICA	DS		DS	ED	DICA	DS
FRI	ED	PSA	DICA	DCS		DS	DICA	C++	DCS
SAT	DS	C++	PSA	ED		DCS	C++	ED	DICA

Faculty:

Electric Drives : Ms. B. Indraja
Power System Analysis : Mr. K. Narendra Babu
Data Structures : Mr. Ch. Siva Rajesh
Digital Control Systems : Mr. S. Nageswara Rao
Elective – I: Digital IC Applications :Ms. N.Kalavathi
Open Elective – I: C++ :Ms. K. Chandana
Power Electronics Laboratory : Mr. S. Nageswara Rao/ Mr. K.Satyanarayana
Microprocessors & Microcontrollers Laboratory: Mr. B.S.S. Tejesh
Employability Skills : Mr. V. Yellamanda

HoD/ Date 14/2/22

S. Sri Gouri
IQAC Coordinator/Date

Principal/ Date

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Electrical and Electronics Engineering** **INDIVIDUAL TIME TABLE**	**SRKIT/EEE/10.2**

Academic Year: 2021-22 **Semester: II**

S. NAGESWARA RAO

II Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:40	11: 40 to 12:30	LUNCH	1:10 to 1:55	1:55 to 2:40	2:50 to 4:50	
III Time	9:00 to 11:00		11:10 to 12:00	12:00 to 12:50		1:30 to 2:20	2:20 to 3:10	3:20 to 4:05	4:05 to 4:50
Period	1	2	3	4		5	6	7	8
MON		BEE		DCS			ISM LAB		
TUE	DCS							BEE	BEE
WED				BEE		PE LAB			
THU			DCS			BEE	ISM LAB		
FRI				DCS		BEE			DCS
SAT						DCS	BEE		

Signature of Faculty: S. Nageswara Rao Signature of HOD:

K. NARENDRA BABU

II Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:40	11: 40 to 12:30	LUNCH	1:10 to 1:55	1:55 to 2:40	2:50 to 4:50	
III Time	9:00 to 11:00		11:10 to 12:00	12:00 to 12:50		1:30 to 2:20	2:20 to 3:10	3:20 to 4:05	4:05 to 4:50
Period	1	2	3	4		5	6	7	8
MON	ISM		PSA					PSA	
TUE		PSA						ISM	
WED	PSA		ISM				ISM		
THU	BEE LAB						ISM LAB		
FRI		PSA					ISM	BEE LAB	
SAT			PSA			PROJECT	ISM	PROJECT	

Signature of Faculty: Signature of HOD:

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Electrical and Electronics Engineering

SRKIT / EEE /12

TEACHING PLAN CUM REALIZATION

Department: **EEE** Name of faculty: **Mr.K.Narendra Babu** Designation: **Assistant Professor**

Semester / Year: **III/II** Name of the subject: **Power System Analysis**

S.No	Unit/Topic	Teaching Planed	Taught on (Date)	No. of Periods (Actual)	Remarks (if any)
	UNIT-I Circuit Topology & Per Unit Representation		22.02.22	1	
1	Formation of element node incidence		26.02.22	1	
2	Formation of bus incidence matrices		26.02.22	1	
3	Formation of bus incidence matrices		26.02.22	1	
4	Primitive network representation		26.02.22	1	
5	Primitive network representation		04.03.22	1	
6	Formation of Ybus matrix by singular transformation	**14-02-2022 TO 15.03.2022**	05.03.22	1	
7	Formation of Ybus matrix by singular transformation		05.03.22	1	
8	problems		07.03.22	1	
9	Formation of Ybus direct inspection methods		07.03.22	1	
10	Per Unit Quantities		14.03.22	1	
11	**Tutorial**		15.03.22	1	
12	problems		16.03.22	1	
13	Single line diagram		17.03.22	1	

14	Single line diagram		19.03.22	1	
15	problems		24.03.22	1	
16	**UNIT-II Power Flow Studies**				
17	Necessity of power flow studies		29.03.22	1	
	Derivation of static power flow equations		29.03.22		
18	Types of buses		30.03.22	1	
19	Power flow solution using Gauss-Seidel Method		30.03.22	1	
20	Power flow solution using Gauss-Seidel Method	**16-03-2022 TO 26-03-2022**	06.04.22	1	
21	**Tutorial**		07.04.22	1	
22	Newton Raphson Method (Rectangular coordinates form)		08.04.22	1	
23	problems		20.04.22	1	
24	Newton Raphson Method (polar coordinates form)		21.04.22	1	
25	Decoupled and Fast Decoupled methods		22.04.22	1	
26	Algorithmic approach		23.04.22	1	
27	Problems on 3–bus system only.		25.04.22	1	
28	**Tutorial**		25.04.22	1	
29	Problems on 3–bus system only.		25.04.22	1	

	UNIT-III Z-Bus Algorith & Symmetrical Fault Analysis & Symmetrical Fault Analysis				
30	Z-Bus Algorith introduction		26.4.22	1	
31	Formation of Zbus		27.04.22	1	
32	Algorithm for the Modification of Zbus Matrix ((without mutual impedance).		28.04.22	1	
33	Algorithm for the Modification of Zbus Matrix ((without mutual impedance).	**28-03-2022 TO 9-04-2022**	30.04.22	1	
34	Algorithm for the Modification of Zbus Matrix ((without mutual impedance).		02.05.22	1	
35	Tutorial		04.05.22	1	
36	Symmetrical Fault Analysis introduction		05.05.22	1	
37	Reactances of Synchronous Machine		07.05.22	1	
38	Three Phase Short Circuit Currents in a alternator		09.05.22	1	
39	Three Phase Short Circuit Currents in a transformer		10.05.22	1	
40	Short circuit MVA calculations for Power Systems.		12.05.22	1	
41	**UNIT-IV Symmetrical Components & Fault analysis**		13.05.22	1	
42	symmetrical components of unbalanced three phase systems		16.05.22	1	
	Power in symmetrical components		17.05.22		

43	Sequence impedances of Synchronous generator	20-04-2022 TO 07-05-2022	18.05.22	1	
44	Sequence impedances of Transmission line		20.05.22	1	
45	Sequence impedances of transformers Sequence networks		20.05.22	1	
46	faults LG & LL on unloaded alternator		21.05.22	1	
47	faults LLG and LLL on unloaded alternator		21.05.22	1	
48	unsymmetrical faults on power system		23.05.22	1	
49	unsymmetrical faults on power system			1	
50	**UNIT-V Power System Stability Analysis**	09-05-2022 TO 28-05-2022		1	
51	Elementary concepts of Steady state – Dynamic Stabilities		24.05.22	1	
52	Description of Steady State Stability Power Limit		24.05.22	1	
53	Power Angle Curve and Determination of Steady State Stability		25.05.22	1	
54	Derivation of Swing Equation		25.05.22	1	
55	Determination of Transient Stability by Equal Area Criterion		30.05.22	1	
56	Applications of Equal Area Criterion		30.05.22	1	
57	Methods to improve steady state and transient stability		31.05.22	1	

Faculty/ Date 9/5/22 28/5/22

HOD/Date 28/5/22

Power System Analysis

Unit - 1

Per unit Representation & Topology

A typical power system consists of a 3-φ grid to which all generating stations feeds energy and from which all substations taps energy. From the substations electrical energy transmitted to distribution transformers and from the distribution transformers the energy is fed to various loads.

The components of power system are generating stations power transformers, Transmission lines, Substations, Distribution transformers and loads like Synchronous motors, Induction motors, Heating coils etc

The various components of power system and their interconnections are usually represented by single-line diagram. In a single line diagram the components are represented by standard symbols and their interconnection shown by single line, even though they are three phase circuits.

Single line Diagram:-

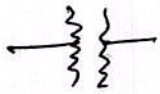
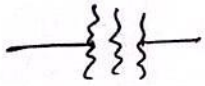
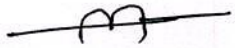
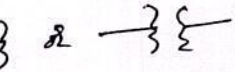
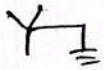
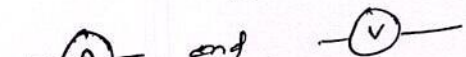
A balanced 3φ system is always analysed on per ~~basis~~ phase basis by considering one of the three phase lines and neutral. Hence it is enough if we show one phase and neutral in the diagrammatic representation of power system. The diagram is further simplified by omitting the neutral and so the resultant diagram will be single line diagram.

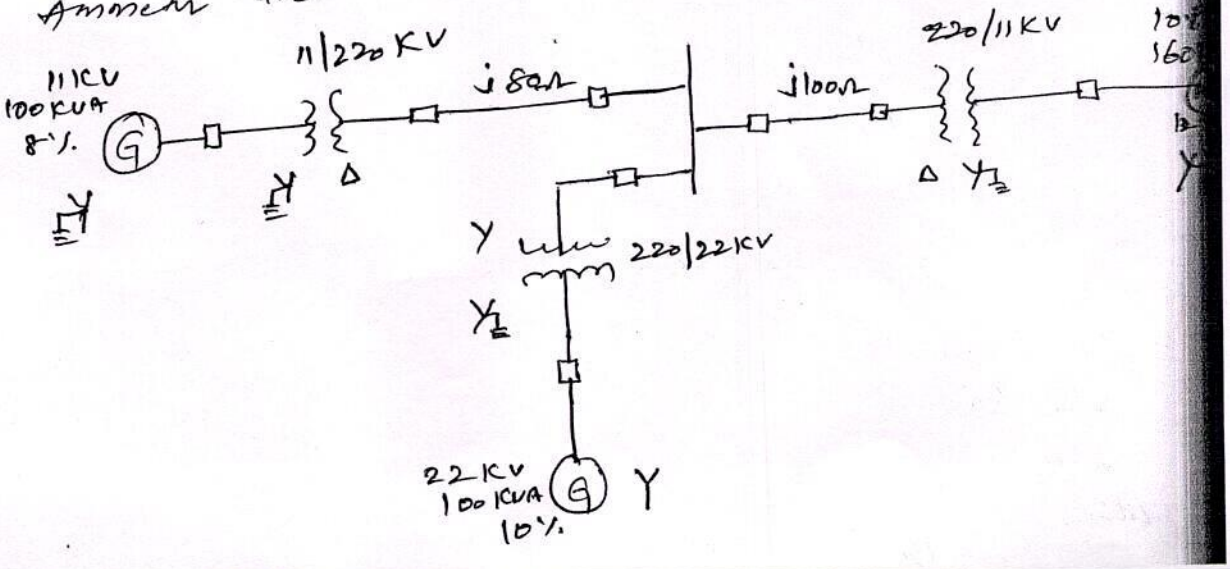
In a single line diagram representations of the PS, the components of the system are represented by standard symbols, and transmission lines are represented by straight lines. Hence single line diagram is diagrammatically representation of PS in which the components are represented by their symbols and interconnections b/w them are shown by straight lines.

Besides the ... Components are also marked on the single line diagram.

The purpose of the single-line diagram is to supply in concise form the significant information about the system.

Symbols used in single line Diagram

1. Machine (or) Rotating Armature 
2. Two winding Transformer 
3. Three winding Transformer 
4. Fuse 
5. Current Transformer 
6. potential Transformer 
7. Down circuit breaker 
8. Air circuit Breaker 
9. 3φ, 3 wire Delta Connection 
10. 3φ - Star neutral ungrounded
11. 3φ star neutral grounded 
12. Ammeter and voltmeter 



Per unit Quantities:

The electric power transmission lines are operated at high voltage levels and transmits large amount of power. Hence the operating voltage of the line is expressed in KV and power transmitted in KW or MW and KVA or MVA.

The various components of power system like alternators, motors, transformers etc have their voltage, power, current and impedance rating in KV, KVA, KA and Ω (ohms) respectively.

The components of various section of power system may operate at different voltage and power levels. It will be convenient for analysis of power system if the voltage, power, current and impedance of components of power system are expressed with reference to common value called base value. Here for analysis purpose a base value is chosen for voltage, power, current and impedance. Then all the voltage, power, current and impedance ratings of the components are expressed as percent or per unit of the base value.

The per unit value of any quantity is defined as the ratio of the actual value of the quantity to the base value expressed as a decimal. The ratio is percent is 100 times the value of per unit. The base value is an arbitary chosen value of the quantity.

$$\text{per unit value} = \frac{\text{Actual value}}{\text{Base value}}.$$

$$\% \text{ per unit value} = \frac{\text{Actual value}}{\text{Base value}} \times 100.$$

The power system requires the base values of four quantities and they are voltage, power, current and impedance. Selecting base values for any two of them determines the base value of the remaining two.

Single phase System : Load

Let KVA_b = Base KVA

KV_b = Base voltage in KV

I_b = Base current in Amp

Z_b = Base impedance in Ω

Base current $I_b = \frac{KVA_b}{KV_b}$ in amps

Base impedance : $Z_b = \frac{KV_b \times 1000}{I_b}$ in Ω

$$Z_b = \frac{KV_b \times 1000}{\frac{KVA_b}{KV_b}} = \frac{(KV_b)^2 \times 1000}{KVA_b} = \frac{(KV_b)^2}{\left(\frac{KVA_b}{1000}\right)}$$

$$\boxed{Z_b = \frac{KV_b^2}{MVA_b} \text{ in } \Omega}$$

$$\text{percent impedance} = \frac{\text{Actual impedance, } \Omega}{\text{Base impedance, } \Omega}$$

3-phase System : Load

Balanced Star Connected load

Let P = 3φ active power of star connected load in watts

Q = 3φ reactive power of star connected load in VAR

V, V_L = phase & line voltage of load respectively

I, I_L = phase & line current of load respectively

WKT 3φ complex power $S = 3VI^* = P + jQ$ — (1)

$$3VI^* = P + jQ$$

$$(3VI^*)^* = (P + jQ)^*$$

$$3V^*I = P - jQ \quad — (2)$$

$$\boxed{I = \frac{P - jQ}{3V^*}} \quad — (3)$$

Let $V = |V| \angle\delta$; $V^* = |V| \angle -\delta$.

In star $V = V_{ph} = \frac{V_L}{\sqrt{3}}$ & $I = I_L$

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓ **Drawing** **Practical**

Name of Teacher (s) 1. III Year II Semester B.TECH Course EEE Branch PSA Subject

2. K. Narendra Babu **Academic Year** 2021-22

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5) Unit-2	(1)	(2)	(3)	(4)	(5)
1	Tuesday	11:35-12:25	22.02.22	circuit Topology introduction	21	Friday	10:45-11:35	25.03.22	Types of Buses, need of slack bus
2	Saturday	9:50-10:40	26.02.22	Graph Theory definition	22	Wednesday	1:10-2:00	30.03.22	Basic flow equation in GS method
3	Saturday	10:50-11:35	26.02.22	Element node incidence matrix	23	Wednesday	2:00-2:50	06.04.22	Algorithm
4	Saturday	2:50-3:35	26.02.22	Element Bus incidence matrix	24	Thursday	9:00-9:50	07.04.22	Flow chart equation GS method
5	Monday	11:35-12:25	28.02.22	Branch - path incidence matrix	25	Friday	9:00-9:50	8.04.22	Numerical problem
6	Friday	9:00-9:50	04.03.22	problems on A.A and K.	26	Wednesday	11:35-12:25	20.04.22	Tutorial
7	Saturday	9:50-10:40	05.03.22	Basic cut set incidence matrix B.A	27	Thursday	9:00-9:50	21.04.22	Flow chart equation NR method
8	Saturday	10:40-11:30	05.03.22	Basic loop open loop matrix C.C	28	Friday	9:50-10:40	22.04.22	Static and Flow equation
9	Monday	10:45-11:35	07.03.22	Numerical problems	29	Saturday	9:50-10:40	23.04.22	Algorithm of NR method
10	Monday	11:35-12:25	07.03.22	Formation of Y Bus Derivation	30	Monday	9:00-9:50	25.04.22	Flow chart of NR method
11	Monday	11:35-12:25	07.03.22	Forming Y Bus singular transform	31	Monday	10:35-11:25	25.04.22	Fast Decoupled method
12	Tuesday	1:10-1:55	15.03.22	Primitive network matrices.	32	Wednesday	11:35-12:25	27.04.22	Tutorial Unit-IV
13	Tuesday	1:55-2:40	15.03.22	YBus : A[y] A problems	33	Tuesday	9:00-9:50	26.04.22	Symmetrical fault analysis
14	Wednesday	9:50-10:40	16.03.22	Forming YBus by Direct Inspection method	34	Wednesday	11:35-12:25	27.04.22	Transients due to SC on Alternator
15	Thursday	9:55-10:55	17.03.22	Numerical problem on Y Bus	35	Thursday	9:00-9:50	28.04.22	Transients due to SC in Transmission line
16	Saturday	1:10-2:00	19.03.22	Numerical problems Tutorial.	36	Saturday	11:35-12:25	30.04.22	Transient due to SC in Alternator
17	Thursday	11:10-12:00	24.03.22	per unit quantities Unit-II	37	Monday	11:35-12:25	02.05.22	Sub transient reactance of Alternator
18	Friday	9:00-9:50	25.03.22	power flow studies	38	Wednesday	11:35-12:25	04.05.22	3Ø fault current calculation
19	Tuesday	9:00-9:50	29.03.22	Formation of load flow equation of YBus	39	Thursday	9:00-9:50	5.5.22	Tutorial
20	Wednesday	2:10-2:60	30.03.22	Static load flow equation	40	Saturday	1:10-2:00	7.5.22	Problem

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

III Year II Semester BTECH Course EEE Branch PSA Subject

Theory / Drawing / Practical

Name of Teacher (s) 1.

2. K. Narendra Babu

Academic Year 2021–22

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Monday	9:00-9:50	9.5.22	Short circuit MVA calculation	61				
42	Tuesday	9:00-9:50	10.5.22	Short ckt MVA calculations	62				
43	Thursday	1:30-2:20	12.5.22	problems. Unit-IV	63				
44	Friday	1:30-2:20	13.5.22	Un symmetrical components	64				
45	Monday	11:35-12:25	16.5.22	Symmetrical components of unbalanced ops	65				
46	Tuesday	1:10-2:05	17.5.22	Synchronous Generator impedance	66				
47	Wednesday	9:50-10:40	18.5.22	Transmission line Sequence values	67				
48	Friday	3:10-4:00	20.5.22	various types of faults	68				
49	Friday	4:00-4:50	20.5.22	LG fault on unloaded Generator	69				
50	Saturday	9:50-10:40	21.5.22	LL Fault unloaded Generator	70				
51	Saturday	10:45-11:35	21.5.22	LLG fault unloaded Generator	71				
52	Monday	10:45-11:35	23.5.22	Numerical problems	72				
53	Monday	11:35-12:15	23.5.22	Elementary Concepts of Stability Unit-V	73				
54	Tuesday	9:00-9:50	24.5.22	Steady State power limit	74				
55	Tuesday	9:50-10:40	24.5.22	Transfer function, Psy.	75				
56	Wednesday	11:35-12:25	25.5.22	power angle curve	76				
57	Wednesday	1:05-2:00	25.5.22	swing Equation	77				
58	Monday	9:00-9:50	30.5.22	Equal Area criterion	78				
59	Monday	9:50-10:40	30.5.22	methods of improvement of transient Stability	79				
60	Tuesday	9:00-9:50	31.5.22	Numerical problems.	80				

Website: www.jntuk.edu.in
Email: dap@jntuk.edu.in

Phone: 0884-2300991

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. DAP/RAC/ II,III & IV Year /B. Tech/B. Pharmacy/2021 *Date 08.10.2021*

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Revised Academic Calendar for II, III, IV Year - B. Tech/B. Pharmacy for the AY 2021-22
(As per G.O. Rt. No. 242, Higher Education (U.E) Dept., dated 13.09.2021)

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**01.10.2021**		
I Unit of Instruction	01.10.2021	20.11.2021	7W
I Mid Examinations	22.11.2021	27.11.2021	1W
II Unit of Instructions	29.11.2021	15.01.2022	7W
II Mid Examinations	17.01.2022	22.01.2022	1W
Preparation & Practicals	24.01.2022	29.01.2022	1W
End Examinations	31.01.2022	12.02.2022	2W
Commencement of II Semester Class Work	**14.02.2022**		
II SEMESTER			
I Unit of Instructions	**14.02.2022**	02.04.2022	7W
I Mid Examinations	04.04.2022	09.04.2022	1W
II Unit of Instructions	11.04.2022	28.05.2022	7W
II Mid Examinations	30.05.2022	04.06.2022	1W
Preparation & Practicals	06.06.2022	11.06.2022	1W
End Examinations	13.06.2022	25.06.2022	2W
Commencement of next Year Class Work			
Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period			

R. Srinivasa Rao
Director Academic Planning

Director
Academic Planning
JNTUK Kakinada

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK
Copy to Rector, Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated to JNTUK, Kakinada
(ISO 9001:2015 Certified Institution)

ACADEMIC CALENDAR - 2021-22

S.NO.	DATE	EVENT
		OCTOBER
1	01-10-2021	Commencement of Class Work for B.Tech II,III,IV – I semester – I Unit of Instructions starts
2	25-10-2021 to 30-10-2021	Faculty Development Programs / Seminars / Workshops
		NOVEMBER
1	01-11-2021	Commencement of Class Work for MBA/MCA II-I semester – I Unit of Instruction starts
2	20-11-2021	B.Tech II,III&IV – I semester – I Unit of Instructions ends
3	22-11-2021	Commencement of Class Work for B.Tech I-I semester
4	22-11-2021 to 27-11-2021	I Mid Examinations for B.Tech II,III,IV – I semester, Induction Classes for B.Tech I-I semester
5	29-11-2021	B.Tech II,III & IV – I semester – II Unit of Instructions starts, B.Tech I-I semester – I Unit of Instructions starts
		DECEMBER
1	18-12-2021	MBA/MCA II-I semester – I Unit of Instruction ends
2	20-12-2021 to 25-12-2021	I Mid Examinations for MBA/MCA II-I semester
3	25-12-2021	Christmas
4	27-12-2021	MBA/MCA II-I semester – II Unit of Instruction starts
		JANUARY
1	03-01-2022	Commencement of Class Work for MBA/MCA I-I sem – I Unit of Instruction starts
2	14-01-2022 to 16-01-2022	Sankranti / Pongal Holidays
3	15-01-2022	B.Tech II,III&IV – I semester – II Unit of Instructions ends, B.Tech I-I semester – I Unit of Instructions ends
4	17-01-2021 to 22-01-2022	II Mid Examinations for B.Tech II,III,IV – I semester, I Mid Examinations for B.Tech I-I semester
5	24-01-2022	B.Tech I-I semester – II Unit of Instructions starts
6	24-01-2022 to 29-01-2022	Preparations and Practicals for B.Tech II,III,IV – I semester
7	26-01-2022	Republic Day
8	31-01-2022	End Examinations for B.Tech II,III,IV – I semester starts
		FEBRUARY
1	12-02-2022	End Examinations for B.Tech II,III,IV-I semester ends, MBA/MCA II-I semester – II Unit of Instruction ends
2	14-02-2022	Commencement of Class Work for B.Tech II,III,IV – II semester – I Unit of Instructions starts, II Mid Examinations for MBA/MCA II-I semester starts
3	21-02-2022	I Mid Examinations for MBA/MCA I-I semester starts
4	21-02-2022 to 26-02-2022	Preparations and Practicals for MBA/MCA II-I semester
5	26-02-2022	MBA/MCA I-I semester – I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-I semester ends
6	28-02-2022	MBA/MCA I-I semester – II Unit of Instruction starts, End Examinations for MBA/MCA II-I semester starts

MARCH		
1	01-03-2022	Maha Sivaratri
2	12-03-2022	B.Tech I-I semester – II Unit of Instructions ends, End Examinations for MBA/MCA II-I semester ends
3	14-03-2022	Commencement of Class Work for MBA/MCA II-II semester – I Unit of Instruction starts
4	18-03-2022	Holi
5	14-03-2022 to 19-03-2022	II Mid Examinations for B.Tech I-I semester
6	21-03-2022 to 26-03-2022	Preparations and Practicals for B.Tech I-I semester
7	28-03-2022	End Examinations for B.Tech I-I semester starts
APRIL		
1	02-04-2022	Ugadi
2	02-04-2022	B.Tech II,III&IV/IV – II Sem - I Unit of Instructions ends
3	04-04-2022 to 09-04-2022	I Mid Examinations for B.Tech II,III,IV – II semester
4	05-04-2022	Babu Jagjivan Ram Jayanthi
5	09-04-2022	End Examinations for B.Tech I-I semester ends
6	10-04-2022	Sri Rama Navami
7	11-04-2022	B.Tech II,III&IV/IV – II semester – II Unit of Instructions starts, Commencement of Class Work for B.Tech I-II semester - I Unit of Instructions starts
8	14-04-2022	Dr B R Ambedkar Jayanthi
9	15-04-2022	Good Friday
10	18-04-2022	II Mid Examinations for MBA/MCA I-I semester starts
11	23-04-2022	MBA/MCA I-I semester – II Unit of Instruction ends, II Mid Examinations for MBA/MCA I-I semester ends
12	25-04-2022 to 30-04-2022	Preparations and Practicals for MBA/MCA I-I semester
13	30-04-2022	MBA/MCA II-II semester – I Unit of Instruction ends
MAY		
1	02-05-2022	End Examinations for MBA/MCA I-I semester starts, I Mid Examinations for MBA/MCA II-II semester starts
2	03-05-2022	Ramzan
3	07-05-2022	I Mid Examinations for MBA/MCA II-II semester ends
4	09-05-2022	MBA/MCA II-II semester – II Unit of Instruction starts
5	14-05-2022	End Examinations for MBA/MCA I-I semester ends
6	23-05-2022	MBA/MCA I-II semester – I Unit of Instruction starts
7	28-05-2022	B.Tech II,III & IV/IV – II semester – II Unit of Instructions ends, B.Tech I-II semester - I Unit of Instruction ends
8	30-05-2022	II Mid Examinations for B.Tech II,III,IV – II semester starts, I Mid Examinations for B.Tech I-II semester starts

JUNE		
1	04-06-2022	II Mid Examinations for B.Tech II,III,IV - II semester ends,I Mid Examinations for B.Tech I-II semester ends
2	06-06-2022	B.Tech I-II semester - II Unit of Instructions starts
3	06-06-2022 to 11-06-2022	Preparations and Practicals for B.Tech II,III,IV-II semester
4	13-06-2022 to 25-06-2022	**End Examinations** for B.Tech II,III,IV-II semester
5	25-06-2022	MBA/MCA II-II semester - II Unit of Instruction ends
6	27-06-2022	II Mid Examinations for II year MBA/MCA II semester starts
JULY		
1	02-07-2022	II Mid Examinations for MBA/MCA II-II semester ends
2	04-07-2022 to 09-07-2022	Preparations and Practicals for MBA/MCA II-II semester
3	10-07-2022	Bakrid
4	11-07-2022	I Mid Examinations for MBA/MCA I-II semester starts, **End Examinations** for MBA/MCA II-II semester starts
5	16-07-2022	MBA/MCA I-II semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-II semester ends
6	18-07-2022	MBA/MCA I-II semester - II Unit of Instruction starts
7	23-07-2022	B.Tech I-II semester - II Unit of Instructions ends, **End Examinations** for MBA/MCA II-II semester ends
8	25-07-2022 to 30-07-2022	II Mid Examinations for B.Tech I-II semester
AUGUST		
1	01-08-2022 to 06-08-2022	Preparations and Practicals for B.Tech I-II semester
2	08-08-2022	**End Examinations** for B.Tech I-II semester starts
3	09-08-2022	Muharram
4	15-08-2022	Independence Day
5	19-08-2022	Krishna Janmashtami
6	20-08-2022	**End Examinations** for B.Tech I-II semester ends
7	31-08-2022	Vinayaka Chavithi
SEPTEMBER		
1	05-09-2022	Teacher's day
2	10-09-2022	MBA/MCA I-II semester - II Unit of Instruction ends
3	12-09-2022 to 17-09-2022	II Mid Examinations for MBA/MCA I-II semester
4	19-09-2022 to 24-09-2022	Preparations and Practicals for MBA/MCA I-II semester
5	26-09-2022	**End Examinations** for MBA/MCA I-II semester starts
OCTOBER		
1	08-10-2022	**End Examinations** for MBA/MCA I-II semester ends

SRK INSTITUTE OF TECHNOLOGY
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(ISO 9001:2015 Certified Institution)
COMPUTER SCIENCE AND ENGINEERING
Department Academic Calendar 2021 – 2022 Semester I

S. No	Activity	Year/Class	Date
1	Notice	Time Table	27-09-2021 (II,III,IV/IV)
		Roll Call List	
		Elective Confirmation List	
		Project Review Committee	
		Mentor – Mentee list	
2	Principal and Faculty Meeting	All Faculty Members	First week of commencement of class work for I semester
3	HOD and Faculty meeting	All Faculty Members	Once in a month and also based on requirement.
4	HOD and CR meeting	HOD and CR's	Before I MID Term test
5	Parents and Teacher meeting	Parents and Faculty	After releasing of university results
6	Commencement of Class work	II/IV B.Tech	01-10-2021
		III/IV B.Tech	01-10-2021
		IV/IV B.Tech	01-10-2021
		M.Tech	
7	I Mid-term test/Online Examinations	II/IV B.Tech	22-11-2021 to 27-11-2021
		III/IV B.Tech	22-11-2021 to 27-11-2021
		IV/IV B.Tech	22-11-2021 to 27-11-2021
		M.Tech	
8	Principal and Faculty Meeting	All Faculty Members	After releasing of university results.
9	Feedback on Faculty	II/IV, III/IV, IV/IV B.Tech, M.Tech	After I MID Examination
10	Internal Lab Examinations	II/IV B.Tech	Before II MID Examination
		III/IV B.Tech	
		IV/IV B.Tech	
		M.Tech	
11	II Mid-term test/Online Examinations	II/IV B.Tech	17-01-2022 to 22-01-2022
		III/IV B.Tech	17-01-2022 to 22-01-2022
		IV/IV B.Tech	17-01-2022 to 22-01-2022
		M.Tech	
12	Practical examinations	II/IV B.Tech	24-01-2022 to 29-01-2022
		III/IV B.Tech	24-01-2022 to 29-01-2022
		IV/IV B.Tech	24-01-2022 to 29-01-2022
		M.Tech	
13	Semester End Examinations	II/IV B.Tech	31-01-2022 to 12-02-2022
		III/IV B.Tech	31-01-2022 to 12-02-2022
		IV/IV B.Tech	31-01-2022 to 12-02-2022
		M.Tech	
14	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month
15	Commencement of Second Semester of Academic Year 2021-2022	B.Tech & M.Tech	14-02-2022 (II,III,IV/IV) (M.Tech)

Signature of HoD

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
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COMPUTER SCIENCE AND ENGINEERING
Department Academic Calendar 2021 – 2022 Semester II

S. No	Activity	Year/Class	Date
1	Notice	Time Table	07-02-2022 (II,III,IV/IV)
		Roll Call List	
		Elective Confirmation List	
		Project Review Committee	
		Mentor – Mentee list	
2	Principal and Faculty Meeting	All Faculty Members	After the release of university results
3	HOD and Faculty meeting	All Faculty Members	Once in a month and also based on requirement.
4	HOD and CR meeting	HOD and CR's	Before I MID Term test
5	Parents and Teacher meeting	Parents and Faculty	After the release of university results
6	Commencement of Class work	II/IV B.Tech	14-02-2022
		III/IV B.Tech	14-02-2022
		IV/IV B.Tech	14-02-2022
		M.Tech	
7	I Mid-term test/Online Examinations	II/IV B.Tech	04-04-2022 to 09-04-2022
		III/IV B.Tech	04-04-2022 to 09-04-2022
		IV/IV B.Tech	04-04-2022 to 09-04-2022
		M.Tech	
8	B.Tech/M.Tech Project Evaluations - I	B.Tech/M.Tech	One week before I MID Examinations
9	Feedback on Faculty	II/IV, III/IV, IV/IV B.Tech, M.Tech	After I MID Examination
10	Internal Lab Examinations	II/IV B.Tech	Before II MID Examination
		III/IV B.Tech	
		IV/IV B.Tech	
		M.Tech	
11	II Mid-term test/Online Examinations	II/IV B.Tech	30-05-2022 to 04-06-2022
		III/IV B.Tech	30-05-2022 to 04-06-2022
		IV/IV B.Tech	30-05-2022 to 04-06-2022
		M.Tech	
12	B.Tech/M.Tech Project Evaluations - II	B.Tech/M.Tech	One week before II MID Examinations
13	Practical examinations	II/IV B.Tech	06-06-2022 to 11-06-2022
		III/IV B.Tech	06-06-2022 to 11-06-2022
		IV/IV B.Tech	06-06-2022 to 11-06-2022
		M.Tech	
14	Semester End Examinations	II/IV B.Tech	13-06-2022 to 25-06-2022
		III/IV B.Tech	13-06-2022 to 25-06-2022
		IV/IV B.Tech	13-06-2022 to 25-06-2022
15	Feedback on Curriculum	IV/IV B.Tech	Last week of second semester
16	Program Exit Survey	IV/IV B.Tech	End of second semester
17	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month

Signature of HoD

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu , Vijayawada 521108** **Department of Computer Science Engineering** **TEACHING PLAN CUM REALIZATION**	**SRKIT / CSE/ 12**

Department: CSE **Name of faculty: Dr. D. Anusha** **Designation: Assistant Professor**

Semester / Year: IV/II - B **Name of the subject: Machine Learning** **AY: 2021-22**

S No	Unit / Topic	Teaching Planned on (Date)	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	Unit-1:The ingredients of machine learning	From 14/3/22 To 18/3/22			
1.	tasks		28/2/22	1	
2.	the problems that can be solved with machine learning		7/3/22	1	
3.	the output of machine learning		8/3/22	1	
4.	Features		9/3/22	1	
5.	the workhorses of machine learning.		10/3/22	1	
6.	Binary classification		11/3/22	1	
7.	related tasks, Classification		17/3/22	1	
8.	Scoring, Class probability estimation		17/3/22	1	
9.	Tutorial		18/3/22	1	

	SRK INSTITUTE OF TECHNOLOGY Enikepadu , Vijayawada 521108 Department of Computer Science Engineering TEACHING PLAN CUM REALIZATION	SRKIT / CSE/ 12

	Unit:2Beyond binary classification				
10.	Beyond binary classification: Introduction	From 22/3/22 To 30/3/22	20/3/22		
11.	Handling more than two classes		21/3/22		
12.	Regression		23/3/22		
13.	Unsupervised learning		24/3/22		
14.	descriptive learning		25/3/22		
15.	The hypothesis space		26/3/22		
16.	Paths through hypothesis space		27/3/22		
17.	Beyond conjunctive concepts		28/3/22		
18.	Tutorial		30/3/22		
	Unit: 3: Tree models				
19.	Decision trees		1/4/22		
20.	Ranking and probability estimation trees		4/4/22		
21.	Tree learning as variance reduction		4/4/22		

	SRK INSTITUTE OF TECHNOLOGY Enikepadu , Vijayawada 521108 Department of Computer Science Engineering TEACHING PLAN CUM REALIZATION	SRKIT / CSE/ 12

	Rule models:Learning ordered rule lists	From 1/4/22 To 8/4/22	6/4/22	1	
23.	Learning unordered rule sets		6/4/22	1	
24.	Descriptive rule learning		7/4/22	1	
25.	First-order rule learning		7/4/22	1	
26.	Tutorial		8/4/22	1	
	Unit-4: Linear models				
27.	The least-squares method		18/4/22	1	
28.	The perceptron: a heuristic learning algorithm for linear classifiers		21/4/22	1	
29.	Support vector machines	From 15/4/22 To 30/4/22	22/4/22	1	
30.	obtaining probabilities from linear classifiers		25/4/22	1	
31.	Going behind linearity		26/4/22	1	
32.	Distance Based Models: Introduction		27/4/22	1	
33.	Neighbours and exemplars		27/4/22	1	
34.	Nearest Neighbours classification		28/4/22	1	

	Distance Based Clustering, Hierarchical		28/4/22	1	
36.	Clustering		29/4/22	1	
37.	Tutorial		30/4/22	1	
	Unit-5: Probabilistic models				
38.	The normal distribution and its geometric interpretations		4/5/22	1	
39.	Probabilistic models for categorical data		4/5/22	1	
40.	Discriminative learning by optimising		5/5/22	1	
41.	conditional likelihood		6/5/22	1	
42.	Probabilistic models with hidden variables		7/5/22	1	
43.	Features: Kinds of feature	From	9/5/22	1	
44.	Feature transformation	1/5/22	12/5/22	1	
45.	Feature construction	To 15/5/22	12/5/22	1	
46.	Feature selection		13/5/22	1	
47.	Model ensembles: Bagging		13/5/22	1	
48.	random forests		14/5/22	1	

	SRK INSTITUTE OF TECHNOLOGY Enikepadu , Vijayawada 521108 Department of Computer Science Engineering TEACHING PLAN CUM REALIZATION	SRKIT / CSE/ 12

49.	Boosting		13/5/22	1	
50.	Tutorial		14/5/22	1	
	Unit-6: Artificial Neural Networks		15/5/22	1	
51.	PCA		16/5/22	1	
52.	Implementation and demonstration		17/5/22	1	
53.	Artificial Neural Networks:Introduction,		18/5/22	1	
54.	Neural network representation		21/5/22	1	
55.	Demonstration	From 16/5/22 To 26/5/22	22/5/22	1	
56.	appropriate problems for neural network learning		23/5/22	1	
57.	Multilayer networks		24/5/22	1	
58.	Examples		26/5/22	1	
59.	back propagation algorithm		28/5/22	1	
60.	Tutorial		28/5/22	1	

TEXT BOOKS:

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu , Vijayawada 521108** **Department of Computer Science Engineering** **TEACHING PLAN CUM REALIZATION**	**SRKIT / CSE/ 12**

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.

2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. UnderstandingMachine Learning: From Theory toAlgorithms, Shai Shalev-Shwartz, Shai BenDavid, Cambridge.

2. Machine Learning in Action, Peter Harington, 2012, Cengage.

Prepared: Faculty / Date 14/2/22

Verified: HOD/Date 14/2/22

SRK INSTITUTE OF TECHNOLOGY
VIJAYAWADA

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Department of Computer Science and Engineering

SRKIT / CSE / 09

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

Academic year: 2021-22 Semester: II

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
1.	Dr. M. Ekambaram Naidu	Adv DBM	CSE			4	Principal	
2.	Dr. D. Haritha						HOD	
3.	Mr. D. V. Subba Rao	DS	CSE			6	Examcell Incharge	
4.	Dr. B. Arhalatha	FLAT	CSE			12	ISO, NaacC2, I/C HOD	
5.	Dr. A. Radhika	DWDM	CSD/CSM	DM LAB	CSD/CSM	20	Projects, N-5 Internal Marks, Exams	
6.	Dr. N. Neelima Priyanka	FLAT	CSD/CSM	R Prog lab	CSD/CSM	20	Projects, APSSDC, Naac C7, BLC	
7.	Mr. Ch. Ambedkar	CO	CSD/CSM	R prog lab	CSE	20	TPmetables, C1, Discipline, C7	
8.	Mr. M. V. Sumanth	JAVA	CSE	Java prog lab	CSE	20		
9.	T. Bindu Madhavi	CO	CSE	NLP lab	CSE	12+4=16	—	
10.	P. Jaya Sri	DS	CSE	NLP lab/Mongo DB	CSE	8+6=14	ISO	
11.	Mr. A. Kalyan Kumar	CNT	CSE	CNT lab	CSE	20	BLC lab I-I I/C	

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Computer Science and Engineering** **RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES**	**SRKIT / CSE / 09**

Academic year: 21-22 **Semester:** II

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
12.	Ms. K. SriLakshmi	DBMS	CSE	DBMS lab	CSE	20	C_1	SriLakshmi
13.	Ms. N. V. MadhuBindu	←	Study leave		→		← →	MBindu
14.	Ms. P. UshaSri	←	Long leave		→		C_2	Usha
15.	Ms. D. Anusha	ML	CSE			11	C_3	AD
16.	Ms. D. Madhavi	DS	CSE			12	C_2	DMadhavi
17.	Mr. V. Kapil			Java lab	CSE	8	C_4	Kapil
18	Mr. N. RajamohanReddy	Python	CSE	Python lab	CSE	18	C_5	NRR.
19.	Ms. Ch. Pavani	DAA	CSE			12	C_3	ChP.
20.	Ms. K. Chandana	OOPS thru Java	ECE			6	BLC-2 lab IIc.	KChandana
21.	Mr. J. B. Srinivas			NLP/DM/MongoDB lab	CSM/CSD	12	C_4	Srinivas
22.	Ms. B. Kalika Rai			WT/MongoDB lab	CSE/CSD	14	C_3	BKalika

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Computer Science and Engineering

SRKIT / CSE / 09

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
23.	Ms.P.Beerubeba	DS	CSE	DS lab	CSE	16	C1	Beerubeba
24.	Ms. T. Vijaya Sree			R/SEC lab	CSE	14	C3	T.V.S
25.	Ms.D.Nalinikumari	CC	CSE			5	C4	D.N.K
26.	Mr. V. Dinesh	DC	CSE	Project	CSE	30	C5	V.Dinesh
27	Ms.D.SaravanaPriya	ML	CSE	Projects	CSE	30	C4	DSPriya
28.	Mr.S.SenthilKumar	IRS	CSE	SPP Lab	CSE	10	C3	S.Senthil
29	Mr.B.PurnaChandra			Web tpp/SEC Lab	CSE/CSD/CSM	12	C2	BPChand
30	Mr.D.BabuRamaKrishna			Java lab	CSE	6	C1	DRK.
31.	T. Venkateswaramma			DBMS Lab	CSE	6	C3	Venkat
32.	Ms. D. Usha Rani	Python	CSD/CSM	Python lab	CSM/CSD	17	C5	Usha

B. [signature]
HOD/ Date 7/4/22

[signature]
Principal / Date 7/4/22

SRK INSTITUTE OF TECHNOLOGY

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Department of Computer Science and Engineering

SRKIT / CSE / 09

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

Academic year: 21-22 **Semester:** II

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
12.	Ms. K. SriLakshmi	DBMS	CSE	DBMS lab	CSE	20	C_1	SriLakshmi
13.	Ms. N.V. MadhuBindu	←	Study leave	→		→	← →	MBindu
14.	Ms. P. UshaSri	←	long leave	→		→	C_2	Usharri
15.	Ms. D. Anusha	ML	CSE			11	C_3	AD
16.	Ms. D. Madhavi	DS	CSE			12	C_2	Dmadhavi
17.	Mr. V. Kapil			Java lab	CSE	8	C_4	Kapil
18	Mr. N. RajamohanReddy	Python	CSE	Python lab	CSE	18	C_5	NR.
19.	Ms. Ch. Pavani	DAA	CSE			12	C_3	ch.P.
20.	Ms. K. Chandana	OOPS thru Java	ECE			6	BLC-2 lab IIc.	KChandana
21.	Mr. T.B. Srinivas			NLP/DM/MongoDB lab	CSM/CSD	12	C_4	Srinivas
22.	Ms. B. Kalika Rai			WT/MongoDB lab	CSE/CSD	14	C_3	BKalika

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Academic Year: 2021-2022 **Class: IV** **Semester: II** **Wef: 14-2-2022**

Section A

Time	9:00 To 9:50	9:50 To 10:40	10:45 To 11:35	11:35 To 12:20		1:10 To 2:00	2:00 To 2:45	2:50 To 3:35	3:35 To 4:20
Period	1	2	3	4		5	6	7	8
MON	OR	DS	MS	ML		← PROJECTS →			
TUE	MS	OR	ML	DS		← PROJECTS →			
WED	OR	ML	MS	DS	LUNCH	← PROJECTS →			
THU	ML	DS	OR	MS		← PROJECTS →			
FRI	ML	MS	OR	DS		← PROJECTS →			
SAT	OR	MS	ML	DS		← PROJECTS →			**

SUBJECTS		FACULTY
Distributed Systems (DS)	:	D.V.Subba Rao
Management Science (MS)	:	Dr.B.Krishnaiah
Machine Learning (ML)	:	D.Anusha
Operations Research (OR)	:	V.Sravanthi
Seminar	:	Dr.B.AshaLatha
Project	:	Dr.B.AshaLatha
Class Teacher	:	D.Anusha

B. (T-C)

HOD /Date

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** Enikepadu, Vijayawada 521108 Approved by AICTE, Affiliated to JNTUK, Kakinada (ISO 9001:2015 Certified Institution) **Department of Computer Science and Engineering** **CLASS TIME TABLE**	**SRKIT / CSE / 10.1**

Academic Year: 2021-2022 **Class: IV** **Semester: II** **Wef: 14-2-2022**

Section B

Time	9:00 To 9:50	9:50 To 10:40	10:45 To 11:35	11:35 To 12:20		1:10 To 2:00	2:00 To 2:45	2:50 To 3:35	3:35 To 4:20
Period	1	2	3	4		5	6	7	8
MON	MS	ML	OR	DS		← PROJECTS →			
TUE	ML	DS	MS	OR		← PROJECTS →			
WED	MS	DS	OR	ML	LUNCH	← PROJECTS →			
THU	OR	MS	ML	DS		← PROJECTS →			
FRI	OR	DS	ML	MS		← PROJECTS →			
SAT	ML	DS	OR	MS		← PROJECTS →			**

SUBJECTS		**FACULTY**
Distributed Systems (DS)	:	D.V.Subba Rao
Management Science (MS)	:	B.Chinni
Machine Learning (ML)	:	D.Anusha
Operations Research (OR)	:	V.Sravanthi
Seminar	:	Dr.N.Neelima Priyanka
Project	:	Dr.N.Neelima Priyanka
Class Teacher	:	V.Sravanthi

HOD /Date

Faculty Name: D.ANUSHA

Time	9:00 To 9:50	9:50 To 10:40	10:45 To 11:35	11: 35 To 12:25	LUNCH	1:10 To 2:00	2:00 To 2:45	2:50 To 3:35	3:35 To 4:20
Period	1	2	3	4		5	6	7	8
MON		ML(B)		*ML(A)*					
TUE	ML(B)		*ML(A)*						
WED		*ML(A)*		ML(B)					
THU	*ML(A)*		ML(B)						
FRI	*ML(A)*		ML(B)						
SAT	ML(B)		*ML(A)*						***

Signature of the Faculty : Signature of the HOD :

UNIT - I

INTRODUCTION

→ Definition of learning systems:

A computer program is said to learn from experience E w.r.t to class of tasks T & Performance measure P, if its performance at tasks is measured by P & improves with experience E.

→ In general, to have a well-defined learning problem, we must identify these three features.

1. The class of tasks
2. The Measure of performance &
3. The source of Experience.

→ Let us some of the examples where the computer learns:

(1) Learning to recognize spoken words (speech Recognition)
(2) Learning to drive autonomous vehicle.
(3) Classify new astronomical structures.
(4) Learning to play world class backgammon.

→ Goals and Applications of Machine Learning:-

The main goals of Machine learning are:

(1) To make the computers more intelligent & smarter.

(2) To develop computational Models for human learning & perform computer simulations.

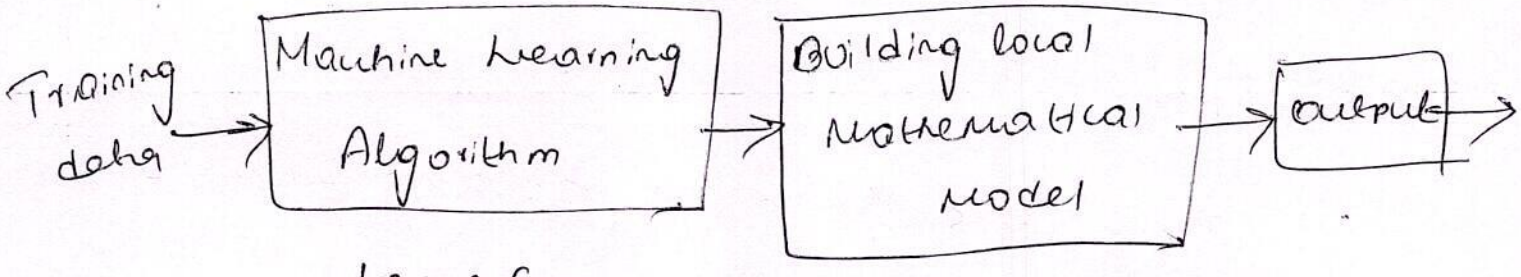
(3) To develop new learning Methods & develop more generalised algorithms.

The applications of machine learning are: Image Recognition, Speech Recognition, Traffic Prediction, Product Recommendation, Self-driving cars, E-mail spam detection, Virtual Personal assistant, Online Fraud detection, Stock Market trading etc.

→ Aspects of developing a learning system:-

→ Training data:-

A computer program is supposed to learn from the Experience from a given tasks & its performance should be improved. For that purpose, the following are the various steps:



→ When we fed the training data to the Machine learning algorithm, a Mathematical Machine learning Model is generated. This model can be used to make the prediction without being explicitly Programmed.

→ The more the Machine learning work with the training data, the more experience it will get & the more efficient result is generated.

→ Steps for Designing a learning system:

① Choosing the training Experience.

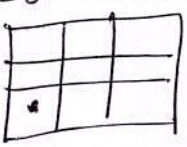
It is the primary task to feed the training experience in to the Machine learning algorithm. The training data should have a significant impact on success or Failure of the Model. Hence training data should

Step ②: Choosing the target Function

What type of knowledge is learnt & how it is used by the performance of the system:

For Ex: In the checkers game, while we are playing with the opponent or ourself, we decide what is our next move to become successful in the game. Hence Nextmove() is the targetfunction in checkers game.

Step ③: Choosing Representation for Target function



one move()

→ The four possible target functions for checkers game.

① b is the final board state that is won,

$$v(b) = 100$$

② b is the final board state that is loss

$$v(b) = -100$$

③ b is the final board state that is draw, then $v(b) = 0$

Concept Learning

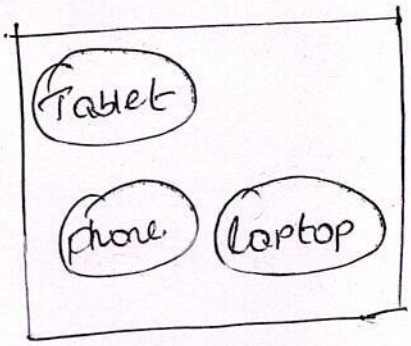
→ Here mainly, you need to know what is a concept & hypothesis.

→ **Concept:** A concept is an Example in the hypothesis.

→ **Hypothesis:-** A hypothesis is a collection of concepts that are conjunction of different concepts. It is an assumption made by the system.

→ **Concept Learning:** Here we only learn about the data. If a concept belongs to the hypothesis, then it is called a positive example. denoted by $h(x) = 1$. If a concept doesn't belongs to the hypothesis, then it is called negative example. denoted by $h(x) = 0$.

Ex: Example of concept & hypothesis



hypothesis
Gradgets.

Tablet, phone, laptop are the concepts of the hypothesis Gradgets.

→ We need to predict the class label Enjoy sports based on the value of Features.

→ Each feature has the attributes (values)

① Sky : {Sunny, Rainy}

② AirTemp: {warm, cold}

③ Humidity : {Normal, high}

④ Wind : {Strong}

⑤ Water : {warm, cool}

⑥ Forecast: {Same, change}

→ Notations:

→ Each attribute in the hypothesis may be denoted as ? or ϕ. whereas,

→ "?" indicates that any value is acceptable.

→ "ϕ" indicates that no value is acceptable.

→ Consider the following hypothesis:

(Sunny, ?, ?, ?, ?, ?)

Means, Sky should be Sunny & any value is accepted for rest of the Features.

→ If a hypothesis accepts all values of the instances then it is called Most general hypothesis

$$h = (?, ?, ?, ?, ?, ?)$$

→ If a hypothesis does not accepts any value of the hypothesis, then it is called Least specific hypothesis.

$$h = (\phi, \phi, \phi, \phi, \phi, \phi)$$

→ The set of items/objects over which the concepts is defined is called set of instances.

$$\text{No. of instances} = 2^d.$$

In the given data, No. of instances $= 2^6$

→ A hypothesis h in H such that

$$h(x) = c(x) \text{ for all } x \text{ in } X$$

$h(x)$ = hypothesis

H = hypothesis space

$c(x)$ = concept

X = set of instances.

→ The Enjoy sport data is finite data. (a)

So, we got finite No. of hypothesis. Data can be infinite also. To find the hypothesis that best fits we need to find an efficient algorithm.

d -

x. 26

→ Find Specific Hypothesis :

The Find-S algorithm is used to find the most specific hypothesis. It is a basic concept learning algorithm. It takes only positive examples & constructs the most specific hypothesis.

⇒ Positive Example means it should be in the training data.

→ Initially the algorithm takes the most specific hypothesis & generalises it.

Algorithm :

1. Initialize the hypothesis with most specific hypothesis
2. For every +ve example, for each attribute
   if(value = hypothesis value) then ignore
3. Otherwise, replace the value with ?

→ Let us see an example:

→ General to specific ordering of Hypothesis:

Consider the two hypothesis

$h_1 = (Sunny, ?, ?, Strong, ?, ?)$

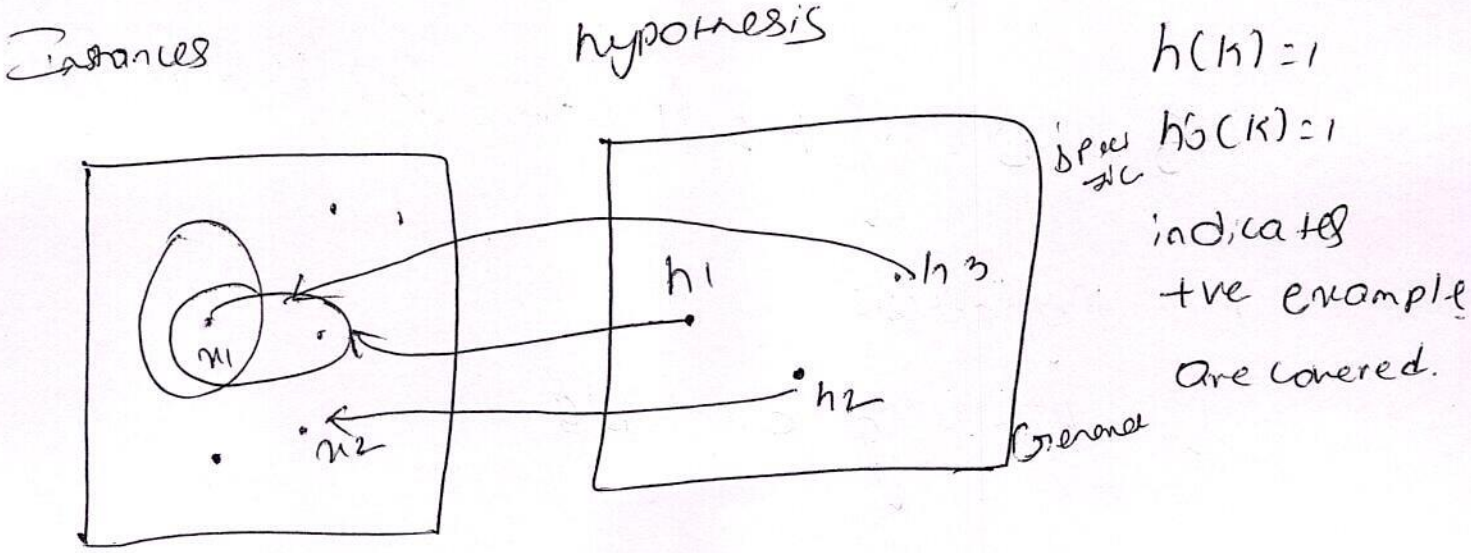
$h_2 = (Sunny, ?, ?, ?, ?, ?)$

→ h_2 imposes fewer constraints & hence classifies more examples as +ve.

→ The instance that is satisfied by $h(1)$ also satisfies h_2.

Def: Let h_j and h_k be the boolean valued functions over X. Then h_j is more general than or equal to h_k if & only if:

$$(\forall x \in X)\left[(h_k(x) = 1) \rightarrow (h_j(x) = 1)\right]$$



→ If $h(x) = c(x)$ then, the hypothesis consistent to the training example.

→ Eg: Consider there are 4 hypothesis.

h_1, h_2, h_3, h_4.

→ Consider there are 4 examples

x_1, x_2, x_3, x_4.

→ Let us suppose:

$h_1(x_1) = c(x_1)$

$h_1(x_2) = c(x_2)$

$h_1(x_3) = c(x_3)$

$h_1(x_4) = c(x_4)$

The hypothesis h_1 is consistent with all the examples. Hence it is consistent hypothesis.

→ Consider h_3 also consistent with all the examples.

→ Hence the Version space $VS = \{h_1, h_3\}$.

As we have removed inconsistent ~~eno~~ hypothesis

→ The process of obtaining the version space is done by List-then-eliminating algorithm.

→ Candidate - Elimination Algorithm;

→ This algorithm computes the version space containing all hypothesis from H.

→ The algorithm begins by Identifying the most general and most specific hypothesis.

→ Here both +ve & -ve examples are taken into account.

Algorithm :

1. Initialize G to the set of maximally general hypothesis in H.

2. Initialize S to the set of maximally specific hypothesis in H.

3- For each training example :

(i) if example is positive

make specific to general else

(ii) if the example is negative

make general to specific.

So, let us compare the newly defined specific hypothesis & the hypothesis in the given data.

(Compare S_1 to the 2nd instance)

$S_2 = \{$ Sunny, warm, ?, Strong, warm, Same $\}$

If the values are matching write the same values. If they are not matching write the "?".

$G_2 = \{?, ?, ?, ?, ?, ?\}$.

No change in G_2.

Step 3 : 3rd example is No. (−ve).

Change General to Specific.

Specific hypothesis will be same.

$S_3 = \{$ sunny, warm, ?, Strong, warm, Same $\}$

$G_3 = \{\langle$Sunny, ?, ?, ?, ?, ?$\rangle$, $\langle$?, warm, ?, ?, ?, ?$\rangle$, $\langle$?, ?, ?, ?, ?, same$\rangle\}$.

⇒ The Inductive Bias:

The remarks on the candidate-Elimination algorithm has given rise to inductive bias. Does the candidate Elimination algorithm gives us the correct hypothesis-?

A Biased hypothesis space:

Generally a hypothesis consists of all possible hypothesis. In inductive Learning, we learn from examples & derive the rules. Generally biased means partiality. It doesnot consider all types of training examples

Ex: Sunny ∩ warm ∩ normal ∩ strong ∩ cool ∩ change
= yes.

→ If a player needs to enjoy the sport, all concepts should be there.

→ Suppose if change is not important concept & instead of change there is small, the machine will Predict as No. i.e, biased hypothesis is not suitable in all cases.

→ Unbiased hypothesis space:

It provides a hypothesis capable of representing all the examples.

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓
Drawing
Practical

IV Year II Semester B.Tech Course CSE Branch ML Subject

Name of Teacher (s) 1. D. Anusha

2.

Academic Year

Sl. No.	Periods			Topic Covered
	Day	Time	Date	
(1)	(2)	(3)	(4)	(5)
1	Monday	9 to 9:50	28/2/22	UNIT-I Tasks Machine learning
2	Monday	9:00 to 9:50	7/3/22	Problems solved with
3	Tuesday	8 to 8:50	8/3/22	Models :: Output
4	Wednesday	11:40 to 10:50	9/3/22	Features
5	Thursday	10:50 to 11:40	10/3/22	Varieties of Machine learning
6	Friday	11:40 to 12:30	11/3/22	Classification
7	Thursday	11:40 to 12:30	17/3/22	Scoring & Ranking
8	Thursday	11:40 to 12:30	17/3/22	Class probability &
9	Friday	11:40 to 12:30	18/3/22	Estimation
10	Monday	9 to 9:50	21/3/22	Tutorial
11	Monday	9:00 to 8:50	22/3/22	UNIT-II Handling more than two classes
12	Wednesday	10 to 10:50	23/3/22	Regression
13	Friday	11:40 to 12:30	25/3/22	Unsupervised & descriptive learning
14	Saturday	11:40 to 12:30	26/3/22	The Hypothesis space
15	Monday	9 to 9:50	28/3/22	Hypothesis space
16	Tuesday	9 to 9:50	29/3/22	Beyond conjunctive concepts
17	Tuesday	9 to 9:50	29/3/22	Beyond Conjunctive concepts
18	Wednesday	9 to 9:50	30/3/22	Beyond Conjunctive Concepts
19	Thursday	10 to 10:50	31/3/22	Tutorial
20	Thursday	10 to 10:50	31/3/22	UNIT-III Decision Trees, Ranking Trees

Sl. No.	Periods			Topic Covered
	Day	Time	Date	
(1)	(2)	(3)	(4)	(5)
21	Friday	11:40 to 12:30	1/4/22	Tree learning as Variance
22	Tuesday	8 to 8:50	4/4/22	Learning ordered Rule lists
23	Tuesday	8 to 8:50	4/4/22	Learning unordered rulelists
24	Tuesday	8 to 8:50	4/4/22	Descriptive learning
25	Thursday	11:40 to 12:30	6/4/22	Descriptive learning
26	Friday	11:40 to 12:30	7/4/22	First order learning
27	Saturday	11:40 to 12:30	8/4/22	Tutorial
28	Monday	9 to 9:50	9/4/22	The least squares Method
29	Monday	10:40 to 11:40	11/4/22	The perceptron
30	Tuesday	8 to 8:50	18/4/22	Support Vector Machines
31	Thursday	9 to 9:50	21/4/22	Obtaining probalities
32	Friday	11:40 to 12:30	22/4/22	Going behind linearity.
33	Monday	9 to 9:50	25/4/22	Distance based models
34	Tuesday	10:30 to 11:30	27/4/22	Neighbours.
35	Wednesday	8 to 8:50	28/4/22	(Tutorial)
36	Thursday	9 to 9:50	29/4/22	Normal distribution
37	Friday	10:40 to 11:40	29/4/22	Geometric interpretation
38	Saturday	10:40 to 11:40	30/4/22	Discriminative learning
39	Saturday	9 to 9:50	30/4/22	Kinds of features
40	Monday	11:40 to 12:30	2/5/22	Feature Transformation

20	Thursday	10 to 11:30	31/3/22	Decision Trees, Ranking Trees	40	Monday	11:40 to 12:30	4/5/22	Feature Transformation

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓
Drawing
Practical

IV Year II Semester B.Tech Course CSE Branch ML Subject

Name of Teacher (s) 1. 2. D. Anusha

Academic Year

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Tuesday	9:30 to 10:40	2/5/22	Feature Construction	61				
42	Wednesday	10:50 to 11:40	3/5/22	Model Selection	62				
43	Thursday	9:30 to 10:40	4/5/22	Bagging	63				
44	Friday	10:40 to 11:30	5/5/22	Random Forests	64				
45	Saturday	10:40 to 11:30	6/5/22	Tutorial Unit-V	65				
46	Monday	9:40 to 10:30	9/5/22	PCA	66				
47	Tuesday	11:30 to 12:20	10/5/22	PCA	67				
48	Friday	11:40 to 12:30	13/5/22	Details of PCA	68				
49	Saturday	9:40 to 10:30	14/5/22	Implementation	69				
50	Monday	11:40 to 12:30	16/5/22	Demonstration	70				
51	Tuesday	9:30 to 10:40	17/5/22	ANN	71				
52	Wednesday	9:40 to 10:30	18/5/22	Introduction	72				
53	Monday	11:40 to 12:30	23/5/22	NN Representation	73				
54	Tuesday	11:40 to 12:30	24/5/22	Demonstration	74				
55	Wednesday	9:40 to 10:40	25/5/22	problems for NN learning	75				
56	Thursday	9:30 to 10:40	26/5/22	Multilayer Networks	76				
57	Friday	11:30 to 12:30	27/5/22	Back propagation	77				
58	Saturday	11:40 to 12:30	28/5/22	Tutorial	78				
59					79				
60					80				

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Name of Teacher (s) 1. IV Year II Semester B.Tech Course CSE Branch ML Subject

2. D. Anuradha

Academic Year

Theory ✓ Drawing Practical

Sl. No.	Periods: Day	Time	Date	Topic Covered
(1)	(2)	(3)	(4)	(5)
				UNIT-I
1	Monday	9 to 9:50	28/3/22	Basics
2	Monday	9 to 9:50	7/3/22	problems solved with Machine learning
3	Tuesday	11:50 to 12:50	8/3/22	Models & output
4	Wednesday	10 to 11:50	9/3/22	Features
5	Thursday	9 to 9:50	10/3/22	workflows of Machine learning
6	Friday	10 to 10:50	11/3/22	classification
7	Thursday	9 to 9:50	17/3/22	Scoring & Ranking
8	Thursday	10:50 to 11:00	17/3/22	class probability &
9	Friday	9 to 9:50	18/3/22	Estimation
10	Monday	9 to 9:50	21/3/22	Tutorial
11	Monday	10:50 to 11:40	22/3/22	Handling more than two classes
12	Wednesday	9 to 9:50	23/3/22	Regression
13	Friday	11:40 to 12:30	25/3/22	Unsupervised & descriptive learning
14	Saturday	9:50 to 10:40	26/3/22	The hypothesis
15	Monday	9:50 to 10:40	28/3/22	Hypothesis space
16	Tuesday	10:50 to 11:40	29/3/22	Beyond conjunctive
17	Tuesday	9:50 to 10:40	31/3/22	Tutorial
18	Wednesday	11:40 to 12:30	31/3/22	Decision Trees UNIT-II
19	Thursday	11:40 to 12:30	31/3/22	Ranking Trees.
20	Thursday	9 to 9:50	31/3/22	Tree learning Reduced

Sl. No.	Periods: Day	Time	Date	Topic Covered
(1)	(2)	(3)	(4)	(5)
21	Friday	9:50 to 10:40	1/4/22	learning ordered Rule lists
22	Tuesday	9 to 9:50	4/4/22	learning unordered collections
23	Tuesday	11:40 to 12:30	4/4/22	Descriptive learning
24	Tuesday	9 to 9:50	5/4/22	Descriptive learning
25	Thursday	11:40 to 12:30	7/4/22	First order learning
26	Friday	11:40 to 12:30	8/4/22	Tutorial
27	Saturday	9 to 9:50	9/4/22	UNIT-IV The least Square Method
28	Monday	10:50 to 11:40	11/4/22	The perceptron
29	Tuesday	9 to 9:50	12/4/22	Support Vector Machines
30	Thursday	10:50 to 11:40	14/4/22	Obtaining probabilities
31	Saturday	10:50 to 11:40	16/4/22	Going behind linearity
32	Wednesday	11:40 to 12:30	20/4/22	Distance based models
33	Thursday	9 to 9:50	21/4/22	Neighbours
34	Friday	9 to 9:50	22/4/22	Tutorial
35	Saturday	10:50 to 11:40	23/4/22	UNIT-V Normal distribution
36	Monday	9 to 9:50	30/4/22	Geometric interpretation
37	Monday	10:50 to 11:40	30/4/22	Discriminative learning
38	Monday	9 to 9:50	30/4/22	Kinds of features
39	Tuesday	10:50 to 11:40	1/5/22	Feature Transformation
40	Wednesday	11:40 to 12:30	2/5/22	Feature combination

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PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Name of Teacher (s) 1. IV Year II Semester B.Tech Course CSE Branch ML Subject

2.

Academic Year

Theory ✓ Drawing Practical

Sl. No.	Periods: Day	Time	Date	Topic Covered
(1)	(2)	(3)	(4)	(5)

Sl. No.	Periods: Day	Time	Date	Topic Covered
(1)	(2)	(3)	(4)	(5)

14	Saturday	9:00 to 10:40	26/3/22	Hypothesis space	35	Saturday	10:50 to 12:30	30/4/22	Geometric interpretation		
15	Monday	9:50 to 10:40	28/3/22	Beyond conjunctive	36	Monday	9 to 10:50	30/4/22	Discriminative learning		
16	Tuesday	10:50 to 11:40	29/3/22	Tutorial	37	Monday	10:50 to 11:40	30/4/22	Kinds of features		
17	Tuesday	9:50 to 10:50	29/3/22	Decision Trees	38	Monday	9 to 9:50	30/4/22	Feature Transformation		
18	Wednesday	11:40 to 12:30	30/3/22	Ranking Trees	39	Tuesday	10:50 to 11:40	1/5/22	Feature construction		
19	Thursday	10 to 10:50	31/3/22	Tree learning Reduced	40	Wednesday	12:30 to 1:20	2/5/22			
20	Thursday	9 to 9:50	31/3/22								

31/3

2/5

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓
Drawing
Practical

IV Year II Semester B.Tech Course CSE Branch ML Subject

Name of Teacher (s) 1. D. Anitha

2.

Academic Year

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Thursday	9 to 9:50	3/5/22	Feature Selection	61				
42	Thursday	10:50 to 11:40	3/5/22	Model Selection	62				
43	Friday	9 to 9:50	4/5/22	Bagging	63				
44	Saturday	9 to 9:50	5/5/22	Random Forests	64				
45	Monday	9:50 to 10:40	8/5/22	Tutorial UNIT-VI	65				
46	Tuesday	9 to 9:50	9/5/22	PCA	66				
47	Thursday	9 to 9:50	12/5/22	Details of PCA	67				
48	Friday	10:50 to 11:40	13/5/22	Implementation	68				
49	Saturday	11:40 to 12:30	14/5/22	Demonstration	69				
50	Monday	9 to 9:50	16/5/22	ANN	70				
51	Tuesday	9:50 to 10:40	17/5/22	Introduction	71				
52	Wednesday	9:00 to 9:50	18/5/22	Neural Networks Perceptron	72				
53	Thursday	10:50 to 11:40	21/5/22	Demonstration	73				
54	Thursday	9 to 9:50	20/5/22	Problems for NN learning	74				
55	Friday	10:50 to 11:40	23/5/22	Multilayer Networks	75				
56	Saturday	11:40 to 12:30	24/5/22	Back propagation	76				
57					77				
58					78				
59					79				
60					80				

Website: www.jntuk.edu.in
Email: dap@jntuk.edu.in

Phone: 0884-2300991

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. DAP/AC/IV Year /B. Tech-B. Pharmacy/2021 *Date 28.08.2021*

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Academic Calendar for IV - B. Tech & B. Pharmacy
Academic year 2021-22

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**01.09.2021**		
I Unit of Instruction	01.09.2021	16.10.2021	7W
I Mid Examinations	18.10.2021	23.10.2021	1W
II Unit of Instructions	25.10.2021	11.12.2021	7W
II Mid Examinations	13.12.2021	18.12.2021	1W
Preparation & Practicals	20.12.2021	25.12.2021	1W
End Examinations	27.12.2021	08.01.2022	2W
Commencement of II Semester Class Work	**17.01.2022**		
II SEMESTER			
I Unit of Instructions	**17.01.2022**	05.03.2022	7W
I Mid Examinations	07.03.2022	12.03.2022	1W
II Unit of Instructions	14.03.2022	30.04.2022	7W
II Mid Examinations	02.05.2022	07.05.2022	1W
Preparation & Practicals	09.05.2022	14.05.2022	1W
End Examinations	16.05.2022	28.05.2022	2W
Commencement of next Year Class Work			
Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period			

R. Srinivasa Rao
Director Academic Planning

Director
Academic Planning
JNTUK Kakinada

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK
Copy to Rector, Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated to JNTUK, Kakinada
(ISO 9001:2015 Certified Institution)

ACADEMIC CALENDAR - 2021-22

S.NO.	DATE	EVENT
		OCTOBER
1	01-10-2021	Commencement of Class Work for B.Tech II,III,IV – I semester - I Unit of Instructions starts
2	25-10-2021 to 30-10-2021	Faculty Development Programs / Seminars / Workshops
		NOVEMBER
1	01-11-2021	Commencement of Class Work for MBA/MCA II-I semester - I Unit of Instruction starts
2	20-11-2021	B.Tech II,III&IV - I semester - I Unit of Instructions ends
3	22-11-2021	Commencement of Class Work for B.Tech I-I semester
4	22-11-2021 to 27-11-2021	I Mid Examinations for B.Tech II,III,IV - I semester, Induction Classes for B.Tech I-I semester
5	29-11-2021	B.Tech II,III & IV - I semester - II Unit of Instructions starts, B.Tech I-I semester - I Unit of Instructions starts
		DECEMBER
1	18-12-2021	MBA/MCA II-I semester - I Unit of Instruction ends
2	20-12-2021 to 25-12-2021	I Mid Examinations for MBA/MCA II-I semester
3	25-12-2021	Christmas
4	27-12-2021	MBA/MCA II-I semester - II Unit of Instruction starts
		JANUARY
1	03-01-2022	Commencement of Class Work for MBA/MCA I-I sem - I Unit of Instruction starts
2	14-01-2022 to 16-01-2022	Sankranti / Pongal Holidays
3	15-01-2022	B.Tech II,III&IV - I semester - II Unit of Instructions ends, B.Tech I-I semester - I Unit of Instructions ends
4	17-01-2021 to 22-01-2022	II Mid Examinations for B.Tech II,III,IV - I semester, I Mid Examinations for B.Tech I-I semester
5	24-01-2022	B.Tech I-I semester - II Unit of Instructions starts
6	24-01-2022 to 29-01-2022	Preparations and Practicals for B.Tech II,III,IV - I semester
7	26-01-2022	Republic Day
8	31-01-2022	End Examinations for B.Tech II,III,IV - I semester starts
		FEBRUARY
1	12-02-2022	End Examinations for B.Tech II,III,IV-I semester ends, MBA/MCA II-I semester - II Unit of Instruction ends
2	14-02-2022	Commencement of Class Work for B.Tech II,III,IV – II semester - I Unit of Instructions starts, II Mid Examinations for MBA/MCA II-I semester starts
3	21-02-2022	I Mid Examinations for MBA/MCA I-I semester starts
4	21-02-2022 to 26-02-2022	Preparations and Practicals for MBA/MCA II-I semester
5	26-02-2022	MBA/MCA I-I semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-I semester ends
6	28-02-2022	MBA/MCA I-I semester - II Unit of Instruction starts, End Examinations for MBA/MCA II-I semester starts

MARCH		
1	01-03-2022	Maha Sivaratri
2	12-03-2022	B.Tech I-I semester – II Unit of Instructions ends, End Examinations for MBA/MCA II-I semester ends
3	14-03-2022	Commencement of Class Work for MBA/MCA II-II semester - I Unit of Instruction starts
4	18-03-2022	Holi
5	14-03-2022 to 19-03-2022	II Mid Examinations for B.Tech I-I semester
6	21-03-2022 to 26-03-2022	Preparations and Practicals for B.Tech I-I semester
7	28-03-2022	End Examinations for B.Tech I-I semester starts
APRIL		
1	02-04-2022	Ugadi
2	02-04-2022	B.Tech II,III&IV/IV – II Sem – I Unit of Instructions ends
3	04-04-2022 to 09-04-2022	I Mid Examinations for B.Tech II,III,IV – II semester
4	05-04-2022	Babu Jagjivan Ram Jayanthi
5	09-04-2022	End Examinations for B.Tech I-I semester ends
6	10-04-2022	Sri Rama Navami
7	11-04-2022	B.Tech II,III&IV/IV – II semester – II Unit of Instructions starts, Commencement of Class Work for B.Tech I-II semester - I Unit of Instructions starts
8	14-04-2022	Dr B R Ambedkar Jayanthi
9	15-04-2022	Good Friday
10	18-04-2022	II Mid Examinations for MBA/MCA I-I semester starts
11	23-04-2022	MBA/MCA I-I semester – II Unit of Instruction ends, II Mid Examinations for MBA/MCA I-I semester ends
12	25-04-2022 to 30-04-2022	Preparations and Practicals for MBA/MCA I-I semester
13	30-04-2022	MBA/MCA II-II semester – I Unit of Instruction ends
MAY		
1	02-05-2022	End Examinations for MBA/MCA I-I semester starts, I Mid Examinations for MBA/MCA II-II semester starts
2	03-05-2022	Ramzan
3	07-05-2022	I Mid Examinations for MBA/MCA II-II semester ends
4	09-05-2022	MBA/MCA II-II semester – II Unit of Instruction starts
5	14-05-2022	End Examinations for MBA/MCA I-I semester ends
6	23-05-2022	MBA/MCA I-II semester - I Unit of Instruction starts
7	28-05-2022	B.Tech II,III & IV/IV – II semester – II Unit of Instructions ends, B.Tech I-II semester - I Unit of Instruction ends
8	30-05-2022	II Mid Examinations for B.Tech II,III,IV – II semester starts, I Mid Examinations for B.Tech I-II semester starts

	JUNE	
1	04-06-2022	II Mid Examinations for B.Tech II,III,IV – II semester ends,I Mid Examinations for B.Tech I-II semester ends
2	06-06-2022	B.Tech I-II semester – II Unit of Instructions starts
3	06-06-2022 to 11-06-2022	Preparations and Practicals for B.Tech II,III,IV-II semester
4	13-06-2022 to 25-06-2022	End Examinations for B.Tech II,III,IV-II semester
5	25-06-2022	MBA/MCA II-II semester – II Unit of Instruction ends
6	27-06-2022	II Mid Examinations for II year MBA/MCA II semester starts
	JULY	
1	02-07-2022	II Mid Examinations for MBA/MCA II-II semester ends
2	04-07-2022 to 09-07-2022	Preparations and Practicals for MBA/MCA II-II semester
3	10-07-2022	Bakrid
4	11-07-2022	I Mid Examinations for MBA/MCA I-II semester starts, End Examinations for MBA/MCA II-II semester starts
5	16-07-2022	MBA/MCA I-II semester – I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-II semester ends
6	18-07-2022	MBA/MCA I-II semester – II Unit of Instruction starts
7	23-07-2022	B.Tech I-II semester – II Unit of Instructions ends, End Examinations for MBA/MCA II-II semester ends
8	25-07-2022 to 30-07-2022	II Mid Examinations for B.Tech I-II semester
	AUGUST	
1	01-08-2022 to 06-08-2022	Preparations and Practicals for B.Tech I-II semester
2	08-08-2022	End Examinations for B.Tech I-II semester starts
3	09-08-2022	Muharram
4	15-08-2022	Independence Day
5	19-08-2022	Krishna Janmashtami
6	20-08-2022	End Examinations for B.Tech I-II semester ends
7	31-08-2022	Vinayaka Chavithi
	SEPTEMBER	
1	05-09-2022	Teacher's day
2	10-09-2022	MBA/MCA I-II semester – II Unit of Instruction ends
3	12-09-2022 to 17-09-2022	II Mid Examinations for MBA/MCA I-II semester
4	19-09-2022 to 24-09-2022	Preparations and Practicals for MBA/MCA I-II semester
5	26-09-2022	End Examinations for MBA/MCA I-II semester starts
	OCTOBER	
1	08-10-2022	End Examinations for MBA/MCA I-II semester ends

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated - JNTUK, Kakinada
(ISO 9001:2015 Certified Institution)
MECHANICAL ENGINEERING
Department Academic Calendar 2021 – 2022 Semester I

S. No	Activity	Year/Class	Date
1	Notice	Time Table	27-09-2021 (II,III,IV/IV)
		Roll Call List	
		Elective Confirmation List	
		Project Review Committee	
		Mentor – Mentee list	
2	Principal and Faculty Meeting	All Faculty Members	First week of commencement of class work for I semester
3	HOD and Faculty meeting	All Faculty Members	Every Saturday
4	HOD and CR meeting	HOD and CR's	Before I MID Term test
5	Parents and Teacher meeting	Parents and Faculty	After releasing of university results
6	Commencement of Class work	II/IV B.Tech	01-10-2021
		III/IV B.Tech	01-10-2021
		IV/IV B.Tech	01-10-2021
7	I Mid-term test/Online Examinations	II/IV B.Tech	22-11-2021 to 27-11-2021
		III/IV B.Tech	22-11-2021 to 27-11-2021
		IV/IV B.Tech	22-11-2021 to 27-11-2021
8	Principal and Faculty Meeting	All Faculty Members	After releasing of university results.
9	Feedback on Faculty	II/IV, III/IV, IV/IV B.Tech	4-10-2021 to 9-10-2021(III, IV/IV) 28-11-2021 to 30-11-2021(II/IV)
10	Internal Lab Examinations	II/IV B.Tech	28-11-2021 to 02-12-2021
		III/IV B.Tech	
		IV/IV B.Tech	
11	II Mid-term test/Online Examinations	II/IV B.Tech	17-01-2022 to 22-01-2022
		III/IV B.Tech	17-01-2022 to 22-01-2022
		IV/IV B.Tech	17-01-2022 to 22-01-2022
12	Practical examinations	II/IV B.Tech	24-01-2022 to 29-01-2022
		III/IV B.Tech	24-01-2022 to 29-01-2022
		IV/IV B.Tech	24-01-2022 to 29-01-2022
13	Semester End Examinations	II/IV B.Tech	31-01-2022 to 12-02-2022
		III/IV B.Tech	31-01-2022 to 12-02-2022
		IV/IV B.Tech	31-01-2022 to 12-02-2022
14	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month
15	Commencement of Second Semester of Academic Year 2021-2022	B.Tech	14-02-2022 (II,III,IV/IV)

Signature of HoD

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of MECHANICAL ENGINEERING** **RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES**	**SRKIT / ME / 09**

Academic year: 2021-22 **Semester : I**

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
1	Dr. P. Kishore Kumar	Advanced Materials, ED	ME	-	-	12	HOD, Lab Incharge, Anti Ragging	
2	Dr. T. S. S. Balaji	CAD/CAM	ME	CAEDP	ME	12	ISO, Anti Ragging	
3	Dr. P. Jaganathan	PPE	ME	D&M LAB	ME	12	ISO, Anti Ragging	
4	Mr. A. Stanly Kumar	Mechatronics	ME	Mechatronics LAB	ME	24	Incharge HOD, Lab Incharge, Anti Ragging	
5	Mr. V. Bala Chinalingam	KOM, DOM	ME	TOM Lab, FMHM Lab	ME	21	Lab Incharge, Anti Ragging, NAAC	
6	Mr. D. Rognatha Rao	CAD/CAM	ME	CAD/CAM Lab	ME	24	Lab Incharge, Anti Ragging, NAAC	
7	Ms. P. Bhagya Lakshmi	MMM, Additive Manufacturing	ME	MMM LAB, PT LAB	ME	21	Lab Incharge, Anti Ragging, NAAC	
8	Ms. Y. Durga Bhavani	PT, IC Engines	ME	TE Lab	ME	18	Lab Incharge, Anti Ragging, NAAC	
9	Mr. R. Kiran Kumar	MOS, ED	ME	D&M Lab	ME	18	Lab Incharge, Anti Ragging, NAAC	
10	Mr. R. Karun Kumar	FEM	ME	CAEDP	ME	20	Lab Incharge, Anti Ragging, NAAC	
11	Ms. D. Haritha Bramha	DMM-II, ED	ME	Mechatronics Lab	ME	18	Lab Incharge, Anti Ragging, NAAC	

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of MECHANICAL ENGINEERING** **RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES**	**SRKIT / ME / 09**

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
12	Mr. U. Tanoj	PPE	ME	MMM Lab, PT Lab	ME	21	Lab Incharge, Anti Ragging, NAAC	
13	Mr. P. Tarun Naga Venkatesh	Additive Manufacturing, FMHM	ME	FMHM Lab, TE Lab	ME	21	Placement Incharge, Lab Incharge, Anti Ragging, NAAC	
14	Mr. M. Hari Krishna	ED, Advanced Materials, SRP	ME	TOM Lab	ME	18	ARC, Lab Incharge, Anti Ragging, NAAC	
15	Mr. Ch. Mohammad Akram	SRP	ME	TE Lab	ME	6	Anti Ragging, NAAC	
16	Mr. P. Muthayya	-	-	CAD/CAM Lab	ME	12	Anti Ragging, NAAC	
17	Mr. R. Murali	ED	ME	-	-	6	Anti Ragging, NAAC	

HOD / Date

Principal / Date

PRINCIPAL
SRK Institute of Technology
ENIKEPADU, VIJAYAWADA-521 108

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108.** **Department of Mechanical Engineering** **CLASS TIME TABLE**	**SRKIT / ME / 10.1**

Class: IV ME-A Section

Academic Year: 2021 – 22 **Semester: I**

Class Incharge: Mr.D. Rognatha Rao **W.E.F. 04-09-2021**

SECTION- I									
Time	**9:00 to 9:50**	**9:50 to 10:40**	**10:45 to 11:35**	**11: 35 to 12:25**	**LUNCH**	**1:10 to 2:00**	**2:00 to 2:45**	**2:50 to 3:35**	**3:35 to 4:20**
Period	**1**	**2**	**3**	**4**		**5**	**6**	**7**	**8**
MON	FEM	MECHTR	CAD/CAM	AM		PPE	FEM	AMT	Library
TUE	MECHTR	AM	FEM	PPE		**DASSULT SYSTEMS**		AMT	CAD/CAM
WED	PPE	**CAD/CAM/MECHTR-LAB**				AMT	FEM	AM	MECHTR
THU	PPE	FEM	MECHTR	AM		MECHTR	PPE	AMT	Sports
FRI	AM	MECHTR	FEM	AMT		CAD/CAM	**CAD/CAM/MECHTR-LAB**		
SAT	MECHTR	PPE	CAD/CAM	AM		CAD/CAM	AMT	Counselling	******

Mechatronics	**Mr. A Stanly Kumar**
CAD/CAM	**Mr. D Roghnatha Rao**
Finite Element Methods	**Mr. R Karun Kumar**
Power Plant Engineering	**Dr. R Jaganadhan**
Additive Manufacturing	**Mr. P. Tarun Naga Venkatesh**
Advanced Materials	**Dr. P Kishorekumar**
CAD/CAM Lab	**Mr. D.Roghnatha Rao / Mr. P. Muthayya**
Mechatronics Lab	**Mr. A. Stanly Kumar / Ms. D. Haritha Brahma**

HOD

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108.** **Department of Mechanical Engineering** **CLASS TIME TABLE**	**SRKIT / ME / 10.1**

Class: IV ME-Section B

Academic Year: 2021 –22 **Semester: I**

Class Incharge: Mr. R. Karun Kumar **W.E.F. 20-09-2021**

SECTION II									
Time	**9:00 to 9:50**	**9:50 to 10:40**	**10:45 to 11:35**	**11: 35 to 12:25**		**1:10 to 2:00**	**2:00 to 2:45**	**2:50 to 3:35**	**3:35 to 4:20**
Period	**1**	**2**	**3**	**4**		**5**	**6**	**7**	**8**
MON	AMT	AM	PPE	FEM		CAD/CAM	**CAD/CAM/MECHTR-LAB**		
TUE	CAD/CAM	**CAD/CAM/MECHTR-LAB**			**LUNCH**	AMT	PPE	FEM	Library
WED	MECHTR	FEM	AM	PPE		CAD/CAM	MECHTR	AMT	Sports
THU	MECHTR	AM	PPE	AMT		FEM	CAD/CAM	**DASSULT SYSTEMS**	
FRI	PPE	FEM	CAD/CAM	AMT		MECHTR	AM	PPE	AM
SAT	AM	Counselling	FEM	PPE		MECHTR	FEM	MECHTR	******

Mechatronics	**Mr. A Stanly Kumar**
CAD/CAM	**Dr. T S S Balaji**
Finite Element Methods	**Mr. R Karun Kumar**
Power Plant Engineering	**Mr. U Tanoj**
Additive Manufacturing	**Ms. P Bhagya Lakshmi**
Advanced Materials	**Mr. M Hari Krishna**
CAD/CAM Lab	**Mr. D.Roghnatha Rao / Mr. P. Muthayya**
Mechatronics Lab	**Mr. A. Stanly Kumar / Ms. D. Haritha Brahma**

HOD

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada - 521108** **Approved by AICTE, Affiliated to JNTUK, Kakinada** **(ISO 9001:2015 Certified Institution)** **INDIVIDUAL TIMETABLE**	**SRKIT / ME / 10.2**

Finite Element Methods									
Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:45	2:50 to 3:35	3:35 to 4:20
Period	**1**	**2**	**3**	**4**		**5**	**6**	**7**	**8**
MON	FEM-A			FEM-B			FEM-A		
TUE			FEM-A					FEM-B	
WED		FEM-B					FEM-A		
THU		FEM-A			**LUNCH**	FEM-B			
FRI		FEM-B	FEM-A						
SAT			FEM-B				FEM-B		

HOD /Date

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **DEPARTMENT OF MECHANICAL ENGINEERING** **TEACHING PLAN CUM REALIZATION**	**SRKIT / ME/12**

Department: **MECHANICAL ENGINEERING** Name of faculty: **R. KARUN KUMAR** Designation: **ASST.PROF**

Semester / Year: **I/IV** Academic Year: **2021-2022** Name of the subject: **FINITE ELEMENT METHODS** Section: **I**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	UNIT – 1 INTRODUCTION	From 13-09-21 To: 29-09-21			
1	Introduction to finite element method		13/9/21	1	–
2	stress and equilibrium		14/9/21	1	–
3	strain – displacement relations		15/9/21	1	–
4	stress – strain relations		16/9/21	1	–
5	plane stress and plane strain conditions		17/9/21	1	–
6	variational and weighted residual methods		20/9/21	1	–
7	concept of potential energy		21/9/21	1	–
8	Rayleigh-Ritz method		22/9/21	1	–
9	problems		23/9/21	1	–
10	problems		24/9/21	1	–
11	Element stiffness matrix for 1-D Problems		25/9/21	1	–
12	Strain displacement matrix derivation		27/9/21	1	–
13	Problems on 1-D Bar element		28/9/21	1	–
14	Elimination approach & penalty approach		29/9/21	1	✓

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **DEPARTMENT OF MECHANICAL ENGINEERING** **TEACHING PLAN CUM REALIZATION**	**SRKIT / ME/12**

	UNIT – 2 DESCRETIZATION OF ELEMENTS	From: 30-09-21 To: 21-10-21			
15	Discretization of domain element shapes		30/9/21	1	–
16	Derivation of element shapes		01/10/21	1	–
17	Discretization procedures, assembly of stiffness matrix		4/10/21	1	–
18	Band width, node numbering, mesh generation		4/10/21	1	–
19	Interpolation functions, problems		5/10/21	1	–
20	Local and global coordinates		6/10/21	1	–
21	convergence requirements, problems		11/10/21	1	–
22	Treatment of boundary conditions, problems		18/10/21	1	–
23	Problems		21/10/21	1	–
	UNIT – 3 ANALYSIS OF TRUSSES & BEAMS	From: 22-10-21 To: 16-11-21			
24	Analysis of trusses, Derivation of element stiffness matrix		22/10/21	1	–
25	Finite element modelling, coordinates and shape functions		23/10/21	1	–
26	Derivation of strain displacement matrix and shape functions		25/10/21	1	–
27	Assembly of global stiffness matrix and derivation of load vector		26/10/21	1	–
28	Treatment of boundary conditions, stress & strain		27/10/21	1	–
29	Support reactions calculations		28/10/21	1	–
30	Problem on Trusses		1/11/21	1	–

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31	Problem on Trusses		2/11/21	1	—
32	**Analysis of Beams:** Derivation of elements, stiffness matrix for Hermite		3/11/21	1	—
33	Derivation of load vector for point UDL load		5/11/21	1	—
34	Derivation of load vector & Assembly stiffness matrix		6/11/21	1	—
35	Problems on beams		8/11/21	1	—
36	Problems on beams with UDL		9/11/21	1	—
37	Problems on beams & frames		10/11/21	1	—
38	Problems on beams with UDL		11/11/21	1	—
39	Problems on frames		12/11/21	1	—
40	Problems on frames & beams		15/11/21	1	—
41	Problems on frames		16/11/21	1	—

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **DEPARTMENT OF MECHANICAL ENGINEERING** **TEACHING PLAN CUM REALIZATION**	**SRKIT / ME/12**

	UNIT – 4 ANALYSIS OF TWO DIMENSIONAL ELEMENTS				
42	Finite element modeling with CST	From: 29-11-21 To: 14-12-2021	29/11/21	1	—
43	Element stiffness matrix for CST element		30/11/21	1	—
44	Strain displacement matrix for CST		2/12/21	1	—
45	treatment of boundary conditions		3/12/21	1	—
46	Problem		6/12/21	1	—
47	problem		7/12/21	1	—
48	formulation of axisymmetric problems		10/12/21	1	—
49	problem		14/12/21	1	—
	UNIT V HIGHER ORDER AND ISOPARAMETRIC ELEMENTS				
50	One dimensional quadratic element in natural coordinates	From: 14-12-2021 To: 21-12-2021	14/12/21	1	—
51	One dimensional cubic element in natural coordinates		15/12/21	1	—
52	Two dimensional four noded isoparametric elements		16/12/21	1	—
53	Numerical integration		17/12/21	1	—
54	Problems quadratic element		18/12/21	1	—
55	Problems cubic element		21/12/21	1	—

	SRK INSTITUTE OF TECHNOLOGY Enikepadu, Vijayawada 521108 DEPARTMENT OF MECHANICAL ENGINEERING TEACHING PLAN CUM REALIZATION	SRKIT / ME/12

	UNIT –6 STEADY STATE HEAT TRANSFER & DYNAMIC ANALYSIS				
56	One dimensional analysis of a fin	From: 22-12-2021 To: 13-01-2022	22/12/21	1	–
57	Two dimensional analysis of thin plate		23/12/21	1	–
58	Analysis of a uniform shaft subjected to torsion		24/12/21	1	–
59	**Dynamic Analysis**: Formulation of finite element model		29/12/21	1	–
60	Element consistent and lumped mass matrices		30/12/21	1	–
61	Evaluation of Eigen values		31/12/21	1	–
62	Evaluation of Eigen vectors		3/01/22	1	–
63	Free vibration analysis		4/01/22	1	–
64	Problems on fins		5/01/22	1	–
65	Problems on thin plate		6/01/22	1	–
66	Problems on shaft subjected to torsion		7/01/22	1	–
67	Problems on lumped mass matrices		10/01/22	1	–
68	Problems on Eigen values & Eigen vectors		10/01/22	1	–
69	Problems		11/01/22	1	–

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **DEPARTMENT OF MECHANICAL ENGINEERING** **TEACHING PLAN CUM REALIZATION**	**SRKIT / ME/12**

70	Problems		11/01/22	1	—
71	Problems		11/01/22	1	—

Faculty/ Date

HOD/Date

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **DEPARTMENT OF MECHANICAL ENGINEERING** **TEACHING PLAN CUM REALIZATION**	**SRKIT / ME/12**

Department: **MECHANICAL ENGINEERING** Name of faculty: **R. KARUN KUMAR** Designation: **ASST.PROF**

Semester / Year:**I/IV** Academic Year: **2021-2022** Name of the subject: **FINITE ELEMENT METHODS** Section: **II**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	UNIT – 1 INTRODUCTION	From 13-09-21 To: 29-09-21			
1	Introduction to finite element method		13/9/2021	1	—
2	stress and equilibrium		14/9/2021	1	—
3	strain – displacement relations		15/9/21	1	—
4	stress – strain relations		16/9/21	1	—
5	plane stress and plane strain conditions		17/9/21	1	—
6	variational and weighted residual methods		20/9/21	1	—
7	concept of potential energy		21/9/21	1	—
8	Rayleigh-Ritz method		22/9/21	1	—
9	problems		23/9/21	1	—
10	problems		24/9/21	1	—
11	Element stiffness matrix for 1-D Problems		25/9/21	1	—
12	Strain displacement matrix derivation		27/9/21	1	—
13	Problems on 1-D Bar element		28/9/21	1	—
14	Elimination approach & penalty approach		29/9/21	1	—

8
21/9/21

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **DEPARTMENT OF MECHANICAL ENGINEERING** **TEACHING PLAN CUM REALIZATION**	**SRKIT / ME/12**

	UNIT – 2 DESCRETIZATION OF ELEMENTS	From: 30-09-21 To: 21-10-21			
15	Discretization of domain element shapes		30/9/2021	✓	—
16	Derivation of element shapes		1/10/2021	✓	—
17	Discretization procedures, assembly of stiffness matrix		4/10/21	✓	—
18	Band width, node numbering, mesh generation		5/10/21	✓	—
19	Interpolation functions, problems		6/10/21	✓	—
20	Local and global coordinates		11/10/21	✓	—
21	convergence requirements, problems		18/10/21	✓	—
22	Treatment of boundary conditions, problems		20/10/21	✓	—
23	Problems		21/10/21	✓	—
	UNIT – 3 ANALYSIS OF TRUSSES & BEAMS	From: 22-10-21 To: 17-11-21			
24	Analysis of trusses, Derivation of element stiffness matrix		22/10/21	✓	—
25	Finite element modeling, coordinates and shape functions		23/10/21	✓	—
26	Derivation of strain displacement matrix and shape functions		27/10/21	✓	—
27	Assembly of global stiffness matrix and derivation of load vector		28/10/21	✓	—
28	Treatment of boundary conditions, stress & strain		29/10/21	✓	—

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29	Support reactions calculations		30/10/24	1	—
30	Problem on Trusses		1/11/2024	1	—
31	Problem on Trusses		3/11/2024	1	—
32	**Analysis of Beams:** Derivation of elements, stiffness matrix for Hermite		5/11/2024	1	—
33	Derivation of load vector for point UDL load		8/11/2024	1	—
34	Derivation of load vector & Assembly stiffness matrix		9/11/2024	1	—
35	Problems on beams		10/11/2024	1	—
36	Problems on beams with UDL		11/11/2024	1	—
37	Concept of frames		12/11/2024	1	—
38	Problems on beams		15/11/2024	1	—
39	Problems on frames		16/11/2024	1	—
40	Problems on frames		17/11/2024	1	—

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	UNIT – 4 ANALYSIS OF TWO DIMENSIONAL ELEMENTS				
41	Finite element modeling with CST	From: 18-11-21 To: 14-12-21	18/11/2021	1	–
42	Element stiffness matrix for CST element		29/11/2021	1	–
43	Strain displacement matrix for CST		30/11/2021	1	–
44	treatment ofboundary conditions		2/12/2021	1	–
45	problem		6/12/2021	1	–
46	problem		7/12/2021	1	–
47	formulation of axisymmetric problems		10/12/2021	1	–
48	problem		13/12/2021	1	–
49	Problems		14/12/2021	1	–
	UNIT V HIGHER ORDER AND ISOPARAMETRIC ELEMENTS				
50	One dimensional quadratic element in natural coordinates	From: 15-12-21 To: 21-12-2021	15/12/2021	1	–
51	One dimensional cubic element in natural coordinates		16/12/2021	1	–
52	Two dimensional four noded isoparametric elements		17/12/21	1	–
53	Numerical integration		18/12/21	1	–
54	Problems quadratic element		18/12/21	1	–

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55	Problems cubic element		21/12/21	1	—
	UNIT –6 STEADY STATE HEAT TRANSFER & DYNAMIC ANALYSIS				
56	One dimensional analysis of a fin		22/12/21	1	—
57	Two dimensional analysis of thin plate		24/12/21	1	—
58	Analysis of a uniform shaft subjected to torsion	From: 22-12-2021	29/12/21	1	—
59	**Dynamic Analysis**: Formulation of finite element model	To: 13-01-2022	30/12/21	1	—
60	Element consistent and lumped mass matrices		31/12/21	1	—
61	Evaluation of Eigen values		3/01/22	1	—
62	Evaluation of Eigen vectors		4/01/22	1	—
63	Free vibration analysis		5/01/22	1	—
64	Problems on fins		6/01/22	1	—
65	Problems on thin plate		6/01/22	1	—
66	Problems on shaft subjected to torsion		7/01/22	1	—
67	Problems on lumped mass matrices		7/01/22	1	—
68	Problems on Eigen values & Eigen vectors		10/01/22	1	—
69	Problems		10/01/22	1	—

	SRK INSTITUTE OF TECHNOLOGY Enikepadu, Vijayawada 521108 DEPARTMENT OF MECHANICAL ENGINEERING TEACHING PLAN CUM REALIZATION	SRKIT / ME/12

70	Problems		11/01/22	1	—
71	Problems		11/01/22	1	—

Faculty/ Date

HOD/Date

UNIT 1

➢ **Derive the equations of equilibrium incase of a three dimensional stress system.**

(or)

Derive stress-equilibrium conditions for structural element.

Ans: A Three dimensional body occupying a volume 'V' and having a surface 'S' is shown in fig. Points in the body are located by x, y, z coordinates. The boundary is constrained on some region, where displacement is specified. On part of the boundary, distributed force per unit area 'T', also called Traction is applied.

The deformation of a point $x = [x, y, z]^T$ is given by. The three components of its displacement.

$$u = [u, v, w]^T \quad -(1)$$

The distributed force per unit volume is

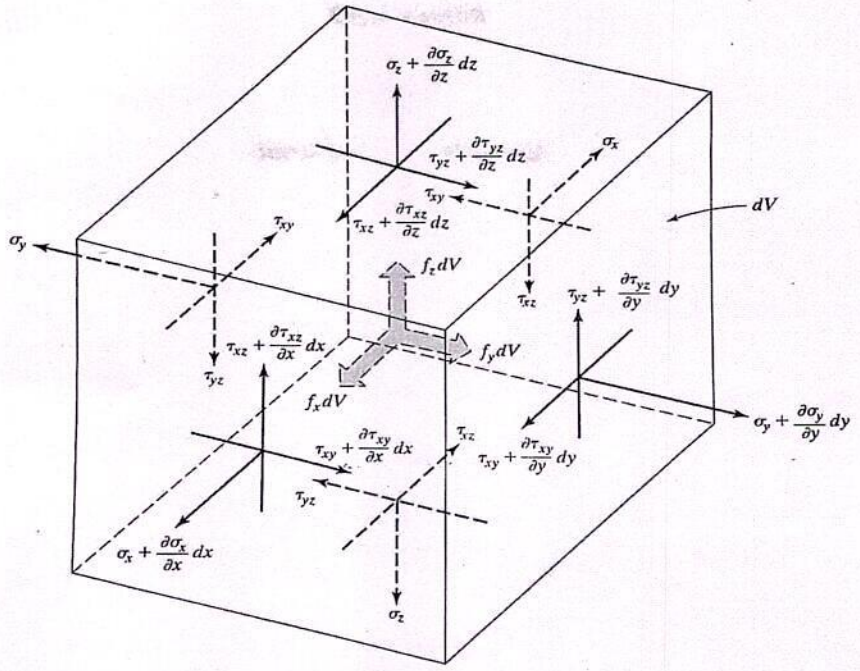
$$f = [f_x, f_y, f_z]^T \quad -(2)$$

The Surface Traction 'T' may be given by

$$T = [T_x, T_y, T_z]^T \quad -(3)$$

A load 'P' acting at a point 'i' is represented by its three components:

$$P_i = [P_x, P_y, P_z]_i^T \quad -(4)$$



$\Sigma f_x = 0$ is

from fig ②

$$= \left(\sigma_x + \frac{\partial \sigma_x}{\partial x} dx\right) + \left(\tau_{xy} + \frac{\partial \tau_{xy}}{\partial y} dy\right) + \tau_{xz} dy dz - \tau_{yz} dx dz + \sigma_x dy dz - \tau_{xy} dx dz + \tau_{xz} dx dy + f_x (dx dy dz) = 0$$

$$\sigma_x dy dz + \frac{\partial \sigma_x}{\partial x} dx dy dz - \tau_{yz} dx dz + \frac{\partial \tau_{xy}}{\partial y} dy dx dz + \tau_{xy} dx dz - \sigma_x dy dz + \tau_{xz} dx dy + \frac{\partial \tau_{xz}}{\partial z} dz dx dy - \tau_{xz} dx dy + f_x dx dy dz = 0$$

$$\frac{\partial \sigma_x}{\partial x} dx dy dz + \frac{\partial \tau_{xy}}{\partial y} dx dy dz + \frac{\partial \tau_{xz}}{\partial z} dx dy dz + f_x dx dy dz = 0$$

$$\Rightarrow \boxed{\frac{\partial \sigma_x}{\partial x} + \frac{\partial \tau_{xy}}{\partial y} + \frac{\partial \tau_{xz}}{\partial z} + f_x = 0}$$

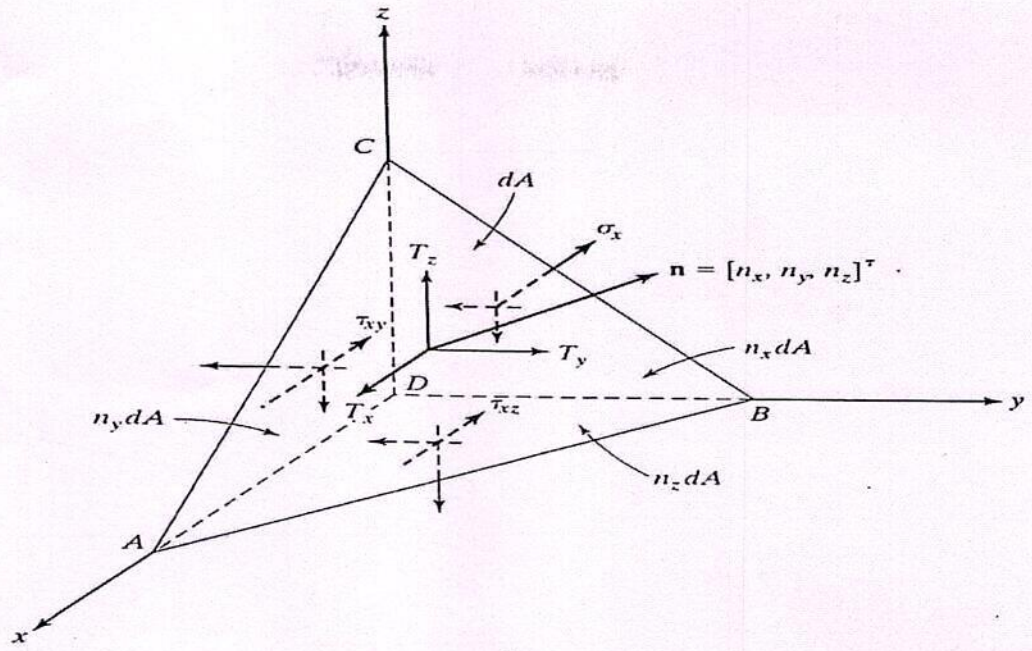
similarly

$\Sigma f_y = 0$

$$\boxed{\frac{\partial \tau_{xy}}{\partial x} + \frac{\partial \sigma_y}{\partial y} + \frac{\partial \tau_{yz}}{\partial z} + f_y = 0}$$

$\Sigma f_z = 0$

$$\boxed{\frac{\partial \tau_{xz}}{\partial x} + \frac{\partial \tau_{yz}}{\partial y} + \frac{\partial \sigma_z}{\partial z} + f_z = 0}$$



(ii) Strain - Displacement Relations:-

The corresponding strains are given by,

$$\varepsilon = [\varepsilon_x, \varepsilon_y, \varepsilon_z, \gamma_{yz}, \gamma_{xz}, \gamma_{xy}]^T \quad - (1)$$

Where $\varepsilon_x, \varepsilon_y$ & ε_z are normal strains & γ_{yz}, γ_{xz} & γ_{xy} are the Engineering Shear Strains.

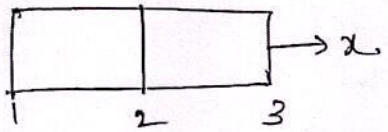
from fig gives the deformation of the dx-dy face for small deformations, which we consider here. Considering the other faces, we can write

$$\varepsilon = \left[\frac{du}{dx}, \frac{dv}{dy}, \frac{dw}{dz}, \frac{dv}{dz} + \frac{dw}{dy}, \frac{du}{dz} + \frac{dw}{dx}, \frac{du}{dy} + \frac{dv}{dx} \right]^T \quad - (2)$$

- These Strain relations hold for small deformations.

UNIT-II

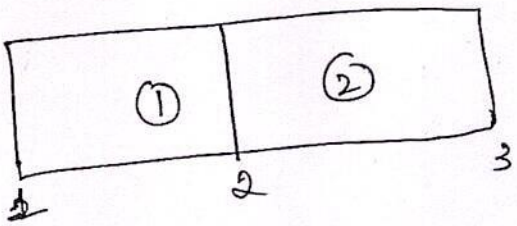
→ Consider the 1-D model of the structure shown in fig. Show that the assembled stiffness matrix K is singular



(OR)

Explain assembly of stiffness matrix with Example.

Ans:- One Dimensional structure:-



let the given structure be divided into two Elements ① & ② as shown in figure.

The stiffness matrix for element ① is given by,

$$K_1 = \frac{A_1E_1}{L_1}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}\begin{matrix} 1 \\ 2 \end{matrix}$$

(1 2)

The stiffness matrix for element ② is given by,

$$K_2 = \frac{A_2E_2}{L_2}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}\begin{matrix} 2 \\ 3 \end{matrix}$$

(2 3)

Assume, $E_1 = E_2 = E$, $A_1 = A_2 = A$ & $L_1 = L_2 = L$

The global stiffness matrix is given by,

→ Shape functions in Natural coordinate System:

Another Type of local coordinate System is th natural coordinate System. In natural coordinate system, any poi in the Element is Specified by the Set of numbers. Range of values of numbers in the set ranges from either 0 to 1 (or) -1 to 1. To obtain Shape function in natural coordinates, it is required to convert local coordi in to natural coordinates.

let $\xi = -1 \text{ to } +1$

$$\xi = a + bx \quad -(1)$$

$$-1 = a + bx_1 \quad -(2)$$

$$1 = a + bx_2 \quad -(3)$$

$$-2 = b(x_1 - x_2) \Rightarrow b = \frac{2}{x_2 - x_1} \quad -(4)$$

Sub (4) in (3)

$$1 = a + \frac{2}{x_2 - x_1} x_2$$

$$a = 1 - \frac{2x_2}{x_2 - x_1}$$

$$a = \frac{-(x_2 + x_1)}{(x_2 - x_1)}$$

Sub a & b values in (1)

$$= \left(\frac{1}{2} - \frac{q}{2}\right) x_1 + \left(\frac{1}{2} + \frac{q}{2}\right) x_2$$

$$= \left(\frac{1-q}{2}\right) x_1 + \left(\frac{1+q}{2}\right) x_2$$

Here N_1 & N_2 are shape functions for geometry not for displacements

$$N_1 = \frac{1-q}{2}$$

$$N_2 = \frac{1+q}{2}$$

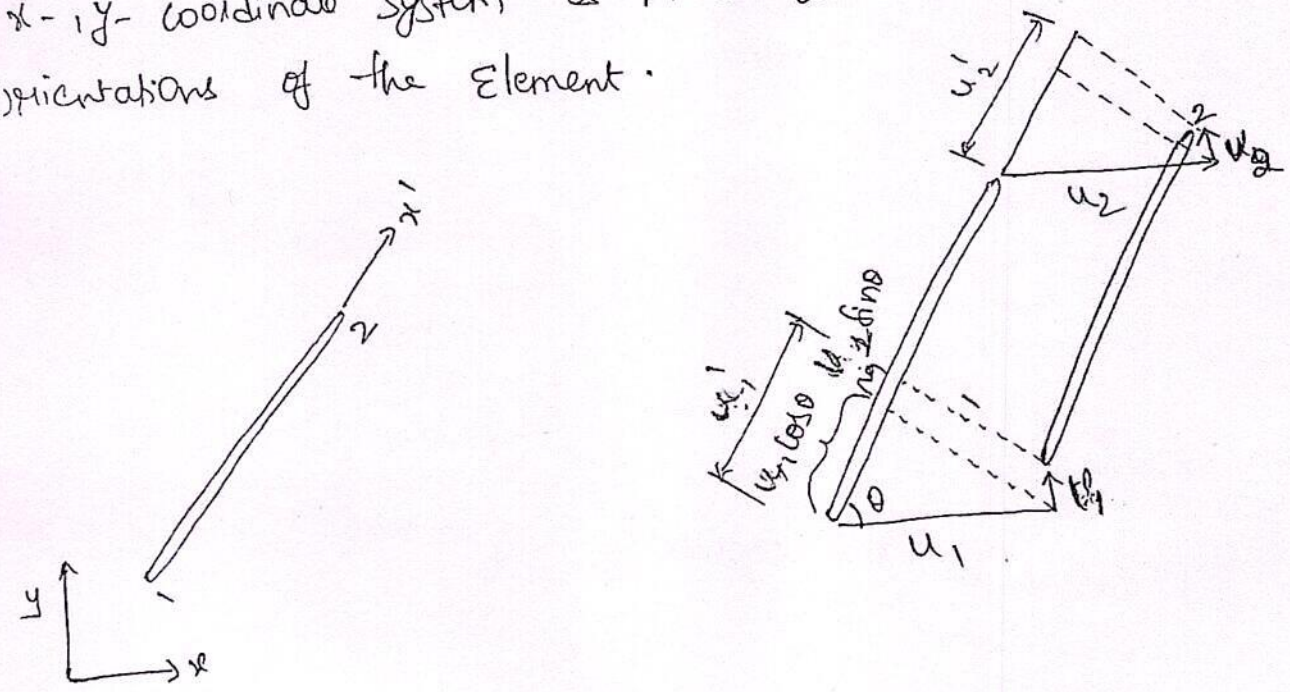
$$N_1 + N_2 = 1$$

UNIT - III

PLANE TRUSSES

The Truss have various orientations. To account for the different orientations, local & global coordinate systems are Introduced as follows:

A Typical plane-Truss Element is shown in local & global coordinate System as shown in fig. The local coordinal System consists of the x'-axis which runs along the Element from node 1 towards node 2. All quantities in the local coordinate System will be denoted by a prime ($'$). The global x-, y- coordinate System is fixed and does not depend on the orientations of the Element.



Let u_1' & u_2' be the displacements of nodes 1 & 2 res in the local coordinate system. Thus the Element displacement Vector in the local coordinate system is denoted by

$$u' = [u_1', u_2']^T$$

→ Element Stiffness matrix :-

The Element Stiffness matrix for a Truss Element in the local Coordinate System is given by.

$$K' = \frac{A_e E_e}{l_e}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$$

where A_e : Element cross-sectional area

E_e : Young's modulus.

The Element Strain Energy in local coordinates is given by

$$U_e = \frac{1}{2} u_e'^T K_e' u_e'$$

Sub $u_e' = L u_e$

$$U_e = \frac{1}{2} u_e^T L_e^T K_e' L_e u_e \quad \text{①} \qquad (\because K = L_e^T K_e' L_e)$$

The Strain Energy in global coordinate can be written as

$$U_e = \frac{1}{2} u_e^T K_e u_e \quad \text{②}$$

① = ②

$$K_e = L_e^T K_e' L_e.$$

$$= \begin{bmatrix} l & 0 \\ m & 0 \\ 0 & l \\ 0 & m \end{bmatrix} \frac{A_e E_e}{l_e}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} l & m & 0 & 0 \\ 0 & 0 & l & m \end{bmatrix}$$

$$K = \frac{A_e E_e}{l_e} \begin{bmatrix} l^2 & lm & -l^2 & -lm \\ lm & m^2 & -lm & -m^2 \\ -l^2 & -lm & l^2 & lm \\ -lm & -m^2 & lm & m^2 \end{bmatrix}$$

Stress Calculation:-

The Stress 'σ' in a Truss Element is given by

$$\sigma = E_e \varepsilon$$

Since Strain ε is the change in length per unit original leg

$$\sigma = E_e \left(\frac{u_2' - u_1'}{l_e} \right)$$

$$= \frac{E_e}{l_e} \begin{bmatrix} -1 & 1 \end{bmatrix} \begin{bmatrix} u_1' \\ u_2' \end{bmatrix}$$

$$= \frac{E_e}{l_e} \begin{bmatrix} -1 & 1 \end{bmatrix} u_e'$$

$\left[\because u_e' = L u_e \right]$

$$\sigma = \frac{E}{l_e} \begin{bmatrix} -1 & 1 \end{bmatrix} L u_e$$

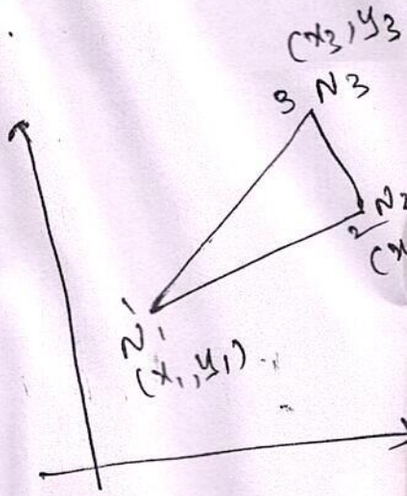
$$= \frac{E}{L_e} \begin{bmatrix} -1 & 1 \end{bmatrix} \begin{bmatrix} l & m & 0 & 0 \\ 0 & 0 & l & m \end{bmatrix} u_e$$

$$\boxed{\sigma = \frac{E}{l_e} \begin{bmatrix} -l & -m & l & m \end{bmatrix} u_e}$$

UNIT-IV

→ What is Constant Strain Triangle (CST):-

A Triangular element with 3 nodes & 6 degrees of freedom is called as constant strain triangle element.



The displacement at any point inside the Element is represented in Terms of the nodal displacements of the element, with the help of shape functions.

For a CST Element, the x & y coordinate are ma on the ξ - η coordinates and shape functions a linear ove the Element. The shape functions are as functions of ξ and η.

$$N_1 + N_2 + N_3 = 1$$

where N_1, N_2 & N_3 are the shape functions at NO', les. from the above Equation, it is concluded t N_1, N_2 & N_3 are not linearly Independent, but th of These are Endependent.

$$N_1 = \xi$$

→ Derive the Element Stiffness matrix, nodal load vectors & nodal displacements matrix for a CST Element.

Ans:

The Total potential Energy for a Triangular Element can be written as

$$\Pi = \sum_e \frac{1}{2}\int_e e^T D e t\, dA - \sum_e \int_e u^T f t\, dA - \int_L u^T T t\, dl - \sum_i u_i^T P_i$$

$$V_e = \frac{1}{2}\int_e q^T B^T D q B t\, dA$$

$$V_e = \frac{1}{2} q^T B^T D B t_e \left(\int dA\right) q$$

$$A_e = \int_e dA$$

$$V_e = \frac{1}{2} q^T B^T D q B t_e A_e$$

$$V_e = \frac{1}{2} q^T k_e q$$

$$k_e = B^T D B t_e A_e$$

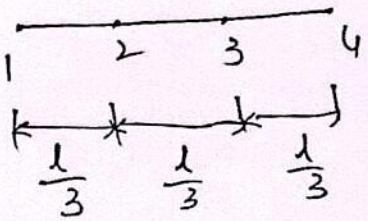
$$(k_e) = \int [B]^T D B t_e A_e$$

UNIT : V

→ Derive shape functions for one dimensional cubic element in natural coordinates.

Ans: Shape functions of cubic Element:-

Consider a cubic one dimensional element with one degree of freedom at each node i.e four degrees of freedom. Natural coordinates at each point is (L_1, L_2).



The cubic Interpolation model can be written as

$$\phi(x) = [N]\vec{\phi}^{(e)}$$

$$= [N_1 \quad N_2 \quad N_3 \quad N_4]\vec{\phi}^{(e)}$$

where

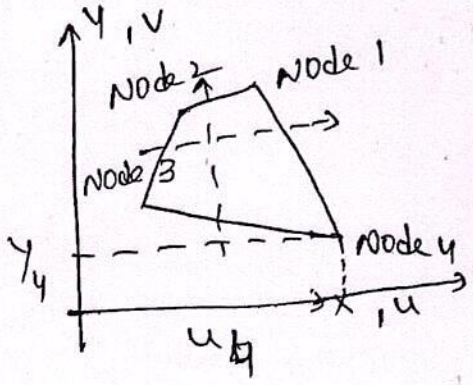
$$\vec{\phi}^{(e)} = \begin{bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \end{bmatrix}^{(e)} = \begin{bmatrix} \phi(x_1) \\ \phi(x_2) \\ \phi(x_3) \\ \phi(x_4) \end{bmatrix}$$

→ The value of 'x' variables are corresponding to each node with natural coordinates (L_1, L_2).

(i.e) x_1 : At node 1 $(L_1 = 1, L_2 = 0)$

x_2 - At node 2 $(L_1 = 2/3, L_2 = 1/3)$

→ Derive the Expression needed for the Evaluation of the stiffness matrix of the Isoparametric four-noded finite Element shown in fig. Assume plane stress & plane strain condition.



(OR)

Derive the Shape function for a 4-noded quadrilateral Element using lagrange's methods.

Ans: Consider the general quadrilateral element as shown in fig. The local nodes are numbered 1, 2, 3 & 4 in counter clockwise direction as shown in fig & (x_i, y_i) are the coordinates of node(i) i.e., N_i, the vector 'q' is given by,

$q = [q_1 \quad q_2 \quad q_3 \quad q_4 \quad q_5 \quad q_6 \quad q_7 \quad q_8]^T$ denotes the Element displacement vector. The displacement of an Interior point 'p' located at (x, y) is represented by

$u = [u, v]^T$

→ ξ & η are the natural coordinates of Elements.

→ N is shape function.

where i = 1, 2, 3, 4 for quadrilateral Element at node i = 1, 2, 3, 4 at other nodes.

$C_1 = \frac{1}{4}$

$$N_1 = \frac{1}{4}(1+\xi_1)(1+\eta) \quad \text{-(6)}$$

At node 2, shape function N_2 is in the form.

$$N_2 = C_2(1-\xi_1)(1+\eta) \quad \text{-(7)}$$

From fig at node 2

$N_2 = 1, \quad \eta = 1, \quad \xi_1 = -1$

$1 = C_2(2)(2)$

$\Rightarrow C_2 = \frac{1}{4}$

$$N_2 = \frac{1}{4}(1-\xi_1)(1-\eta) \quad \text{-(8)}$$

At node 3, shape function is in the form of,

$$N_3 = C_3(1-\xi_1)(1-\eta) \quad \text{-(9)}$$

At node 3, $N_3 = 1, \quad \eta = -1, \xi_1 = -1$

$C_3 = \frac{1}{4}$

$$N_3 = \frac{1}{4}(1-\xi_1)(1-\eta) \quad \text{-(10)}$$

At node 4, shape function is in the form of

$$N_4 = C_4(1+\xi_1)(1-\eta).$$

At node-4 $N_4 = 1 \; ; \xi_1 = -1, \eta = -1$

$C_4 = \frac{1}{4} \Rightarrow N_4 = \frac{1}{4}(1+\xi_1)(1-\eta)$

Solving the Jacobian matrix by taking each term.

$$J_{11} = \frac{\partial x}{\partial \xi} = \frac{\partial}{\partial \xi}(N_1 x_1 + N_2 x_2 + N_3 x_3 + N_4 x_4)$$

$$= \frac{\partial}{\partial \xi}\left[\left[\left(\frac{1}{4}(1+\xi)(1+\eta)\right)x_1\right] + \frac{1}{4}\left[(1-\xi)(1+\eta)\right]x_2 + \left(\frac{1}{4}(1-\xi)(1-\eta)\right)x_3 + \left(\frac{1}{4}(1+\xi)(1-\eta)\right)x_4\right].$$

$$= \frac{\partial}{\partial \xi}\ \frac{1}{4}\left[(1+\xi)(1+\eta)x_1 + (1-\xi)(1+\eta)x_2 + (1-\xi)(1-\eta)x_3 + (1+\xi)(1-\eta)x_4\right].$$

$$\left[\because \frac{\partial}{\partial \xi} = 1\right]$$

Diff Partially w.r.to ξ.

$$= \frac{1}{4}\left[(0+1)(1+\eta)x_1 + (0-1)(1+\eta)x_2 + (0-1)(1-\eta)x_3 + (0+1)(1-\eta)x_4\right].$$

$$= \frac{1}{4}\left[(1+\eta)x_1 - (1+\eta)x_2 - (1-\eta)x_3 + (1-\eta)x_4\right].$$

$$J_{11} = \frac{1}{4}\left[(x_1-x_2)(1+\eta) + (x_4-x_3)(1-\eta)\right].$$

Similarly

$$J_{12} = \frac{\partial y}{\partial \xi} = \frac{1}{4}\left((y_1-y_2)(1+\eta) + (1-\eta)(y_4-y_3)\right]$$

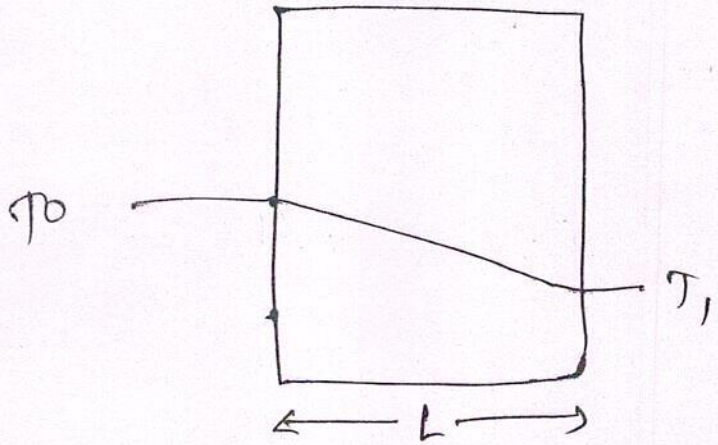
$$J_{21} = \frac{\partial x}{\partial \eta} = \frac{1}{4}\left[(x_1-x_4)(1+\xi) + (x_2-x_3)(1-\xi)\right].$$

$$J_{22} = \frac{\partial y}{\partial \eta} = \frac{1}{4}\left[(y_1-y_4)(1+\xi) + (y_2-y_3)(1-\xi)\right].$$

UNIT - VI

→ Derive one dimensional Conduction problem using weighted Residual method.

Ans: Heat conduction:



Consider a steady state heat conduction across a slab as shown in fig. let, the Temperature maintained at different points be T_0 & T_1.

→ The differential Equation for one dimensional Conduction is given by

$$\frac{d}{dx}\left[k(T)\frac{dT}{dx}\right] = 0 \quad \text{— (1)}$$

Boundary Conditions:-

$$T(x=0) = T_0$$
$$T(x=L) = T_1$$

→ The Thermal Conductivity Variation across a slab is given by,

where $k = 1, 2, \ldots N$

Applying the first approximation,

$$\theta_1 = x + A_1(x^2 - x) \quad , \quad \theta_1' = 1 + A_1(2x - 1)$$

$$\theta_1'' = 2A_1 \qquad -(3)$$

The weighted Residual is Evaluated at $x = \frac{1}{2}$, Thus the weighted becomes,

$$\left[1 + \frac{1}{2}a\left(1 - \frac{1}{2}A_1\right)\right] 2A_1 + a = 0$$

Sub $a = 1$ in above Equation.

$$-\frac{1}{2}A_1^2 + 3A_1 + 1 = 0$$

$$A_1 = -0.317 \qquad -(4)$$

Sub (4) into Eq (3)

$$\theta_1 = x - 0.317(x^2 - x)$$

Applying Second Approximation by Splitting into two Equ lengths.

Thus, weight Residual becomes,

$$\int_0^L R(x, \theta_1)\, dx = 0$$

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

IV Year I Semester B.Tech Course Mechanical Branch FEM Subject

Theory ✓ Drawing Practical

Name of Teacher (s) 1. R. KARUN KUMAR

2.

Academic Year 2021-2022 SECTION-A

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1	monday	3:25-4:20	13/9/2021	Introduction to finite Element method	21	monday	9:00-9:50	11/10/2021	convergence requirements, Problems
2	Tuesday	11:35-4:20	14/9/2021	Stress & Equilibrium conditions	22	monday	2:00-2:45	18/10/2021	Treatment of Boundary Conditions, Problems
3	wednesday	9:00-9:50	15/9/2021	Strain - displacement relations.	23	Thursday	10:45-11:35	21/10/2021	problems.
4	Thursday	10:45-11:35	16/9/2021	stress - Strain relations	24	Friday	10:45-11:35	22/10/2021	UNIT-III Analysis of Truss, Derivation of Element stiffness
5	Friday	3:35-4:20	17/9/2021	plane Stress & plane Strain conditions	25	Saturday	2:50-3:35	23/10/2021	finite Element Modelling, coordinate & Shape functions
6	monday	9:00-9:50	20/9/2021	Variational & weighted residual methods.	26	monday	9:00-9:50	25/10/2021	Derivation of Strain displacement matrix & Stress matrix
7	Tuesday	10:45-11:35	21/9/2021	Concept of potential energy.	27	Tuesday	10:45-11:35	26/10/2021	Assembly of Global Stiffness matrix & derivation of load vector
8	wednesday	2:00-2:45	22/9/2021	Rayleigh - Ritz method	28	wednesday	2:00-2:45	27/10/2021	Treatment of Boundary conditions, Stress & Strain
9	Thursday	9:50-10:40	23/9/2021	problems	29	Thursday	9:50-10:40	28/10/2021	Support reactions Calculations.
10	Friday	10:45-11:35	24/9/2021	Problems	30	Monday	9:00-9:50	1/11/2021	problems on Trusses
11	Saturday	2:50-3:35	25/9/2021	Element Stiffness matrix for 1-D Problems	31	Tuesday	10:45-11:35	2/11/2021	problems on Trusses.
12	monday	9:00-9:50	27/9/2021	Strain displacement matrix derivation.	32	wednesday	2:00-2:45	3/11/2021	Analysis of Beams - Derivation of Elements stiffness matrix
13	Tuesday	10:45-11:35	28/9/2021	problems on 1-D Bar Elements	33	Friday	10:45-11:35	5/11/2021	Derivation of load vectors for Point UDL
14	wednesday	2:00-2:45	29/9/2021	Elimination Approach & Penalty Approach	34	Saturday	2:50-3:35	6/11/2021	Derivation of load vectors & Assembly
15	Thursday	9:50-10.40	30/9/2021	UNIT-II Discretization of domain, Element shapes	35	monday	9:00-9:50	8/11/2021	Problems of Beams
16	Friday	10:45-11:35	1/10/2021	Derivation of Element Shape functions.	36	Tuesday	10:45-11:35	9/11/2021	problems on Beams With UDL
17	monday	9:00-9:50	4/10/2021	Discretization Procedures, Assembly of Stiffness Matrix	37	wednesday	2:00-2:45	10/11/2021	problems on Beams & frames
18	monday	2:00-2:45	4/10/2021	Band width, node numbering, mesh generation	38	Thursday	9:50-10:40	11/11/2021	Problems on Beams with UDL
19	Tuesday	10:45-11:35	5/10/2021	Interpolation functions, Problems	39	Friday	10:45-11:35	12/11/2021	Problems on Frames
20	wednesday	2:00-2:45	6/10/2021	Local & Global coordinates.	40	monday	9:00-9:50	15/11/2021	Problems on frames & Bea

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Name of Teacher (s) 1. R. KARUNKUMAR — IV Year I Semester B.Tech Course Mechanical Branch FEM Subject — Theory / Drawing / Practical

2. Academic Year 2021-2022 SECTION-A

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Tuesday	10:45-11:35	16/11/2021	Problems on frames	61	Friday	10:45-11:35	31/12/2021	Evaluation of Eigen values
42	Monday	9:00-9:45	29/11/2021	UNIT-IV Finite element modelling with CST	62	Monday	9:00-9:45	3/01/2022	Evaluation of Eigen values
43	Tuesday	10:45-11:35	30/11/2021	Element Stiffness matrix for CST element	63	Tuesday	10:45-11:35	4/01/2022	Free Vibration analysis
44	Thursday	9:50-10:40	2/12/2021	Strain displacement matrix for CST	64	Wednesday	2:00-2:45	5/01/2022	Problems on fins
45	Friday	10:45-11:35	3/12/2021	Treatment of Boundary conditions	65	Thursday	9:50-10:40	6/01/2022	Problems on Thin Plate
46	Monday	9:50-10:40	6/12/2021	Problem	66	Friday	10:45-11:35	7/01/2022	Problems on Shaft Sub to Torsion
47	Tuesday	10:45-11:35	7/12/2021	Problem	67	Monday	9:00-9:45	10/01/2022	problems on lumped mass matrix
48	Friday	10:45-11:35	10/12/2021	formulation of axisymmetric Problem	68	Monday	10:45-11:35	10/01/2022	Problems on Eigen values & Eigen V
49	Monday	9:00-9:45	13/12/2021	Problem	69	Tuesday	9:00-9:50	11/01/2022	Problems
50	Tuesday	10:45-11:35	14/12/2021	UNIT-V 2 dim Quadratic Element in Natural co-ordinates	70	Tuesday	10:45-11:35	11/01/2022	Problems
51	Wednesday	2:00-2:45	15/12/2021	1-D cubic Element in natural coordinates	71	Tuesday	11:35-12:25	11/01/2022	Problems
52	Thursday	9:50-10:40	16/12/2021	2-D four Noded Isoparametric Element	72				
53	Friday	10:45-11:35	17/12/2021	Numerical Integration	73				
54	Saturday	2:00-2:35	18/12/2021	Problems Quadric Element	74				
55	Tuesday	10:45-11:35	21/12/2021	problems cubic Element	75				
56	Wednesday	2:00-2:45	22/12/2021	UNIT-6 1-D Analysis of fin	76				
57	Thursday	10:45-11:35	23/12/2021	2-D analysis of Thin Plate	77				
58	Friday	10:45-11:35	24/12/2021	Analysis of circular Shaft Sub to Torsion	78				
59	Wednesday	2:00-2:45	29/12/2021	Formulation of FE Model	79				
60	Thursday	9:50-10:40	30/12/2021	Element Consistent & lumped mass matrix	80				

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓
Drawing
Practical

IV Year I Semester B.Tech Course Mechanical Branch FEM Subject

Name of Teacher (s) 1. R. TARUN KUMAR **2.**

Academic Year 2021-2022 SECTION-B

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1	monday	11:35-12:25	13/9/2021	Introduction to finite element method	21	monday	11:35-12:25	18/10/2021	convergence requirement, Problems
2	Tuesday	1:10-2:00	14/9/2021	Stress & Equilibrium conditions	22	wednesday	9:00-9:50	20/10/2021	Treatment of Boundary problems
3	wednesday	3:35-4:30	15/9/2021	Strain-displacement relations	23	thursday	1:10-2:00	21/10/2021	problems.
4	thursday	2:00-2:45	16/9/2021	Stress-Strain relations	24	friday	9:50-10:40	22/10/2021	UNIT-III Analysis of Trusses, Derivation of stiffness matrix
5	Friday	9:00-9:50	17/9/2021	plane stress & plane strain conditions	25	Saturday	10:41-11:30	23/10/2021	finite element modeling, coordinate system,
6	monday	11:35-12:25	20/9/2021	Variational & weighted residual methods	26	wednesday	9:00-9:50	27/10/2021	Derivation of strain displacement matrix,
7	Tuesday	2:50-3:35	21/9/2021	concept of potential Energy	27	thursday	1:10-2:00	28/10/2021	Assembly of global stiffness matrix & load vector
8	wednesday	9:00-9:50	22/9/2021	Rayleigh-Ritz method	28	friday	9:50-10:40	29/10/2021	Treatment of Boundary conditions, Stress
9	thursday	1:10-2:00	23/9/2021	problems	29	Saturday	10:41-11:30	30/10/2021	Support reactions Calculations.
10	friday	9:50-10:40	24/9/2021	Problems	30	monday	11:35-12:25	1/11/2021	problems on Trusses
11	Saturday	10:41-11:30	25/9/2021	Element Stiffness matrix for 1-D problem	31	wednesday	3:35-4:30	3/11/2021	problems on Trusses
12	monday	11:35-12:25	27/9/2021	Strain displacement matrix derivations	32	Friday	9:00-9:50	5/11/2021	Analysis of Beams-Derivation of Elements stiffness matrix for Hermite
13	Tuesday	2:50-3:35	28/9/2021	problems on 1-D Bar Elements	33	monday	11:35-12:25	8/11/2021	Derivation of load vector for Point UDL load
14	wednesday	9:00-9:50	29/9/2021	Elimination Approach & Penalty Approach	34	Tuesday	2:50-3:35	9/11/2021	Derivation of load vector & Assembly of stiffness matrix
15	Thursday	1:10-2:00	30/9/2021	UNIT-II Discretization of domain Element Shapes	35	wednesday	9:00-9:50	10/11/2021	Problems on Beams
16	Friday	9:50-10:40	1/10/2021	Derivation of Element Shape functions	36	Thursday	1:10-2:00	11/11/2021	problems on Beams with UDL
17	monday	11:35-12:25	4/10/2021	Discretization procedures, Assembly of stiffness matrix	37	Friday	9:00-9:50	12/11/2021	Concept of Frames
18	Tuesday	2:50-3:35	5/10/2021	Band width, node numbering, mesh quality	38	monday	11:35-12:25	15/11/2021	Problems on Beams
19	wednesday	9:00-9:50	6/10/2021	Interpolation functions, Problems	39	Tuesday	2:50-3:35	16/11/2021	problems on frames
20	monday	11:35-12:25	11/10/2021	local & global coordinates	40	wednesday	9:00-9:50	17/11/2021	Problems on frames

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

IV Year II Semester B Tech Course Mechanical Branch FEM Subject

Theory / **Drawing** / **Practical**

Name of Teacher (s) 1. R. KARUN KUMAR

2.

Academic Year 2021-2022 SECTION B

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Thursday	1:10-2:00	18/11/21	UNIT-IV Finite element modeling with CST	61	monday	11:35-12:25	3/01/2022	Evaluation of Eigen values
42	monday	11:35-12:25	29/11/21	Element Stiffness matrix for CST element	62	tuesday	2:50-3:35	4/01/2022	Evaluation of Eigen values
43	Tuesday	2:50-3:35	30/11/21	Strain displacement matrix for CST	63	wednesday	9:00-9:50	5/01/2022	Free Vibration Analysis
44	Thursday	1:10-2:00	2/12/21	Treatment of Boundary conditions	64	Thursday	10:50-11:40	6/01/2022	Problems on Bar
45	monday	11:35-12:25	6/12/21	problem	65	Thursday	1:10-2:00	6/01/2022	Problems on Thin plate
46	Tuesday	2:50-3:35	7/12/21	problem	66	friday	9:00-9:50	7/01/2022	Problems on shaft subjected to Torsion
47	Friday	9:50-10:40	10/12/21	Formulation of axisymmetric Problems	67	Friday	10:45-11:35	7/01/2022	Problems on lumped mass matrix
48	monday	11:35-12:25	13/12/21	problem	68	monday	10:45-11:35	10/01/2022	Problems on Eigen values & Eigen vectors
49	Tuesday	2:50-3:35	14/12/21	problems	69	monday	11:35-12:25	10/01/2022	problems
50	wednesday	9:00-9:50	15/12/21	UNIT-V 1-D quadratic Element in natural	70	Tuesday	8:00-8:50	11/01/2022	problems
51	Thursday	1:10-2:00	16/12/21	1-D cubic Element in natural coordinate	71	Tuesday	10:45-11:35	11/01/2022	problems.
52	Friday	9:50-10:40	17/12/21	2-D four noded Isoparametric Element	72				
53	Saturday	10:45-11:35	18/12/21	Numerical Integration	73				
54	Saturday	2:00-2:45	18/12/21	Problems Quadratic Element	74				
55	Tuesday	2:50-3:35	21/12/21	problems on cubic Elements	75				
56	wednesday	2:50-3:35	22/12/21	UNIT-VI 1-D analysis of a fin	76				
57	Friday	9:50-10:40	24/12/21	2D analysis of Thin plate	77				
58	wednesday	9:00-9:50	29/12/21	Analysis of uniform Shaft Subjected to Torque	78				
59	Thursday	1:10-2:00	30/12/21	formulation of FE model	79				
60	Friday	9:50-10:40	31/12/21	Element Covistent & lumped mass	80				

Website: www.jntuk.edu.in
Email: dapjntuk@gmail.com

Phone: 0884-2300991
Mobile: 7032606555

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. JNTUK/DAP/AC/I Year/B. Tech/2021-22

Date: 19-11-2021

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Academic Calendar of I Year B. Tech for the Academic Year 2021-22

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**22.11.2021**		
Induction Classes	22.11.2021	27.11.2021	1W
I Unit of Instruction	29.11.2021	15.01.2022	7W
I Mid Examinations	17.01.2022	22.01.2022	1W
II Unit of Instructions	24.01.2022	12.03.2022	7W
II Mid Examinations	14.03.2022	19.03.2022	1W
Preparation & Practicals	21.03.2022	26.03.2022	1W
End Examinations	28.03.2022	09.04.2022	2W
Commencement of II Semester Class Work	**11.04.2022**		
II SEMESTER			
I Unit of Instructions	**11.04.2022**	28.05.2022	7W
I Mid Examinations	30.05.2022	04.06.2022	1W
II Unit of Instructions	06.06.2022	23.07.2022	7W
II Mid Examinations	25.07.2022	30.07.2022	1W
Preparation & Practicals	01.08.2022	06.08.2022	1W
End Examinations	08.08.2022	20.08.2022	2W
Commencement of next Year Class Work	**22.08.2022**		
Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period			

R. Srinivasa Rao
Director Academic Planning

Director
Academic Planning
JNTUK Kakinada

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK
Copy to Rector, JNTUK
Copy to Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated - JNTUK, Kakinada
(ISO 9001:2015 Certified Institution)
ELECTRONICS AND COMMUNICATION ENGINEERING
Department Academic Calendar 2021 – 2022 Semester II

S. No	Activity	Year/Class	Date
1	Notice	Time Table	07-02-2022 (II,III,IV/IV)
		Roll Call List	
		Elective Confirmation List	
		Project Review Committee	
		Mentor – Mentee list	
2	Principal and Faculty Meeting	All Faculty Members	After releasing of university results
3	HOD and Faculty meeting	All Faculty Members	Every Saturday
4	HOD and CR meeting	HOD and CR's	Before I MID Term test
5	Parents and Teacher meeting	Parents and Faculty	After releasing of university results
6	Commencement of Class work	II/IV B.Tech	14-02-2022
		III/IV B.Tech	14-02-2022
		IV/IV B.Tech	14-02-2022
		M.Tech	14-02-2022
7	I Mid-term test/Online Examinations	II/IV B.Tech	04-04-2022 to 09-04-2022
		III/IV B.Tech	04-04-2022 to 09-04-2022
		IV/IV B.Tech	04-04-2022 to 09-04-2022
		M.Tech	04-04-2022 to 09-04-2022
8	B.Tech/M.Tech Project Evaluations - I	B.Tech/M.Tech	One week before I MID Examinations
9	Feedback on Faculty	II/IV, III/IV, IV/IV B.Tech, M.Tech	10-04-2022 to 13-04-2022
10	Internal Lab Examinations	II/IV B.Tech	12-04-2022 to 15-04-2022
		III/IV B.Tech	
		IV/IV B.Tech	
		M.Tech	
11	II Mid-term test/Online Examinations	II/IV B.Tech	30-05-2022 to 04-06-2022
		III/IV B.Tech	30-05-2022 to 04-06-2022
		IV/IV B.Tech	30-05-2022 to 04-06-2022
		M.Tech	30-05-2022 to 04-06-2022
12	B.Tech/M.Tech Project Evaluations - II	B.Tech/M.Tech	One week before II MID Examinations
13	Practical examinations	II/IV B.Tech	06-06-2022 to 11-06-2022
		III/IV B.Tech	06-06-2022 to 11-06-2022
		IV/IV B.Tech	06-06-2022 to 11-06-2022
		M.Tech	06-06-2022 to 11-06-2022
14	Semester End Examinations	II/IV B.Tech	13-06-2022 to 25-06-2022
		III/IV B.Tech	13-06-2022 to 25-06-2022
		IV/IV B.Tech	13-06-2022 to 25-06-2022
15	Feedback on Curriculum	IV/IV B.Tech	Last week of second semester
16	Program Exit Survey	IV/IV B.Tech	End of second semester
17	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month

S. Sri Gowri
Signature of HoD

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated - JNTUK, Kakinada
(ISO 9001:2015 Certified Institution)
ELECTRONICS AND COMMUNICATION ENGINEERING
Department Academic Calendar 2021 – 2022 Semester I

S. No	Activity	Year/Class	Date
1	Notice	Time Table	27-09-2021 (II,III,IV/IV)
		Roll Call List	
		Elective Confirmation List	
		Project Review Committee	
		Mentor – Mentee list	
2	Principal and Faculty Meeting	All Faculty Members	First week of commencement of class work for I semester
3	HOD and Faculty meeting	All Faculty Members	Every Saturday
4	HOD and CR meeting	HOD and CR's	Before I MID Term test
5	Parents and Teacher meeting	Parents and Faculty	After releasing of university results
6	Commencement of Class work	II/IV B.Tech	01-10-2021
		III/IV B.Tech	01-10-2021
		IV/IV B.Tech	01-10-2021
		M.Tech	01-10-2021
7	I Mid-term test/Online Examinations	II/IV B.Tech	22-11-2021 to 27-11-2021
		III/IV B.Tech	22-11-2021 to 27-11-2021
		IV/IV B.Tech	22-11-2021 to 27-11-2021
		M.Tech	22-11-2021 to 27-11-2021
8	Principal and Faculty Meeting	All Faculty Members	After releasing of university results.
9	Feedback on Faculty	II/IV, III/IV, IV/IV B.Tech, M.Tech	4-10-2021 to 9-10-2021(III, IV/IV) 28-11-2021 to 30-11-2021(II/IV)
10	Internal Lab Examinations	II/IV B.Tech	28-11-2021 to 02-12-2021
		III/IV B.Tech	
		IV/IV B.Tech	
		M.Tech	
11	II Mid-term test/Online Examinations	II/IV B.Tech	17-01-2022 to 22-01-2022
		III/IV B.Tech	17-01-2022 to 22-01-2022
		IV/IV B.Tech	17-01-2022 to 22-01-2022
		M.Tech	17-01-2022 to 22-01-2022
12	Practical examinations	II/IV B.Tech	24-01-2022 to 29-01-2022
		III/IV B.Tech	24-01-2022 to 29-01-2022
		IV/IV B.Tech	24-01-2022 to 29-01-2022
		M.Tech	24-01-2022 to 29-01-2022
13	Semester End Examinations	II/IV B.Tech	31-01-2022 to 12-02-2022
		III/IV B.Tech	31-01-2022 to 12-02-2022
		IV/IV B.Tech	31-01-2022 to 12-02-2022
		M.Tech	31-01-2022 to 12-02-2022
14	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month
15	Commencement of Second Semester of Academic Year 2021-2022	B.Tech & M.Tech	14-02-2022 (II,III,IV/IV) (M.Tech)

S. Sri Gour
Signature of HoD

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Electronics and Communication Engineering

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

SRKIT / ECE / 09

Academic Year: 2021-22 **Semester : II**

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
1	Dr. S. Sri Gowri	AC II-A	ECE	-	-	6	Administration IQAC Coordinator Autonomous Work Disciplinary Committee Incharge II/IV Sec-A Student Mentor PRC Member UG&PG NAAC Criteria-2 Incharge ISO files–38 to 60,64,67,68,71	S-SriGowri
2	Dr. B.Vanajakshi	AC II-B	ECE	-	-	6+16	Disciplinary Committee Incharge PRC Member UG&PG NAAC Criteria-3	BV
3	Ms. T. Vishnu Priya	ANN III-A&B	ECE	DSP-A&B DE-EEE	ECE	6+6+12	II/IV Sec-B Student Mentor PRC Member UG&PG ISO files-16,21,22,35,75,96	TVP
4	Mr. B. Ravi	ECA II-A&B	ECE	ECA-B	ECE	6+7+8+5	II/IV Sec-B Student Mentor PRC Member UG&PG Robotics club member ISO Dept. Incharge NAAC Criteria-4 Dept.Coordinator ISO files-25,70,83 LICA lab Incharge	

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Electronics and Communication Engineering

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

SRKIT / ECE / 09

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
5	Mr. P. Ratna Bhaskar	CMC IV-A&B	ECE	AC-A&B	ECE	**5+5+16**	IV/IV Sec-A Class Incharge PRC Member UG & PG NAAC Criteria-2 Dept.coordinator OCBE coordinator ISO files 17,23,24,76,77,78 Communication lab Incharge	
6	Mr. P. Koteswara Rao	WWTD III-A&B	ECE	DICD-A&B	ECE	**6+6+16**	III/IV Sec-A Student Mentor PRC Member UG NAAC Criteria-1, IIC coordinator VLSI club facilitator ISO files- 8,9,10,73,82 MW&OC lab Incharge	
7	Mr. D. Ravi Tej	VLSID II-A&B	ECE	VLSI-A&B	ECE	**6+6+12**	III/IV Sec-A Student Mentor PRC Member UG NAAC Criteria-1 Dept. coordinator EDC coordinator VLSI club facilitator ISO files-37,61,74,81,82,95	
8	Ms. A.V.P.Sarvari	LCS II-A&B	ECE	DSP-A	ECE	**6+7+8+5**	II/IV Sec-B Class Incharge PRC Member UG VLSI club facilitator NAAC Criteria-2, APSSDC coordinator, M. Tech lab Incharge ISO files-6,7,19,20,33	

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Electronics and Communication Engineering

CLASS TIME TABLE

SRKIT / ECE / 10.1

Academic Year: 2021-22 Class: II/IV B.Tech. ECE Semester: II w.e.f 07/03/2022

Section A

Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:50	3:00 to 3:55	3:55 to 4:50
Period	1	2	3	4		5	6	7	8
MON	ECA	LCS	AC	DICD		ECA/AC LAB			
TUE	LCS	SS	MOB	LCS		MOB	AC	ECA	SS
WED	DICD	LCS	ECA	AC		AC/DICD LAB			
THU	SS	AC	MOB	DICD		MOB	SS	ECA	LCS
FRI	DICD/ECA LAB					DICD	AC	ECA	MOB
SAT	LCS	ECA	DICD	MOB		DICD	AC	ECA	SPORTS

LUNCH

Section B

Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:50	3:00 to 3:55	3:55 to 4:50
Period	1	2	3	4		5	6	7	8
MON	DICD	MOB	ECA	AC		SS	MOB	LCS	DICD
TUE	ECA/DICD LAB					AC	SS	DICD	AC
WED	ECA	MOB	DICD	LCS		MOB	SS	LCS	SPORTS
THU	MOB	DICD	ECA	AC		DICD/AC LAB			
FRI	AC	ECA	LCS	ECA		SS	MOB	DICD	LCS
SAT	AC/ECA LAB					ECA	LCS	AC	LCS

LUNCH

Faculty:

Electronic Circuit Analysis : Mr. B. Ravi
Digital IC Design : Ms. Ch. Jnana Gayathri
Analog Communications : Dr. S. Sri Gowri / Ms.K.Nagalakshmi
Linear Control Systems : Ms.A.V.P.Sarvari
Management and Organizational Behavior : Ms.P.Kavya
Soft Skills : Ms.V.Navatha / Ms.N.Gayathri
Electronic Circuit Analysis Lab : Mr. B. Ravi / Mr.G.Venkata Rao / Ms.V.Sri Lakshmi / Ms.U.Aparna Devi
Analog Communications Lab : Mr. P.Ratna Bhaskar / Mr. G.Surya Prakash / Ms.K.Nagalakshmi
Digital IC Design Lab : Ms. Ch. Jnana Gayathri / Mr.P.Koteswara Rao

S. Sri Gowri
HOD/Date
7/3/2022

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Electronics and Communication Engineering

INDIVIDUAL FACULTY TIME TABLE

SRKIT / ECE / 10.2

Mr. D RAVI TEJ

Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:50	3:00 to 3:55	3:55 to 4:50
Period	1	2	3	4		5	6	7	8
MON		VLSID-I				VLSID-II			VLSID-II
TUE	VLSID-I		VLSID-II			VLSI LAB - I			
WED	VLSI LAB - II				LUNCH		VLSID-II		VLSID-I
THU	VLSI LAB - I							VLSID-I	
FRI	VLSID-II		VLSID-I						
SAT			VLSID-I				VLSID-II		

Signature of Faculty: ---------- Signature of HOD: ----------

Mr. A V P SARVARI

Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:50	3:00 to 3:55	3:55 to 4:50
Period	1	2	3	4		5	6	7	8
MON		LCS-I				CC		LCS-II	
TUE	LCS-I			LCS-I		CC	DSP LAB – I		
WED		LCS-I		LCS-II		CC		LCS-II	
THU	DSP LAB - I				LUNCH	CC			LCS-I
FRI			LCS-II			CC			LCS-II
SAT	LCS-I						LCS-II		LCS-II

Signature of Faculty: ---------- Signature of HOD: ----------

Ms. V SRI LAKSHMI

Time	9:00 to 9:50	9:50 to 10:40	10:45 to 11:35	11: 35 to 12:25		1:10 to 2:00	2:00 to 2:50	3:00 to 3:55	3:55 to 4:50
Period	1	2	3	4		5	6	7	8
MON		SC-I		SC-II		DE LAB (II EEE)			
TUE	SC-II							SC-I	
WED	SC-I		SC-II		LUNCH				
THU		SC-I		SC-II					
FRI	ECA LAB-I						SC-I		SC-II
SAT	ECA LAB-II								

Signature of Faculty: ---------- Signature of HOD: ----------

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Electronics and Communication Engineering** **TEACHING PLAN CUM REALIZATION**	**SRKIT / ECE /12**

Department: ECE

Name of faculty: A.V.P.SARVARI

Designation: Asst.Prof

Semester / Year: II/II (Sec I)

Name of the subject: Linear Control Systems

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	Unit - I				
1.	Introduction		7.3.2022	1	
2.	Control System				
3.	Open Loop Control System		8.3.2022	1	
4.	Closed loop Control System and differences				
5.	Different Examples of control systems	**From: 7.03.2022**	14.3.2022	1	
6.	Feed-Back Characteristics		17.3.2022	1	
7.	Effects of feedback	**To: 23.03.2022**	21.3.2022	1	
8.	Mathematical models		23.3.2022	1	
9.	Differential equations		24,25,28.3.2022	3	
10.	Impulse Response and transfer functions		29.3.2022	1	
11.	Translational and Rotational mechanical systems		31.3.2022	2	
12.	**Tutorial**		2.4.2022	2	
	UNIT - II				
13.	Transfer Function of DC Servo motor	**From: 24.03.2022**	8.4.2022	2	
14.	AC Servo motor		11.4.2022	1	
15.	Synchro transmitter and Receiver	**To: 9.04.2022**	11.4.2022	1	
16.	Block diagram representation of systems considering electrical systems as examples		12.4.2022	1	

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S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
17.	Block diagram algebra	From: 24.03.2022 To: 9.04.2022	13.4.2022	1	
18.	Representation by Signal flow graph		13.4.2022	1	
19.	Reduction using mason's gain formula		16.4.2022	1	
20.	Time Response Analysis		18.4.2022	1	
21.	Standard test Signals				
22.	Time response of first order systems		18.4.2022	1	
23.	Characteristic Equation of Feedback control systems		19.4.2022	1	
24.	Transient response of second order systems		20.4.2022	1	
25.	Time domain specifications		21.4.2022	1	
26.	Steady state response		22.4.2022	1	
27.	Steady state errors and error constants		23.4.2022	1	
28.	**Tutorial**		14.6.2022	2	
	UNIT - III				
29.	The concept of Stability	From: 11.04.2022 To: 05.05.2022	23.4.2022	1	
30.	Routh's stability criterion		2.5.2022	1	
31.	Qualitative stability and conditional stability		4.5.2022	1	
32.	Limitations of Routh's stability100		5.5.2022	1	
33.	**Root Locus Technique**		7.5.2022	1	
34.	The Root Locus concept		10.5.2022	1	
35.	Construction of Root Loci				
36.	Effects of adding poles and zeros to G(s) H(s) on the root loci		12.5.2022	1	

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S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	UNIT - IV				
37.	**Frequency response analysis**	**From: 06.04.2022 To: 25.05.2022**	13.5.2022	1	
38.	Introduction				
39.	Correlation between time and frequency response		16.5.2022	1	
40.	Polar Plots		19,20.5.2022	2	
41.	Bode Plots		17.5.2022	2	
42.	Nyquist Stability Criterion		21,23.5.2022	2	
43.	**Tutorial**		15,1617,18.6.2022	4	
	UNIT-V	**From: 26.05.2022 To: 11.06.2022**			
44.	Compensation techniques		24.5.2022	1	
45.	Lag, Lead, Lead-Lag Controllers design in frequency Domain		25.5.2022	1	
46.	PID Controllers		30.5.2022	1	
47.	State Space Analysis of Continuous Systems		31.5.2022	1	
48.	Concepts of State		1.6.2022	1	
49.	State Variables and State models				
50.	Derivation of state models from block diagrams		1,2.6.2022	2	
51.	Diagonalization- Solving the Time invariant		3.6.2022	1	

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S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
52.	state Equations	From: 26.05.2022 To: 11.06.2022	4.6.2022	1	
53.	State Transition Matrix and it's Properties		4.6.2022	1	
54.	Concepts of Controllability and Observability		13.6.2022	1	

Faculty/ Date 15/6/2022

HoD/Date 15/6/22

Mathematical Modeling:

The process involved in modeling a system using mathematical equations, formed by the variables and constants of the system is called the mathematical modeling of a system.

Mathematical Equations for problem solving:

Basic Laplace transform of different functions are

$$L\{f(t)\} = F(s)$$

$$L\left\{\frac{df(t)}{dt}\right\} = sF(s) - f(0)$$

$$L\left\{\int f(t)\,dt\right\} = \frac{F(s)}{s} - \frac{f(0)}{s}$$

modeling of Electrical Systems:

An electrical system consists of resistors, capacitors and inductors.

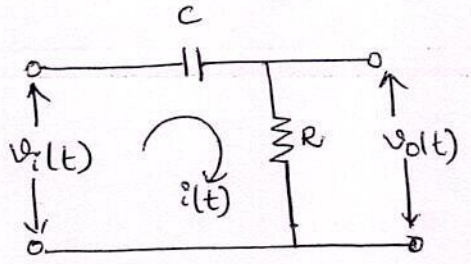
→ The differential equations of electrical systems can be formed by applying kirchhoff's laws.

→ The transfer function can be obtained by taking laplace transform of the integro-differential equations.

→ The relationship between voltage and current for different elements are

Element	Voltage drop across element	Current through the element
R	$v(t) = R \cdot i(t)$	$i(t) = \frac{v(t)}{R}$
L	$v(t) = L\frac{di(t)}{dt}$	$i(t) = \frac{1}{L}\int v(t)dt$
C	$v(t) = \frac{1}{C}\int i(t)dt$	$i(t) = C\cdot\frac{dv(t)}{dt}$

(1) Find the transfer function of High pass filter. (Differentiator)



Apply KVL.

$$v_i(t) - \frac{1}{C}\int i(t)dt - i(t)R = 0$$

Applying laplace transform

$$V_i(S) - \frac{1}{C}\frac{I(S)}{S} - RI(S) = 0$$

$$V_i(S) = \left(\frac{1}{CS} + R\right) I(S)$$

$$I(S) = \frac{V_i(S)}{R + \frac{1}{CS}} \longrightarrow (1)$$

$$v_o(t) = i(t)R$$

Applying laplace transform

$$V_o(S) = I(S)R \longrightarrow (2)$$

Substitute $I(s)$ in equation ②

We get,

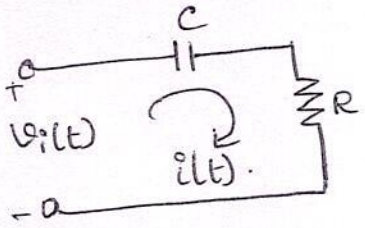
$$V_o(s) = \frac{V_i(s)}{R+\frac{1}{Cs}} \cdot R$$

$$\frac{V_o(s)}{V_i(s)} = \frac{R}{R+\frac{1}{Cs}}$$

$$= \frac{R}{\frac{RCs+1}{Cs}}$$

$$\therefore \frac{V_o(s)}{V_i(s)} = \frac{RCs}{1+RCs}$$

(2) find the transfer function for below circuit



Transfer function = $\frac{I(s)}{V_i(s)}$

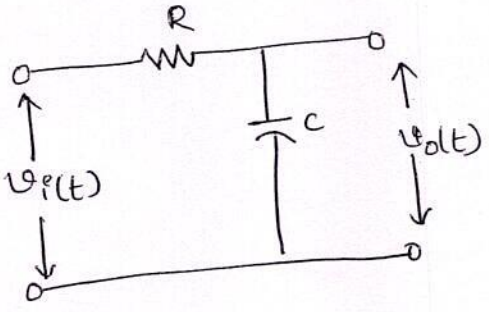
$$I(s) = \frac{V_i(s)}{R+\frac{1}{Cs}}$$ (same as problem ①).

$$\frac{I(s)}{V_i(s)} = \frac{1}{R+\frac{1}{Cs}}$$

$$= \frac{Cs}{1+RCs}$$

$$\therefore \frac{I(s)}{} = \frac{Cs}{}$$

(3) Find the transfer function of LPF. If the input applied is $v_i = 8\sin 10t$, and $R = 10k\Omega$, $C = 1\mu f$. find the transfer function both in magnitude and phase.



Applying KVL

$$v_{i(t)} - i(t)R - \frac{1}{C}\int i(t)\,dt = 0$$

Applying L.T

$$V_{i(s)} - R\,I(s) - \frac{1}{C}\frac{I(s)}{s} = 0$$

$$V_{i(s)} = I(s)\left(R + \frac{1}{Cs}\right)$$

$$I(s) = \frac{V_{i(s)}}{R + \frac{1}{Cs}} \longrightarrow (1)$$

$$v_{o(t)} = \frac{1}{C}\int i(t)\,dt$$

Applying LT

$$V_{o(s)} = \frac{1}{C}\cdot\frac{1}{s}I(s)$$

$$V_{o(s)} = \frac{1}{Cs}\cdot\frac{V_{i(s)}}{R+\frac{1}{Cs}}$$

$$= \frac{1}{Cs}\cdot\frac{Cs\cdot V_{i(s)}}{1+RCs} = \frac{V_{i(s)}}{1+RCs}$$

$$\frac{V_{o(s)}}{V_{i(s)}} = \frac{1}{RCs+1}$$

put $s = j\omega$.

$$\frac{V_o(j\omega)}{V_i(j\omega)} = \frac{1}{1 + jRC\omega}$$

$v_i = A \sin \omega t$

$= 8 \sin 10t$

$\therefore \omega = 10$.

$$\frac{V_o(j\omega)}{V_i(j\omega)} = \frac{1}{1 + j \times 10 \times 10^{+3} \times 10^{-6} \times 10}$$

$$= \frac{1}{1 + 0.1j}$$

$$\left| \frac{V_o(j\omega)}{V_i(j\omega)} \right| = \frac{1}{\sqrt{1^2 + (0.1)^2}}$$

$$= \frac{1}{\sqrt{1.01}} = 0.995$$

$\frac{1}{a+jb}$

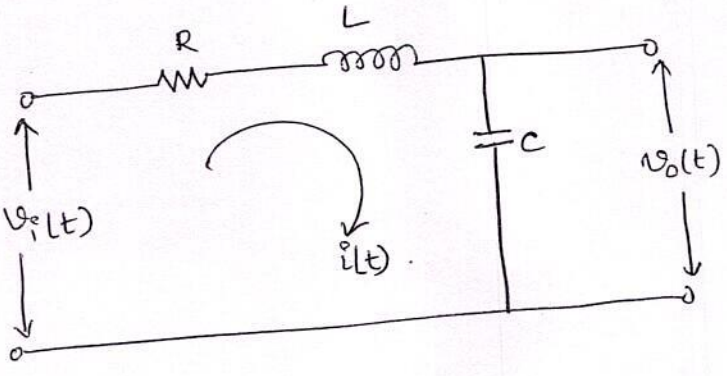
magnitude $= \frac{1}{\sqrt{a^2+b^2}}$

phase $= -\tan^{-1}(b/a)$

$$\angle \frac{V_o(j\omega)}{V_i(j\omega)} = -\tan^{-1}(0.1/1)$$

$$= -5.71^\circ.$$

(4) find the TF of Basic RLC circuit.



Applying KVL

$$v_i(t) - i(t)R - L\frac{di(t)}{dt} - \frac{1}{C}\int i(t)\,dt = 0$$

Applying LT

$$V_i(s) - R\,I(s) - L\cdot s\,I(s) - \frac{1}{C}\frac{I(s)}{s} = 0$$

$$V_i(s) = I(s)\left[R + Ls + \frac{1}{Cs}\right]$$

$$I(s) = \frac{V_i(s)}{R + Ls + \frac{1}{Cs}} \longrightarrow (1)$$

$$v_o(t) = \frac{1}{C}\int i(t)\,dt$$

Applying L-T

$$V_o(s) = \frac{1}{C}\frac{I(s)}{s} \longrightarrow (2)$$

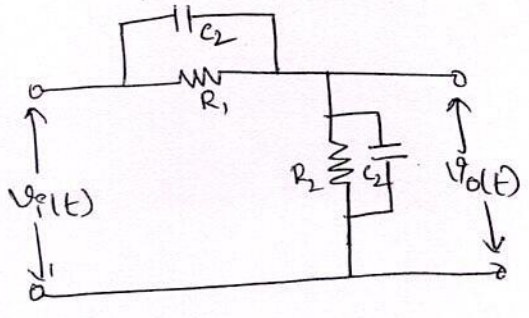
Substitute (1) in (2)

$$V_o(s) = \frac{1}{Cs}\,\frac{V_i(s)}{R + Ls + \frac{1}{Cs}}$$

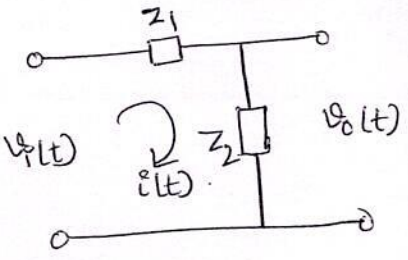
$$= \frac{1}{Cs}\cdot\frac{V_i(s)\cdot Cs}{RCs + LCs^2 + 1}$$

$$\frac{V_o(s)}{V_i(s)} = \frac{1}{RCs + LCs^2 + 1}$$

(5) Find the TF of compensated attenuator (lead).



The above ckt can be replaced by



$$Z_1 = \frac{R_1 \times \frac{1}{j\omega C_1}}{R_1 + \frac{1}{j\omega C_1}} = \frac{R_1}{1+j\omega R_1 C_1} \Rightarrow \frac{R_1}{1+SR_1C_1}$$

$$Z_2 = \frac{R_2 \times \frac{1}{j\omega C_2}}{R_2 + \frac{1}{j\omega C_2}} = \frac{R_2}{1+j\omega R_2 C_2} \Rightarrow \frac{R_2}{1+SR_2C_2}$$

$$v_o(t) = v_i(t) \cdot \frac{Z_2}{Z_1+Z_2}$$

Applying LT

$$V_o(s) = V_i(s) \cdot \frac{Z_2}{Z_1+Z_2}$$

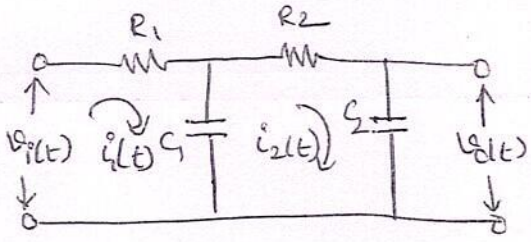
$$\frac{V_o(s)}{V_i(s)} = \frac{Z_2}{Z_1+Z_2}$$

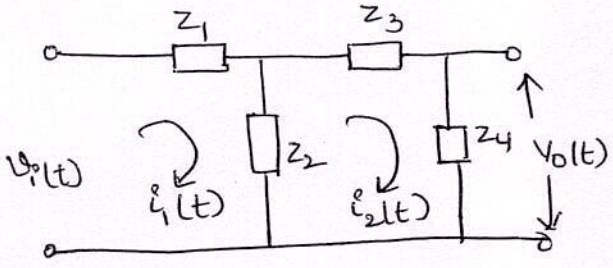
$$= \frac{\frac{R_2}{1+SR_2C_2}}{\frac{R_1}{1+SR_1C_1} + \frac{R_2}{1+SR_2C_2}}$$

$$= \frac{\frac{R_2}{(1+SR_2C_2)}}{\frac{R_1(1+SR_1C_1)+R_2(1+SR_1C_1)}{(1+SR_1C_1)(1+SR_2C_2)}}$$

$$\frac{V_o(s)}{V_i(s)} = \frac{R_2(1+SR_1C_1)}{R_1(1+SR_1C_1)+R_2(1+SR_1C_1)}$$

(6) Find the TF.





$Z_1 = R_1 \qquad Z_3 = R_2$

$Z_2 = \frac{1}{j\omega C_1} = \frac{1}{sC_1} \qquad Z_4 = \frac{1}{j\omega C_2} = \frac{1}{sC_2}$

$$v_i(t) - i_1(t)R_1 - [i_1(t) - i_2(t)]Z_2 = 0$$

$$v_o(t) = i_4(t)$$

Applying LT

$$V_i(s) - I_1(s)Z_1 - [I_1(s) - I_2(s)]Z_2 = 0$$

$$V_i(s) - I_1(s)[Z_1+Z_2] + I_2(s)Z_2 = 0 \longrightarrow (1)$$

Applying KVL.

$$-Z_2\left[i_2(t)-i_1(t)\right]-Z_3 i_2(t)-Z_4 i_2(t)=0$$

$$Z_2\left[I_2(s)-I_1(s)\right]+Z_3 I_2(s)+Z_4 I_2(s)=0$$

$$I_2(s)\left[Z_2+Z_3+Z_4\right]-Z_2 I_1(s)=0$$

$$I_2(s)\left[Z_2+Z_3+Z_4\right]-Z_2 I_1(s)=0$$

$$I_2(s)\left[Z_2+Z_3+Z_4\right]=Z_2 I_1(s)$$

$$I_1(s)=I_2(s)\cdot\left[\frac{Z_2+Z_3+Z_4}{Z_2}\right] \longrightarrow (2)$$

$$v_0(t)=Z_4 i_2(t)$$

$$V_0(s)=Z_4 I_2(s)$$

$$I_2(s)=\frac{V_0(s)}{Z_4} \longrightarrow (3)$$

Substitute (3) in (2) we get,

$$I_1(s)=\frac{V_0(s)}{Z_4}\cdot\frac{Z_2+Z_3+Z_4}{Z_2} \longrightarrow (4)$$

Substitute (3) & (4) in (1)

$$V_i(s)-I_1(s)\left[Z_1+Z_2\right]+I_2(s)Z_2=0$$

$$V_i(s)-\frac{V_0(s)}{Z_4}\cdot\frac{Z_2+Z_3+Z_4}{Z_2}\times(Z_1+Z_2)+\frac{V_0(s)}{Z_4}\times Z_2=0$$

$$V_{i(s)} = \frac{V_{o(s)}}{Z_4}\left[\frac{Z_2+Z_3+Z_4}{Z_2} \times (Z_1+Z_2) - Z_2\right]$$

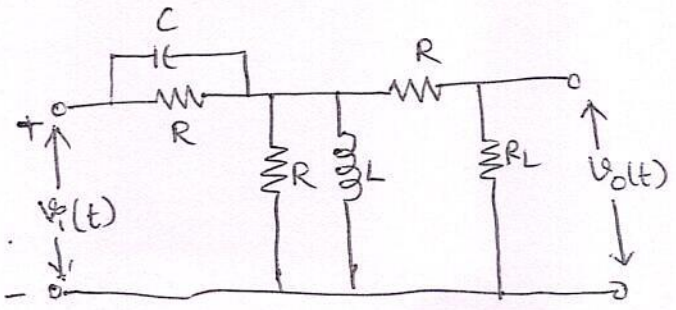
$$\frac{V_{i(s)}}{V_{o(s)}} = \left[\frac{Z_2+Z_3+Z_4}{Z_2} \times \frac{(Z_1+Z_2)}{Z_4} - \frac{Z_2}{Z_4}\right]$$

$$\frac{V_{o(s)}}{V_{i(s)}} = \frac{1}{\frac{(Z_2+Z_3+Z_4)}{Z_2} \cdot \frac{(Z_1+Z_2)}{Z_4} - \frac{Z_2}{Z_4}}$$

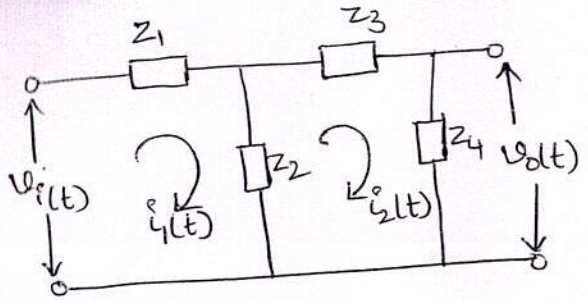
$$= \frac{Z_2 Z_4}{(Z_2+Z_3+Z_4)(Z_1+Z_2) - Z_2^2}$$

$$\therefore \frac{V_{o(s)}}{V_{i(s)}} = \frac{\frac{1}{sC_1} \cdot \frac{1}{sC_2}}{\left(\frac{1}{sC_1} + R_2 + \frac{1}{sC_2}\right)\left(R_1 + \frac{1}{sC_1}\right) - \left(\frac{1}{sC_1}\right)^2}$$

(7) Find the T.F for following Network.



Sol:



$$Z_1 = \frac{R \cdot X_C}{R + X_C} = \frac{R \cdot \frac{1}{j\omega C}}{R + \frac{1}{j\omega C}} = \frac{R}{1 + j\omega RC} = \frac{R}{1 + SRC}.$$

$$Z_2 = \frac{R \cdot X_L}{R + X_L} = \frac{R \cdot j\omega L}{R + j\omega L} \Rightarrow \frac{SRL}{R + SL}.$$

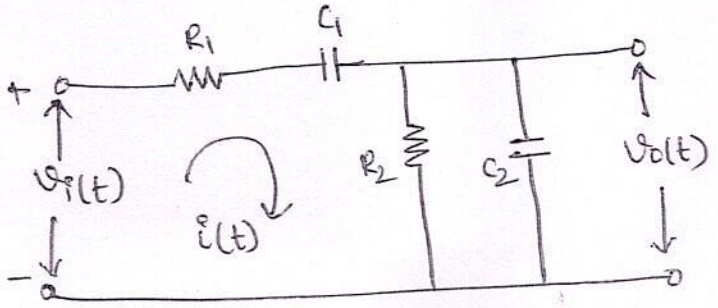
$$Z_3 = R$$

$$Z_4 = R_L.$$

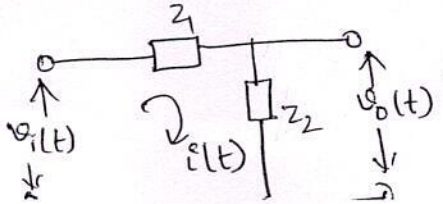
$$\frac{V_o(S)}{V_i(S)} = \frac{Z_2 Z_4}{(Z_2 + Z_3 + Z_4)(Z_1 + Z_2) + Z_2^2}$$ [∵ from the above problem].

$$= \frac{\frac{SRL}{R + SL} \cdot R_L}{\left(\frac{SRL}{R + SL} + R + R_L\right)\left(\frac{R}{1 + SRC} + \frac{SRL}{R + SL}\right) + \left(\frac{SRL}{R + SL}\right)^2}$$

(8) Find the T.F for the following Network.



Sol)



$$Z_1 = R_1 + \frac{1}{XC_1} = R_1 + \frac{1}{j\omega C_1} = R_1 + \frac{1}{SC_1} = \frac{SR_1C_1 + 1}{SC_1}$$

$$Z_2 = \frac{R_2 \cdot \frac{1}{XC_2}}{R_2 + \frac{1}{XC_2}} = \frac{R_2}{1 + SR_2C_2}$$

$$v_o(t) = v_i(t) \times \frac{Z_2}{Z_1 + Z_2}$$

$$V_o(s) = V_i(s) \cdot \frac{Z_2}{Z_1 + Z_2}$$

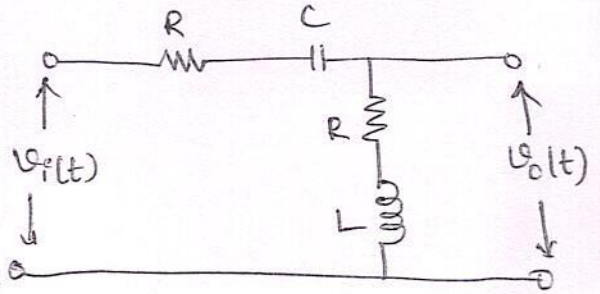
$$\frac{V_o(s)}{V_i(s)} = \frac{Z_2}{Z_1 + Z_2}$$

$$= \frac{\frac{R_2}{1 + SR_2C_2}}{\frac{SR_1C_1 + 1}{SC_1} + \frac{R_2}{1 + SR_2C_2}}$$

$$= \frac{R_2}{(1 + SR_2C_2)} \times \frac{(SC_1)(1 + SR_2C_2)}{(SC_1R_1 + 1)(SR_2C_2 + 1)}$$

$$= \frac{SR_2C_1}{(SR_1C_1 + 1)(SR_2C_2 + 1)}$$

1) find the TF



$$v_{i(t)} - i(t)R - \frac{1}{C}\int i(t)\,dt - i(t)R - L\cdot\frac{di(t)}{dt} = 0$$

$$V_{i(s)} - I(s)R - \frac{1}{C}\cdot\frac{I(s)}{s} - I(s)R - LS\cdot I(s) = 0$$

$$V_{i(s)} - I(s)\left[2R + \frac{1}{CS} + LS\right] = 0$$

$$I(s) = \frac{V_{i(s)}}{2R + \frac{1}{CS} + LS}$$

$$v_o(t) = i(t)R + L\cdot\frac{di(t)}{dt}$$

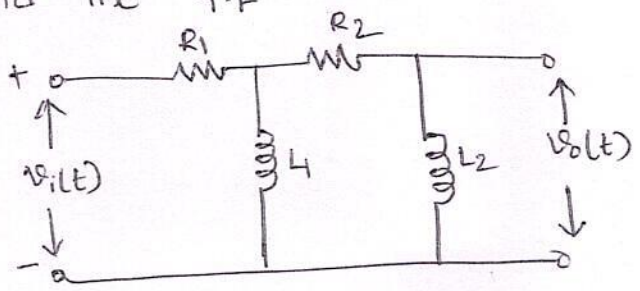
$$V_{o(s)} = I(s)R + L\cdot S\cdot I(s)$$

$$= \frac{V_{i(s)}}{2R + \frac{1}{CS} + LS}\left[R + LS\right]$$

$$\frac{V_{o(s)}}{V_{i(s)}} = \frac{R + LS}{2R + \frac{1}{CS} + LS}$$

$$\therefore \frac{V_{o(s)}}{V_{i(s)}} = \frac{RCS + LCS^2}{2RCS + 1 + LCS^2}$$

(10) find the T.F



Sol

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Name of Teacher (s) 1. A.V.P. Sarvani Year II Semester B.Tech Course ECE Branch LCS Subject

2.

Academic Year 2021-22

Theory ✓ Drawing Practical

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1	mon	2.50-3.35	7.3.2022	Concept of system, control system	21	Tue	1.10-2.00	12.4.2022	Block diagram representation of system
2	Tue	9.00-9.50	8.3.2022	openloop & closed loop control system	22	Tue	3.00-3.55	12.4.2022	Block diagram algebra
3	mon	2.55-3.40	14.3.2022	Differences	23	wed	9.50-10.40	13.4.2022	Representation by signal flow graph
4	mon	1.40-2.25	14.3.2022	Different Examples	24	wed	10.45-11.35	13.4.2022	Reduction using masons gain form
5	wed	4.05-4.50	16.3.2022	Feedback characteristics	25	Sat	10.45-11.35	16.4.2022	Standard Test Signals
6	wed	9.50-10.40	16.3.2022	Effects of feedback	26	mon	11.35-12.25	18.4.2022	Time response of 1st order system
7	Thu	9.50-10.40	17.3.2022	Mathematical models.	27	Tue	11.35-12.25	19.4.2022	Characteristic equation of feedback
8	mon	3.20-4.05	21.3.2022	Differential equations	28	Tue	2.00-2.50	19.4.2022	Transient response of 2nd order system
9	wed	1.40-2.25	23.3.2022	Electrical Systems	29	wed	10.45-11.35	20.4.2022	Time domain Specifications
10	Thu	9.50-9.55	24.3.2022	Transfere function	30	Thu	9.00-9.50	21.4.2022	Steady state response
11	fri	9.55-10.50	25.3.2022	Impulse response of systems	31	Thu	3.00-3.55	21.4.2022	Steady state errors and error constants.
12	mon	3.20-4.05	28.3.2022	Transfer functions	32	Fri	1.10-2.00	22.4.2022	The concept of Stability
13	Tue	9.00-9.55	29.3.2022	Translational mechanical system	33	Fri	3.55-4.50	22.4.2022	Rouths Stability Criterion
14	Thu	9.00-9.50	31.3.2022	Rotational mechanical systems	34	Sat	3.00-3.55	23.4.2022	qualitative and conditional stability
15	fri	10.45-11.35	1.4.2022	Problems	35	mon	3.00-3.55	2.5.2022	Limitations of Routh's Stability Too
16	Fri	2.00-2.50	1.4.2022	Problems	36	Wed	10.45-11.35	4.5.2022	The root locus concept
17	mon	3.00-3.50	4.4.2022	Field controlled DC servomotor T.F	37	Wed	1.10-2.00	4.5.2022	construction of root loci
18	wed	3.00-3.50	6.4.2022	Armature " " " "	38	Fri	10.45-11.35	6.5.2022	effect of adding poles & zeros to G(s)H(s)
19	fri	10.45-11.35	8.4.2022	AC Servo motor	39	Fri	3.55-4.50	6.5.2022	Frequency response analysis Introduction
20	mon	3.00-3.55	11.4.2022	Synchro Transmitter and Receiver	40	Sat	3.00-3.55	7.5.2022	correlation b/n time and frequency

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓
Drawing
Practical

Name of Teacher (s) 1. II Year II Semester B.Tech Course ECE Branch LCS Subject

2. A.V.P. Sarvari

Academic Year 2021-22

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Tue	3.55-4.50	10.5.2022	Bode plots	61	wed	9.00-9.50	15.6.2022	Unit-III Problems
42	wed	9.00-9.55	11.5.2022	Bode plots	62	Thu	10.45-11.35	16.6.2022	Unit-III Problems
43	wed	3.20-4.05	11.5.2022	Polar Plots	63	fri	9.00-9.50	17.6.2022	Unit IV problems
44	fri	9.55-10.50	13.5.2022	Polar Plots	64	sat	9.50-10.40	18.6.2022	Unit IV problems
45	mon	4.05-4.50	16.5.2022	Nyquist Stability Criterion	65				
46	wed	9.55-10.50	18.5.2022	Nyquist stability Criterion	66				
47	Fri	9.55-10.50	20.5.2022	compensation techniques lag	67				
48	mon	2.00-2.50	23.5.2022	Lead, Lead-lag controller	68				
49	Tue	2.00-2.50	24.5.2022	PID controllers	69				
50	wed	10.45-11.35	25.5.2022	State Space Analysis of C system	70				
51	mon	11.35-12.25	30.5.2022	concept of state, State variable model	71				
52	mon	2.00-2.50	30.5.2022	derivation of state models from	72				
53	Tue	4.05-4.50	31.5.2022	block diagrams	73				
54	wed	11.35-12.25	1.6.2022	Diagonalization	74				
55	Thu	2.00-2.50	2.6.2022	Solving the time invariant state	75				
56	fri	9.50-10.40	3.6.2022	State transition matrix	76				
57	fri	1.10-2.00	3.6.2022	and properties	77				
58	Sat	9.50-10.40	4.6.2022	concept of controllability & observabili	78				
59	mon	1.10-2.00	13.6.2022	Unit-II Problems	79				
60	Tue	3.00-3.55	14.6.2022	Unit-II problems	80				

Website: www.jntuk.edu.in
Email: dap@jntuk.edu.in

Phone: 0884-2300991

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. DAP/AC/ II Year /B. Tech/2021 *Date 25.09.2021*

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Academic Calendar for II - B. Tech
Academic year 2021-22

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**01.10.2021**		
I Unit of Instruction	01.10.2021	20.11.2021	7W
I Mid Examinations	22.11.2021	27.11.2021	1W
II Unit of Instructions	29.11.2021	15.01.2022	7W
II Mid Examinations	17.01.2022	22.01.2022	1W
Preparation & Practicals	24.01.2022	29.01.2022	1W
End Examinations	31.01.2022	12.02.2022	2W
Commencement of II Semester Class Work	**14.02.2022**		
II SEMESTER			
I Unit of Instructions	**14.02.2022**	02.04.2022	7W
I Mid Examinations	04.04.2022	09.04.2022	1W
II Unit of Instructions	11.04.2022	28.05.2022	7W
II Mid Examinations	30.05.2022	04.06.2022	1W
Preparation & Practicals	06.06.2022	11.06.2022	1W
End Examinations	13.06.2022	25.06.2022	2W
Commencement of next Year Class Work			
Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period			

R. Srinivasa Rao
Director Academic Planning
Director
Academic Planning
JNTUK Kakinada

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK
Copy to Rector, Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated to JNTUK, Kakinada
(ISO 9001:2015 Certified Institution)

ACADEMIC CALENDAR - 2021-22

S.NO.	DATE	EVENT
		OCTOBER
1	01-10-2021	Commencement of Class Work for B.Tech II,III,IV – I semester - I Unit of Instructions starts
2	25-10-2021 to 30-10-2021	Faculty Development Programs / Seminars / Workshops
		NOVEMBER
1	01-11-2021	Commencement of Class Work for MBA/MCA II-I semester - I Unit of Instruction starts
2	20-11-2021	B.Tech II,III&IV – I semester – I Unit of Instructions ends
3	22-11-2021	Commencement of Class Work for B.Tech I-I semester
4	22-11-2021 to 27-11-2021	I Mid Examinations for B.Tech II,III,IV – I semester, Induction Classes for B.Tech I-I semester
5	29-11-2021	B.Tech II,III & IV – I semester – II Unit of Instructions starts, B.Tech I-I semester - I Unit of Instructions starts
		DECEMBER
1	18-12-2021	MBA/MCA II-I semester - I Unit of Instruction ends
2	20-12-2021 to 25-12-2021	I Mid Examinations for MBA/MCA II-I semester
3	25-12-2021	Christmas
4	27-12-2021	MBA/MCA II-I semester - II Unit of Instruction starts
		JANUARY
1	03-01-2022	Commencement of Class Work for MBA/MCA I-I sem - I Unit of Instruction starts
2	14-01-2022 to 16-01-2022	Sankranti / Pongal Holidays
3	15-01-2022	B.Tech II,III&IV – I semester – II Unit of Instructions ends, B.Tech I-I semester - I Unit of Instructions ends
4	17-01-2021 to 22-01-2022	II Mid Examinations for B.Tech II,III,IV – I semester, I Mid Examinations for B.Tech I-I semester
5	24-01-2022	B.Tech I-I semester – II Unit of Instructions starts
6	24-01-2022 to 29-01-2022	Preparations and Practicals for B.Tech II,III,IV – I semester
7	26-01-2022	Republic Day
8	31-01-2022	End Examinations for B.Tech II,III,IV – I semester starts
		FEBRUARY
1	12-02-2022	End Examinations for B.Tech II,III,IV-I semester ends, MBA/MCA II-I semester - II Unit of Instruction ends
2	14-02-2022	Commencement of Class Work for B.Tech II,III,IV – II semester – I Unit of Instructions starts, II Mid Examinations for MBA/MCA II-I semester starts
3	21-02-2022	I Mid Examinations for MBA/MCA I-I semester starts
4	21-02-2022 to 26-02-2022	Preparations and Practicals for MBA/MCA II-I semester
5	26-02-2022	MBA/MCA I-I semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-I semester ends
6	28-02-2022	MBA/MCA I-I semester - II Unit of Instruction starts, End Examinations for MBA/MCA II-I semester starts

MARCH		
1	01-03-2022	Maha Sivaratri
2	12-03-2022	B.Tech I-I semester - II Unit of Instructions ends, End Examinations for MBA/MCA II-I semester ends
3	14-03-2022	Commencement of Class Work for MBA/MCA II-II semester - I Unit of Instruction starts
4	18-03-2022	Holi
5	14-03-2022 to 19-03-2022	II Mid Examinations for B.Tech I-I semester
6	21-03-2022 to 26-03-2022	Preparations and Practicals for B.Tech I-I semester
7	28-03-2022	End Examinations for B.Tech I-I semester starts
APRIL		
1	02-04-2022	Ugadi
2	02-04-2022	B.Tech II,III&IV/IV - II Sem - I Unit of Instructions ends
3	04-04-2022 to 09-04-2022	I Mid Examinations for B.Tech II,III,IV - II semester
4	05-04-2022	Babu Jagjivan Ram Jayanthi
5	09-04-2022	End Examinations for B.Tech I-I semester ends
6	10-04-2022	Sri Rama Navami
7	11-04-2022	B.Tech II,III&IV/IV - II semester - II Unit of Instructions starts, Commencement of Class Work for B.Tech I-II semester - I Unit of Instructions starts
8	14-04-2022	Dr B R Ambedkar Jayanthi
9	15-04-2022	Good Friday
10	18-04-2022	II Mid Examinations for MBA/MCA I-I semester starts
11	23-04-2022	MBA/MCA I-I semester - II Unit of Instruction ends, II Mid Examinations for MBA/MCA I-I semester ends
12	25-04-2022 to 30-04-2022	Preparations and Practicals for MBA/MCA I-I semester
13	30-04-2022	MBA/MCA II-II semester - I Unit of Instruction ends
MAY		
1	02-05-2022	End Examinations for MBA/MCA I-I semester starts, I Mid Examinations for MBA/MCA II-II semester starts
2	03-05-2022	Ramzan
3	07-05-2022	I Mid Examinations for MBA/MCA II-II semester ends
4	09-05-2022	MBA/MCA II-II semester - II Unit of Instruction starts
5	14-05-2022	End Examinations for MBA/MCA I-I semester ends
6	23-05-2022	MBA/MCA I-II semester - I Unit of Instruction starts
7	28-05-2022	B.Tech II,III & IV/IV - II semester - II Unit of Instructions ends, B.Tech I-II semester - I Unit of Instruction ends
8	30-05-2022	II Mid Examinations for B.Tech II,III,IV - II semester starts, I Mid Examinations for B.Tech I-II semester starts

JUNE		
1	04-06-2022	II Mid Examinations for B.Tech II,III,IV - II semester ends,I Mid Examinations for B.Tech I-II semester ends
2	06-06-2022	B.Tech I-II semester - II Unit of Instructions starts
3	06-06-2022 to 11-06-2022	Preparations and Practicals for B.Tech II,III,IV-II semester
4	13-06-2022 to 25-06-2022	End Examinations for B.Tech II,III,IV-II semester
5	25-06-2022	MBA/MCA II-II semester - II Unit of Instruction ends
6	27-06-2022	II Mid Examinations for II year MBA/MCA II semester starts
JULY		
1	02-07-2022	II Mid Examinations for MBA/MCA II-II semester ends
2	04-07-2022 to 09-07-2022	Preparations and Practicals for MBA/MCA II-II semester
3	10-07-2022	Bakrid
4	11-07-2022	I Mid Examinations for MBA/MCA I-II semester starts, End Examinations for MBA/MCA II-II semester starts
5	16-07-2022	MBA/MCA I-II semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-II semester ends
6	18-07-2022	MBA/MCA I-II semester - II Unit of Instruction starts
7	23-07-2022	B.Tech I-II semester - II Unit of Instructions ends, End Examinations for MBA/MCA II-II semester ends
8	25-07-2022 to 30-07-2022	II Mid Examinations for B.Tech I-II semester
AUGUST		
1	01-08-2022 to 06-08-2022	Preparations and Practicals for B.Tech I-II semester
2	08-08-2022	End Examinations for B.Tech I-II semester starts
3	09-08-2022	Muharram
4	15-08-2022	Independence Day
5	19-08-2022	Krishna Janmashtami
6	20-08-2022	End Examinations for B.Tech I-II semester ends
7	31-08-2022	Vinayaka Chavithi
SEPTEMBER		
1	05-09-2022	Teacher's day
2	10-09-2022	MBA/MCA I-II semester - II Unit of Instruction ends
3	12-09-2022 to 17-09-2022	II Mid Examinations for MBA/MCA I-II semester
4	19-09-2022 to 24-09-2022	Preparations and Practicals for MBA/MCA I-II semester
5	26-09-2022	End Examinations for MBA/MCA I-II semester starts
OCTOBER		
1	08-10-2022	End Examinations for MBA/MCA I-II semester ends

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Information Technology

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

SRKIT / IT / 09

Academic year:2021-2022

Semester:I

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
1	Mr.G.D.K.kishore	DWBI	IT			6	HOD Responsibilities,Subject Allocation,Criteria - 3incharge,Red Hat Instructor	
		R-PROG	IT			6		
2	Mrs.G.Sri Lakshmi	CNS	IT	CNS LAB	IT	6+4	Time table incharge,iso incharge,internal examiner,criteria-5 member,4th year class teacher	
		AI	IT	AI LAB	IT	6+4		
3	Mr.M.Suresh Babu	MC	IT	MC LAB	IT	5+4	Cisco Co-ordinator,Placement Incharge,Criteria-7,4th year Mentor, Lab incharge	
		SPM	IT			4		
		CN	IT	CN LAB	IT	5+3		

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Information Technology

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

SRKIT / IT / 09

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
4	Mrs.A.Veda Sri	IRS	IT			6	APSSDC Co-ordinator, Attendence incharge, Criteria-1 Member,2nd year Mentor	
		DBMS	IT	DBMS LAB	IT	6+3		
				C –PROG LAB	IT	3		
5	Mrs.Amritha Mishra	CD	IT	CD LAB	IT	6+3	FDP Co-ordinator,Training incharge,3rd year Class Teacher,Criteria-6 Member	
		OS	IT	OSLAB	IT	6+3		
6	Mrs.Y.V.Nandini	ADS	IT			6	Result Analysis,Blue prism instructor,NSS Co-ordinator,Criteria-2 Member,2nd year Class Teacher	
		OOPS	IT	OOPS LAB	IT	6+3		
				EWS LAB	IT	3		
7	Mrs.P.Sai Charitha	UNIX	IT	UNIX LAB		6+3	Notic Board Incharge, Minutes of Meeting,2nd yaer mentor	
8	Mr.S.Moshe Dayan	AJP	IT	AJP LAB	IT	6+3	Lab Incharage,Workshop-Co-ordinator,3rd year mentor	
				SKILL ORIENTED LAB	IT	2		

SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Information Technology

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

SRKIT / IT / 09

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
9	Ms.V.Lalitha	DAA	IT			6	Entrepreneurship incharge, 3rd year Mentor	
		C-PROG	IT	C –PROG LAB	IT	6+3		
				EWS LAB	IT	3		

HOD/ Date 20/9/22

Principal / Date

	SRK INSTITUTE OF TECHNOLOGY **Enikepadu, Vijayawada 521108** **Department of Information Technology** **CLASS TIME TABLE**	**SRKIT / IT / 10.1**

w.e.f.: 01-10-2021 **Room no: 408**

II/IV B. Tech – I SEM Time Table(2021-22)

PERIOD	1	2	3	4	12.25P.M to 01.10 P.M Lunch Break	5	6	7	8
TIME/ DAY	9:00A.M to 09.50 A.M	09.50A.M to 10.40A.M	10.45 A.M to 11.35 A.M	11.35 A.M to 12.25P.M		01.10P.M to 02.00P.M	02.00 P.M to 02.45 P.M	02.50P.M to 03.35 P.M	03.35P.M to 04.20 P.M
MON	OS	OOPS	DMG			OS LAB			
TUE	OOPS LAB			DBMS		DBMS	M-III	OOPS	SPORT
WED	M-III	DMG	OS	OOPS		M-III	DBMS LAB		
THU	OS	DBMS	OOPS	OS		OOPS	DMG	DBMS	COUNSELLING
FRI	SKILL ORIENTED PRO LAB		DBMS	OS		DMG	OOPS	M-III	CI
SAT	OS	DBMS	M-III	DMG		M-III	CI	LIBRARY	--

NAME OF THE SUBJECT	NAME OF THE FACULTY
Mathematics - III	Mr.RAMA KRISHNA
Object Oriented Programming through C++	Mrs.Y.V.NANDINI
Operating Systems	Mrs.AMRITHA MISHRA
Data base Management Systems	Mrs.A.VEDA SRI
Discrete Mathematics and Graph Theory	Mrs. G.KOTESWARAMMA
Object Oriented Programming through C++ Lab	Mrs.Y.V.NANDINI
Operating Systems Lab	Mrs. AMRITHA MISHRA/P.SAI CHARITHA
Database Management Systems Lab	Mrs.A.VEDA SRI/ S.MOSHE DAYAN
Skill oriented Course - I	Mr.M.SURESH BABU/ S.MOSHE DAYAN
1) Animations- 2D Animation	
2) Distributed Technologies- NoSQL	
Constitution of India	Mrs.N.GAYATHRI

HOD

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Department of Information Technology

SRKIT / IT / 10.2

FACULTY INDIVIDUAL TIME TABLE

FACULTY INDIVIDUAL TIMETABLE FOR THE SEM-I : ACADEMIC YEAR-2021-22

Name of the staff: Mrs.A.Veda sri **Name of the Subjects: IRS,DBMS,DBMS LAB,COUNSELLING**

Period	1	2	3	4	12.25P.M to 1.10 P.M Lunch Break	5	6	7	8
Time/ Day	09:00.M to 09.50 A.M	09.50A.M to 10.40A.M	10.45 A.M to 11.35 A.M	11.35 A.M to 12.25P.M		01.10P.M to 02.00P.M	02.00 P.M to 02.45 P.M	02.50P.M to 03.35 P.M	03.35P.M to 04.20 P.M
MON	C-PROGRAMMING LAB			IRS				IRS	
TUE	IRS			DBMS		DBMS			
WED			IRS			DBMS LAB			
THU		DBMS				IRS		DBMS	COUNSELING
FRI			DBMS					IRS	
SAT		DBMS				IRS			

SIGNATURE OF FACULTY: SIGNATURE OF HOD:

Name of the staff: Mrs. Amritha Mishra **Name of the Subjects: CD,CN-CD LAB,OS,OS LAB**

Period	1	2	3	4	12.25P.M to 1.10 P.M Lunch Break	5	6	7	8
Time/ Day	09:00.M to 09.50 A.M	09.50A.M to 10.40A.M	10.45 A.M to 11.35 A.M	11.35 A.M to 12.25P.M		01.10P.M to 02.00P.M	02.00 P.M to 02.45 P.M	02.50P.M to 03.35 P.M	03.35P.M to 04.20 P.M
MON	OS		CD			OS LAB			
TUE			CD						
WED			OS			CD			
THU	OS			OS			CD		
FRI		CD		OS		CN-CD LAB			
SAT	OS		CD			CD			

SIGNATURE OF FACULTY: SIGNATURE OF HOD:

Name of the Staff: Mrs.Y.V.Nandini **Name of the Subjects: ADS,OOPS, OOPS through C++ ,Lab**

Period	1	2	3	4	12.25P.M to 1.10 P.M Lunch Break	5	6	7	8
Time/ Day	09:00.M to 09.50 A.M	09.50A.M to 10.40A.M	10.45 A.M to 11.35 A.M	11.35 A.M to 12.25P.M		01.10P.M to 02.00P.M	02.00 P.M to 02.45 P.M	02.50P.M to 03.35 P.M	03.35P.M to 04.20 P.M
MON		OOPS						ADS	
TUE	OOPS LAB					ADS		OOPS	
WED				OOPS			ADS		
THU	ADS		OOPS			OOPS			
FRI			ADS				OOPS		
SAT	CMP ENGG WORKSHOP LAB					ADS			

SIGNATURE OF FACULTY: SIGNATURE OF HOD:

HOD - IT

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Information Technology** **TEACHING PLAN CUM REALIZATION**	**SRKIT / IT /12**

Department: **Information Technology** Name of faculty: **Amritha mishra** Designation: **Assistant Professor**

Semester / Year: **II/I** Name of the subject: **Operating system** AY: **2021-22**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	Unit - 1				
1.	Operating Systems Overview		11/10/21	1	
2.	Operating system Concepts		12/10/21	1	
3	Operating system functions		18/10/21	1	
4	Evaluation of Operating systems operations		20/10/21	1	
5	System Structures: Operating System Services,		21/10/21	1	
6	operating system structure		21/10/21	1	
7	Systems calls- Types of System Calls,		22/10/21	1	
8	operating system debugging		23/10/21	1	
9	System generation		25/10/21	1	
10	Process Concept: Basic concepts		26/10/21	1	
11	Process states, process control block		27/10/21	1	

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Information Technology** **TEACHING PLAN CUM REALIZATION**	**SRKIT / IT /12**

12	Operations on processes		28/10/21	1	
13	Tutorial		29/10/21	1	
	Unit - 2				
14	Process Scheduling, Scheduling Criteria		30/10/21	1	
15	Scheduling Algorithms		1/11/21	1	
16	Multiple Processor Scheduling		2/11/21	1	
17	Thread Scheduling, Multithreaded Programming: Multithreading Models		3/1121	1	
18	Thread Libraries, Threading Issues, Examples.		5/11/21	1	
19	Process Concurrency And Synchronization: Introduction		8/11/21	1	
20	Race Condition, Critical Region		9/11/21	1	
21	Mutual Exclusion, Peterson's Solution, Hardware Support		10/11/21	1	
22	Operating System Support, Semaphores,		11/11/21	1	

	SRK INSTITUTE OF TECHNOLOGY Enikepadu, Vijayawada 521108 Department of Information Technology TEACHING PLAN CUM REALIZATION	SRKIT / IT /12

	Monitors				
23	Classic Synchronization problem: Reader's-Writer's with unlimited & limited buffer		11/11/21	1	
24	Producer –Consumer problem, Dining philosopher's problem.		12/11/21	1	
25	Tutorial		16/11/21	1	
	Unit / Topic	**Teaching Planned**	**Taught on (Date)**	**No of Periods (actual taken)**	**Remarks (if any deviation)**
	Unit - 3		30/10/21	1	
26	Memory-Management Strategies: Introduction		1/11/21	1	
27	Swapping, Contiguous memory allocation		2/11/21	1	
28	Paging,		3/1121	1	
29	Segmentation, Examples,		5/11/21	1	
30	Virtual Memory Management: Introduction		8/11/21	1	
31	Demand paging		9/11/21	1	

32	Copy on-write,		10/11/21	1	
33	Page replacement,		11/11/21	1	
34	Page replacement algorithms		11/11/21	1	
35	Frame allocation		12/11/21	1	
36	Thrashing		16/11/21	1	
37	Memory-mapped files		30/10/21	1	
38	Kernel memory allocation		1/11/21	1	
39	Tutorial				
	Unit - 4				
40	Deadlocks: Resources		2/12/21	1	
41	Conditions for resource deadlocks		3/12/21	1	
42	Graph models of deadlocks,		4/12/21	1	
43	Deadlock detection and recovery		6/12/21	1	
44	Deadlock avoidance		7/12/21	1	

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45	Deadlock prevention.		8/12/21	1	
46	File Systems: Files		9/12/21	1	
47	Directories		9/12/21	1	
48	File system implementation		10/12/21	1	
49	management and optimization		13/12/21	1	
50, 51	Secondary-Storage Structure:		14/12/21, 15/12/21	2	
52	Overview of disk structure and attachment		16/12/21	1	
53	Disk scheduling		16/12/21, 18/12/21	2	
54	RAID structure.		20/12/21	1	
55	Tutorial		21/12/21	1	
	Unit - 5				
56,57	System Protection:		23/12/21	1	

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Information Technology** **TEACHING PLAN CUM REALIZATION**	**SRKIT / IT /12**

58	Goals of protection		24/12/21	1	
59,60	Principles and domain of protection		28/12/21	1	
61,62	Access matrix		30/12/21	1	
63	Access control, Revocation of access rights		04/01/22	1	
64	System Security: Introduction		06/01/22	1	
65	Program threats, System and network threats		07/01/22	1	
66	Cryptography for security,User authentication		11/01/22	1	
67,68	Implementing security defenses		18/01/22, 20/01/22	2	
69	Firewalling to protect systems and networks		21/1/22	1	
70	Computer security classification.		22/1/22	1	
71	Case Studies:		24/1/22	1	
72, 73	Study of Operating System Functionalities in various operating Systems like Windows		31/01/22, 02/02/22	2	

74, 75	Unix, Linux and Mobile Operating Systems.:		03/02/22, 04/02/22	2	
76	Tutorial		05/02/22	1	

Text Books:

1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.

2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:

1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.

2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Inter process Communication and File systems.)

3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

Faculty/Date

HOD/Date

UNIT-1

Operating System Overview:

→ Operating System Concepts:

1) What is an operating system?

A program that acts as an intermediary between a user of a computer and the computer hardware.

Operating system goals:

(i) Execute user programs and make solving user problem easier.

(ii) Make the computer system convenient to use

(iii) Use the computer hardware in an efficient manner.

Computer System Structure:

Computer systems can be divided into four componets.

* Hardware:

Provides basic computing resources cpu, memory, I/o devices.

* Operating Systems:

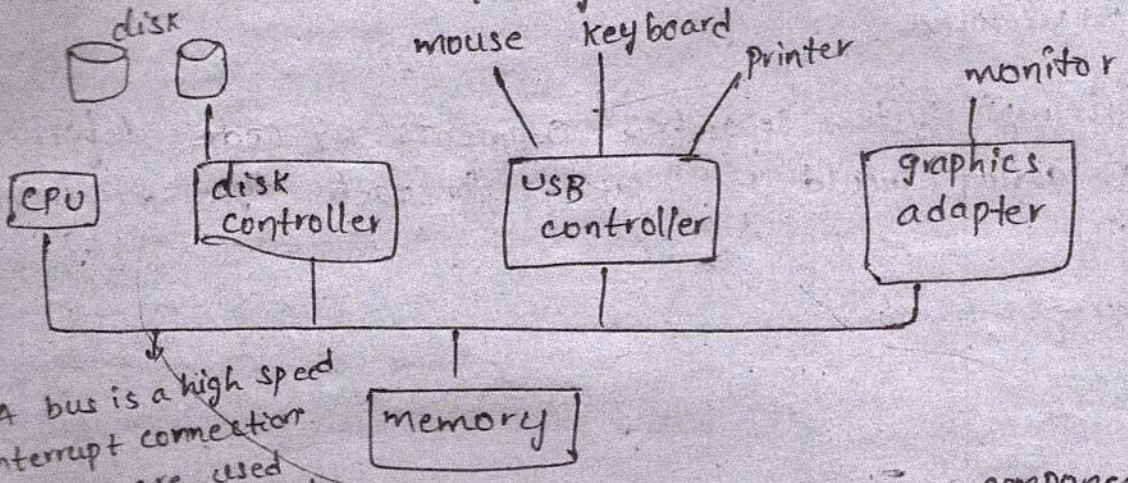
Controls and co-ordinates use of hardware among various applications and user

* Application programs:

Define the ways in which the system resources are used to solve the computing problems of the users word processor, compilers, web browsers, data base system, video games.

Computer System Organization with its functionality

Computer system operations are one or more CPUs, devices, Controllers. Connect through common bus providing access to shared memory concurrent execution of CPUs, and devices competing for memory cycles.



A bus is a high speed interrupt connection Buses are used to send control signals and data b/w the processor and other components

Common functions of interrupts:

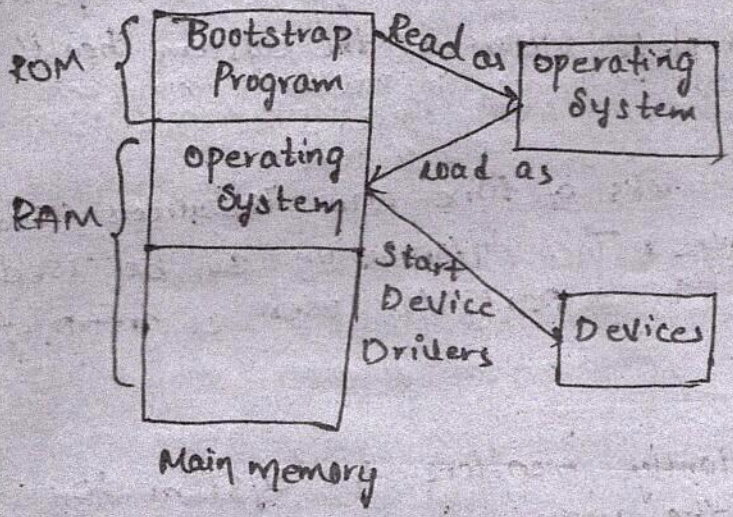
Interrupt transfer control to the intreput serdice routine generally, through interrupt dector, which contains the addresses of all the serdices routines. interrupt architecture must sade the address of the interrupted intruction.

Def:

An interrupt is usually defined as an event that allows alters the sequence of instruction executed by a processor.

→ A suspension of a process such as the execution of a computer program caused by an event program/external to that process, and performed in such a way that the process can be resumed.

The entire operating system depends on the boot strap program to work correctly as it loads the OS.



In the above image, the boot strap program is a part of ROM which is non-volatile memory. The operating system is loaded into RAM by the bootstrap program after the start of the computer system. Then the operating system starts the device drivers.

Operating System functions:

An Operating system acts as a communication bridge (interface) blew the user and computer hardware. The Purpose of an operating system is to provide a platform on which a user can execute programs in a convenient and efficient manner.

Important functions of an operating System:

i) Security:

The operating system uses password protection to protect user data and similar other techniques, it also prevent unauthorized access to programs and user data.

(viii) Device Management:

An Os manages device communication via their respective drivers, it performs the following activities for device management.

→ Keeps tracks of all devices connected to system, designates a program responsible for every device known as the I/O controller.

(ix) File management:

A file system is organised into directories for efficient or easy navigation and usage

(Or)

(i) Resource management
(ii) Process management
(iii) Storage management
(iv) Memory management
(v) Security

Evaluation of Operating Systems operations:

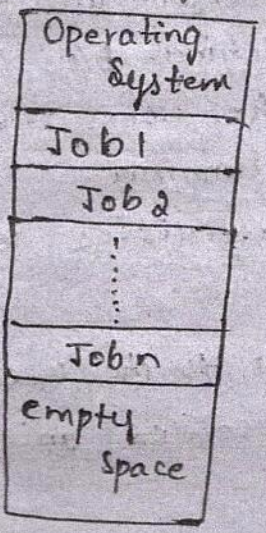
(i) Main frame Os
(ii) Batch processing Os
(iii) Multiprogramming Os (non preemitive)
(iv) Time sharing or multitasking Os (preemetive)
(v) Multiprocessing Os
(vi) Distributed Os
(vii) Desktop System
(viii) Real time Os.

Ex: payroll system, Bank statements, etc.

2. Multiprogramming Operating System:

Sharing the processor, when two or more programs reside in memory at the same time is reffered as multiprogramming.

Multiprogramming assumes a single shared processor multiprogramming increases CPU utilization by organizing jobs so that the cpu always has one to execute



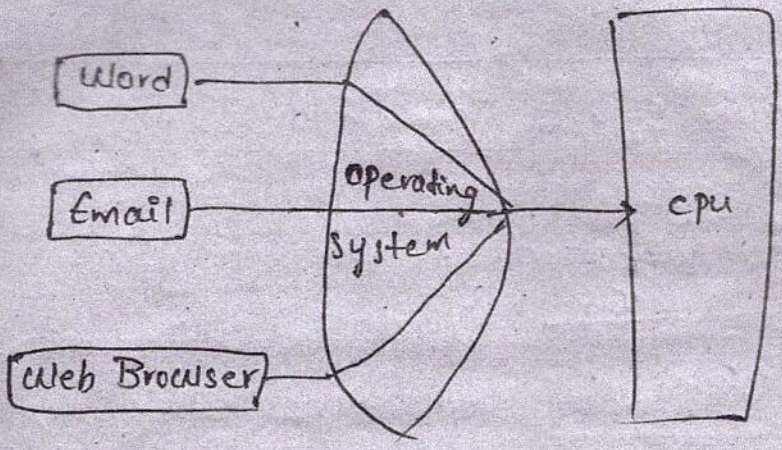
An Os does the following actilities releated to multi programming.

→ The Os keeps seclerals Jobs in memory at a time.

→ This set of jobs is a subset of the jobs kept in the job pool.

→ The Os picks and begins to execute one of the Jobs in the memory.

→ Multiprogramming Os monitor the state of all actide Programs and System resources using memory mangement Programs to ensure that the CPU is never idle, unless there is no jobs to process.



Advantages:

(i) each task gets an equal opportunity
(ii) fewer chances of duplication of software
(iii) CPU idle time can be reduced.

Disadvantage:

(i) Reliability problem
(ii) One must have to take care of the security and integrity of user programs and data.
(iii) Data communication problem.

** Operating System Services:

Here is the ~~Som~~ some list of Operating system services.

1. User interface ← (GUI, CUI, Batch OS)
2. Program execution
3. file system manipulation
4. I/O operations
5. Communication
6. Resource allocation
7. Job accounting
8. error handling
9. Security & Protection

An O.S provides services to both the users & the programs.

Unit-2

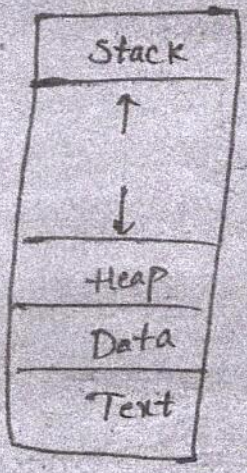
What is Process :

-A process is basically a program execution. The execution of a process must progess in an sequential manner.

-A process is defined as a entity which represents the basic unit of work to be implemented in the system.

When the program is loaded into a memory, it became a process, and it divided into four different sections.

1) Stack
2) Heap
3) Data
4) Text



1) STACK:
The process stack contain the temporary data such as methods/functions, return address and local variables.

2) Heap:
This a dyanamically allocated memory during the execution of your process.

3) Data:
This include current activity represented by the program counter and content of proce processor registes.

4) Text:
This section contains the global and static variables.

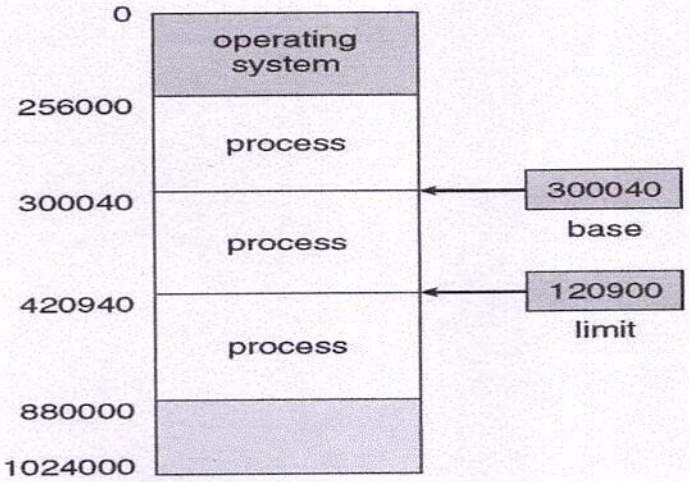
UNIT III

Memory Management

- To provide a detailed description of various ways of organizing memory hardware
- To discuss various memory-management techniques, including paging and segmentation
- To provide a detailed description of the Intel Pentium, which supports both pure segmentation and segmentation with paging
- Program must be brought (from disk) into memory and placed within a process for it to be run
- Main memory and registers are only storage CPU can access directly
- Register access in one CPU clock (or less)
- Main memory can take many cycles
- **Cache** sits between main memory and CPU registers
- Protection of memory required to ensure correct operation

Base and Limit Registers

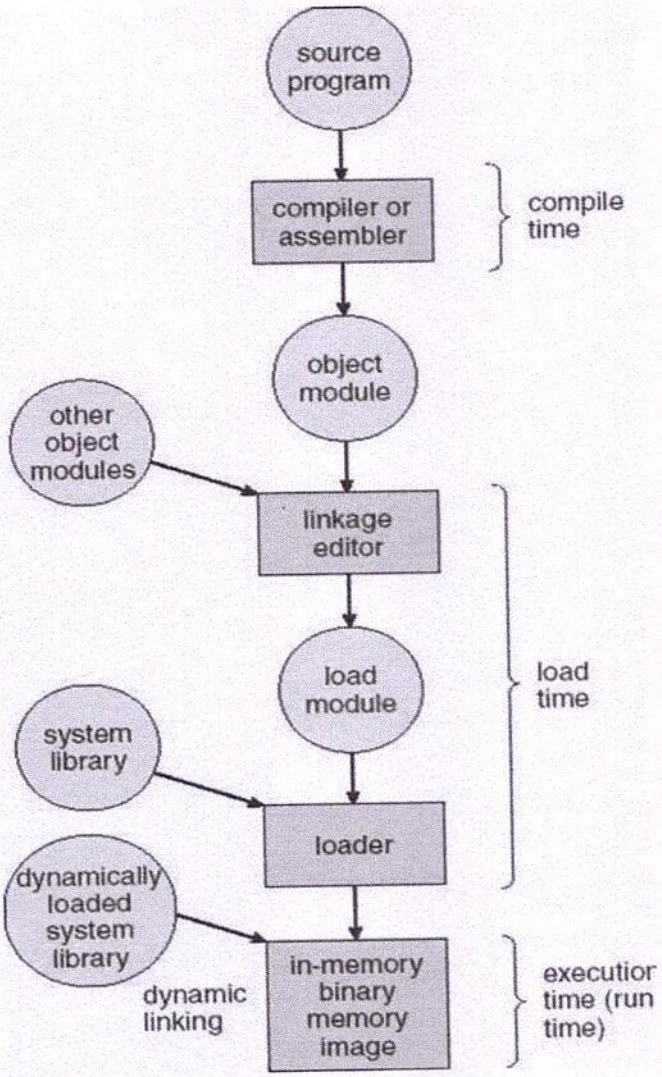
A pair of **base** and **limit** registers define the logical address space



Binding of Instructions and Data to Memory

- Address binding of instructions and data to memory addresses can happen at three different stages
- **Compile time**: If memory location known a priori, **absolute code** can be generated; must recompile code if starting location changes
- **Load time**: Must generate **relocatable code** if memory location is not known at compile time
- **Execution time**: Binding delayed until run time if the process can be moved during its execution from one memory segment to another. Need hardware support for address maps (e.g., base and limit registers)

Multistep Processing of a User Program



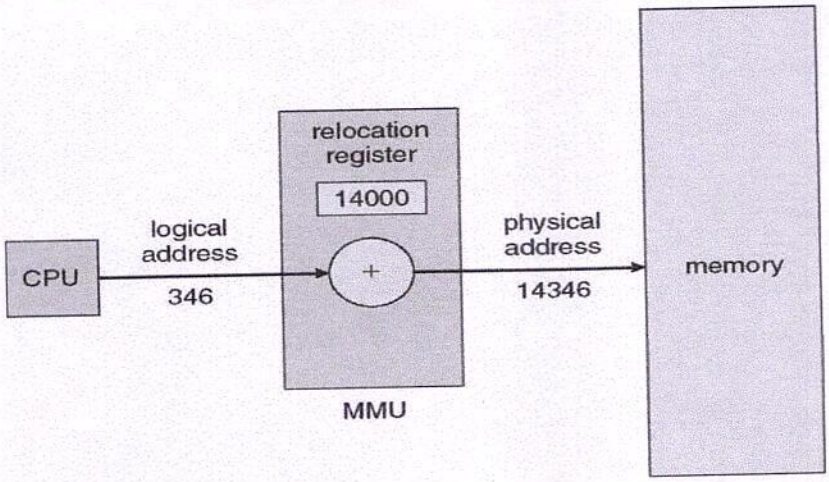
Logical vs. Physical Address Space

- The concept of a logical address space that is bound to a separate **physical address space** is central to proper memory management
- **Logical address** – generated by the CPU; also referred to as **virtual address**
- **Physical address** – address seen by the memory unit
- Logical and physical addresses are the same in compile-time and load-time address-binding schemes; logical (virtual) and physical addresses differ in execution-time address-binding scheme

Memory-Management Unit (MMU)

- Hardware device that maps virtual to physical address
- In MMU scheme, the value in the relocation register is added to every address generated by a user process at the time it is sent to memory
- The user program deals with *logical* addresses; it never sees the *real* physical addresses

Dynamic relocation using a relocation register



Dynamic Loading

- Routine is not loaded until it is called
- Better memory-space utilization; unused routine is never loaded
- Useful when large amounts of code are needed to handle infrequently occurring cases
- No special support from the operating system is required implemented through program design

Dynamic Linking

- Linking postponed until execution time
- Small piece of code, *stub*, used to locate the appropriate memory-resident library routine
- Stub replaces itself with the address of the routine, and executes the routine
- Operating system needed to check if routine is in processes' memory address
- Dynamic linking is particularly useful for libraries
- System also known as **shared libraries**

Swapping

A process can be swapped temporarily out of memory to a backing store, and then brought back into memory for continued executionn**Backing store** – fast disk large enough to accommodate copies of all memory images for all users; must provide direct access to these memory imagesn**Roll out, roll in** – swapping variant used for priority-based scheduling algorithms; lower-priority process is swapped out so higher-priority process can be loaded and executednMajor part of swap time is transfer time; total transfer time is directly proportional to the amount of memory swappednModified versions of swapping are found on many systems (i.e., UNIX, Linux, and Windows)

System maintains a **ready queue** of ready-to-run processes which have memory images on disk

Introduction to dead...

UNIT-4

Every process needs some resources to complete its execution. However, the resources is granted in a sequential order.

1. The process request for some resources
2. Os grant the resources if it is available otherwise let the process wait.
3. The process uses it and release on the compl

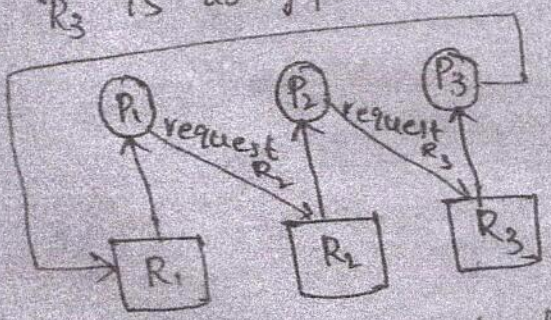
A Deadlock is a situation where each of the computer process waits for a resource which is ~~begin~~ being assigned to some other process.

Let us assume that there are three processes P_1, P_2 and there are three different resources R_1, R_2 & R_3.

Here R_1 is assigned to P_1

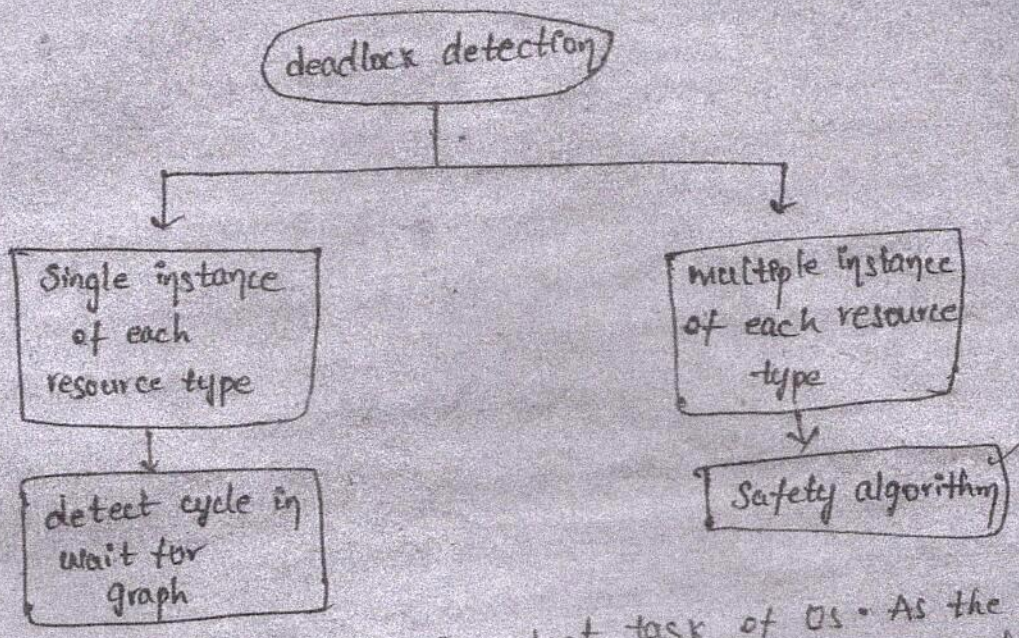
R_2 is assigned to P_2 &

R_3 is assigned to P_3



- After sometime P_1 demands for R_2 which is being by P_2. P_1 halts its execution since it can't con without R_2. P_2 also demand for R_3 which being used by R_3. P_2 also stops its execution because it can't continue without R_3.

Deadlock detection and recovery:

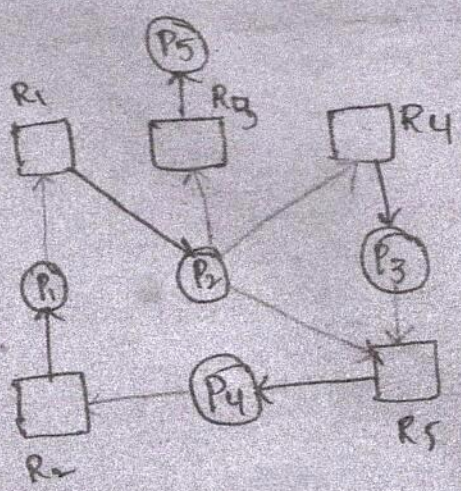


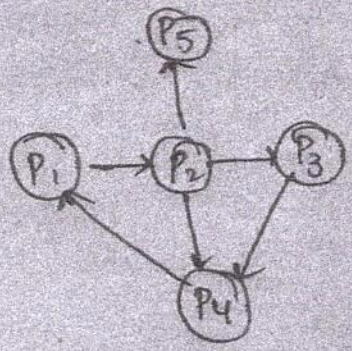
Deadlock detection is an important task of OS. As the OS doesn't take many precautionary means to avoid it. The periodically checks if there is any existing deadlock the system and take measures to remove the deadlock

There are 2 different cases in case of deadlock detection.

→ if resource has single instance
- wait for graph

→ if resource has multiple instance
- safety algorithm (bankers algorithm)





Unit-5

System Protection:

Protection refers to a mechanism which controls the access of programs, user to the resources defined by the computer system.

Needs of protection:

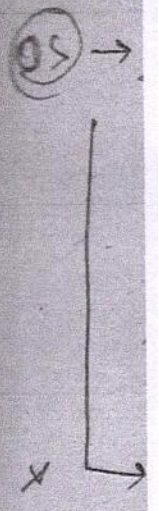
- To prevent the unauthorized access to the user'
- To ensure that each active program or process in the system.
- To improve reliabilty by decting errors.

C I A — availbility

confedential integrity

Goals of protection:

- Prevent malicious misuse of system or user program
- To ensures that each ~~she~~ shareduse resocurces is use only in accoundance with system policies
- To ensures that errent programs ~~or~~ causes the ~~min~~ minimal damage to the system.
- Protection system only provide the mechanism for enforcing policies and ensuring reliable system



Principles & Domain of Protection:

Principles of Protection:

→ To implement the protection enabled system we need to follow a principle throughout the design of principle

- principle of least privileage

programs, users & even systems we give enough privileages to perform a task

Ex:

Security guard – Pass key

Pass key | security → Access (allow) — only for his area

→ misse → damage is low

For all area access → miss → damage is max

OS → P.O.L.P.

it will implement its

↓ features, programs, system calls

↓ failure → damage is low

→ Provides system calls & services which allows application written in frame grained access control.

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory ✓ Drawing Practical

II Year I Semester B.tech Course IT Branch OS Subject

Name of Teacher (s) 1. Amritha mishra

2.

Academic Year 2021 - 2022

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1	mon	4	11/10/21	Unit-1:- operating System overview	21	Tue	7	9/11/21	multiple processor scheduling, Thread Sche
2	Tue	7	12/10	operating System concepts	22	wed	4	10/11/21	IPC: Race conditions, critical Regions
3	mon	4	18/10	operating System functions, Services	23	Thur	3	11/11/21	mutual exclusion with busy waiting
4	wed	4	20/10	operating System operations	24	Thurs	7	11/11/21	Sleep and wakeup.
5	Thur	3	21/10	operating System structure.	25	Sat	1	13/11/21	Semaphores, mutex's, monitors
6	Thur	7	21/10	System calls- Types of Systemcalls	26	Mon	4	15/11/21	message passing, Barriers.
7	fri	1	22/10	operating computing environment	27	Tues	7	16/11/21	Classical problems of IPC
8	Sat	1	23/10	open-Source OS, System program	28	wed	4	17/11/21	Dining-philosophers problem
9	Mon	4	25/10	operating System debugging	29	Thurs	3	18/11/21	Readers and writers problem
10	Tue	7	26/10	System boot.	30	Thurs	7	18/11/21	Unit-3:- memory-management
11	wed	4	27/10	Unit-2:- process concepts, Scheduling	31	Sat	1	20/11/21	Introduction; Swapping
12	Thurs	3	28/10	operations on processes	32	Mon	4	22/11/21	contiguous memory allocation
13	Thurs	7	28/10	Inter-process communication, client Server	33	Tues	7	23/11/21	MVT, MFT
14	Sat	1	30/10	multithreaded programming:	34	wed	4	24/11/21	Paging
15	Mon	4	1/11/21	multithreading models,	35	Thursday	3	25/11/21	Segmentation.
16	Tue	7	2/11/21	Thread libraries,	36	Sat	1	27/11/21	Virtual memory management:
17	wed	4	3/11/21	Thread Issues.	37	Mon	4	29/11/21	Introduction,
18	fri	3	5/11/21	process scheduling- Basic concepts	38	Tuesday	7	30/11/21	Demand paging
19	Sat	1	6/11/21	Scheduling criteria,	39	wednesday	4	1/12/21	copy-on-write.
20	Mon	4	8/11/21	Scheduling algorithms.	40	Thursday	3	2/12/21	page Replacement algorithms

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory / Drawing / Practical

II Year I Semester Btech Course IT Branch CS Subject

Name of Teacher (s) 1. 2. Amritha Mishra

Academic Year 2021-2022

Sl. No.	Periods			Topic Covered
	Day	Time	Date	
(1)	(2)	(3)	(4)	(5)
41	Thursday	4	2/12/21	FIFO, optimal, LRU.
42	Saturday	1	4/12/21	LRU page Replacement algorithm
43	Monday	4	6/12/21	copy-on-write.
44	Tuesday	7	7/12/21	memory-mapped files, Kernel memory
45	Thursday	4	9/12/21	UNIT-4:- Deadlocks
46	Thursday	4	9/12/21	Introduction to deadlocks, Resources.
47	Tuesday	5	14/12/21	Ostrich algorithm
48	wednesday	3	15/12/21	Deadlock detection and Recovery,
49	Thursday	1	16/12/21	Deadlock avoidance, Deadlock prevention
50	Thursday	4	18/12/21	File Systems: Files, Directories
51	Friday	4	17/12/21	File system Implementation.
52	Saturday	1	18/12/21	management and optimization
53	monday	4	20/12/21	Secondary Storage structure, overview
54	Tuesday	7	21/12/21	attachments, Disk Scheduling
55	wednesday	3	22/12	RAID Structure
56	Thursday	1	23/12	Stable Storage Implementation.
57	Friday	4	24/12	UNIT-5:- System protection
58	monday	4	27/12	Goals of protection, principles and domain
59	wednesday	3	29/12	Access matrix, Access Control
60	Thursday	4	30/12	Revocation of access rights
61	Thursday	7	30/12	System Security: Introduction
62	Monday	4	3/1/22	program threats.
63	Monday	4	10/1/22	System and network threats
64	Tuesday	5	11/1/22	cryptography for Security
65	Monday	4	17/1/22	user authentication,
66	Tuesday	5	18/1/22	Implementing Security defense
67	wednesday	3	19/1/22	Continuation
68	Thursday	4	20/1/22	Firewalling to protect System and network
69	Friday	4	21/1/22	computer Security classification
70	Saturday	1	22/1/22	Case Studies
71	Monday	4	24/1/22	Linux
72	Monday	4	31/1/22	Micro Soft windows
73	wednesday	3	2/2/22	Cpu Scheduling explation
74	Thursday	4	3/2/22	page Replacement
75	Friday	4	4/2/22	Bankers's algorithm.
76	Saturday	1	5/2/22	Revision
77				
78				
79				
80				

Website: www.jntuk.edu.in
Email: dapjntuk@gmail.com

Phone: 0884-2300991
Mobile: 7032606555

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. JNTUK/DAP/AC/I Year/B. Tech/2021-22

Date: 19-11-2021

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges.
JNTUK, Kakinada.

Academic Calendar of I Year B. Tech for the Academic Year 2021-22

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**22.11.2021**		
Induction Classes	22.11.2021	27.11.2021	1W
I Unit of Instruction	29.11.2021	15.01.2022	7W
I Mid Examinations	17.01.2022	22.01.2022	1W
II Unit of Instructions	24.01.2022	12.03.2022	7W
II Mid Examinations	14.03.2022	19.03.2022	1W
Preparation & Practicals	21.03.2022	26.03.2022	1W
End Examinations	28.03.2022	09.04.2022	2W
Commencement of II Semester Class Work	**11.04.2022**		
II SEMESTER			
I Unit of Instructions	**11.04.2022**	28.05.2022	7W
I Mid Examinations	30.05.2022	04.06.2022	1W
II Unit of Instructions	06.06.2022	23.07.2022	7W
II Mid Examinations	25.07.2022	30.07.2022	1W
Preparation & Practicals	01.08.2022	06.08.2022	1W
End Examinations	08.08.2022	20.08.2022	2W
Commencement of next Year Class Work	**22.08.2022**		
Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period			

R. Srinivasa Rao

Director Academic Planning

Director
Academic Planning
JNTUK Kakinada

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK
Copy to Rector, JNTUK
Copy to Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada 521108
Approved by AICTE, Affiliated to JNTUK, Kakinada
(ISO 9001:2015 Certified Institution)

ACADEMIC CALENDAR - 2021-22

S.NO.	DATE	EVENT
		OCTOBER
1	01-10-2021	**Commencement of Class Work** for B.Tech II,III,IV - I semester - I Unit of Instructions starts
2	25-10-2021 to 30-10-2021	Faculty Development Programs / Seminars / Workshops
		NOVEMBER
1	01-11-2021	**Commencement of Class Work** for MBA/MCA II-I semester - I Unit of Instruction starts
2	20-11-2021	B.Tech II,III&IV - I semester - I Unit of Instructions ends
3	22-11-2021	**Commencement of Class Work** for B.Tech I-I semester
4	22-11-2021 to 27-11-2021	I Mid Examinations for B.Tech II,III,IV - I semester, Induction Classes for B.Tech I-I semester
5	29-11-2021	B.Tech II,III & IV - I semester - II Unit of Instructions starts, B.Tech I-I semester - I Unit of Instructions starts
		DECEMBER
1	18-12-2021	MBA/MCA II-I semester - I Unit of Instruction ends
2	20-12-2021 to 25-12-2021	I Mid Examinations for MBA/MCA II-I semester
3	25-12-2021	Christmas
4	27-12-2021	MBA/MCA II-I semester - II Unit of Instruction starts
		JANUARY
1	03-01-2022	**Commencement of Class Work** for MBA/MCA I-I sem - I Unit of Instruction starts
2	14-01-2022 to 16-01-2022	Sankranti / Pongal Holidays
3	15-01-2022	B.Tech II,III&IV - I semester - II Unit of Instructions ends, B.Tech I-I semester - I Unit of Instructions ends
4	17-01-2021 to 22-01-2022	II Mid Examinations for B.Tech II,III,IV - I semester, I Mid Examinations for B.Tech I-I semester
5	24-01-2022	B.Tech I-I semester - II Unit of Instructions starts
6	24-01-2022 to 29-01-2022	Preparations and Practicals for B.Tech II,III,IV - I semester
7	26-01-2022	Republic Day
8	31-01-2022	**End Examinations** for B.Tech II,III,IV - I semester starts
		FEBRUARY
1	12-02-2022	**End Examinations** for B.Tech II,III,IV-I semester ends, MBA/MCA II-I semester - II Unit of Instruction ends
2	14-02-2022	**Commencement of Class Work** for B.Tech II,III,IV - II semester - I Unit of Instructions starts, II Mid Examinations for MBA/MCA II-I semester starts
3	21-02-2022	I Mid Examinations for MBA/MCA I-I semester starts
4	21-02-2022 to 26-02-2022	Preparations and Practicals for MBA/MCA II-I semester
5	26-02-2022	MBA/MCA I-I semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-I semester ends
6	28-02-2022	MBA/MCA I-I semester - II Unit of Instruction starts, **End Examinations** for MBA/MCA II-I semester starts

MARCH		
1	01-03-2022	Maha Sivaratri
2	12-03-2022	B.Tech I-I semester - II Unit of Instructions ends, **End Examinations** for MBA/MCA II-I semester ends
3	14-03-2022	**Commencement of Class Work** for MBA/MCA II-II semester - I Unit of Instruction starts
4	18-03-2022	Holi
5	14-03-2022 to 19-03-2022	II Mid Examinations for B.Tech I-I semester
6	21-03-2022 to 26-03-2022	Preparations and Practicals for B.Tech I-I semester
7	28-03-2022	**End Examinations** for B.Tech I-I semester starts
APRIL		
1	02-04-2022	Ugadi
2	02-04-2022	B.Tech II,III&IV/IV - II Sem - I Unit of Instructions ends
3	04-04-2022 to 09-04-2022	I Mid Examinations for B.Tech II,III,IV - II semester
4	05-04-2022	Babu Jagjivan Ram Jayanthi
5	09-04-2022	**End Examinations** for B.Tech I-I semester ends
6	10-04-2022	Sri Rama Navami
7	11-04-2022	B.Tech II,III&IV/IV - II semester - II Unit of Instructions starts, **Commencement of Class Work** for B.Tech I-II semester - I Unit of Instructions starts
8	14-04-2022	Dr B R Ambedkar Jayanthi
9	15-04-2022	Good Friday
10	18-04-2022	II Mid Examinations for MBA/MCA I-I semester starts
11	23-04-2022	MBA/MCA I-I semester - II Unit of Instruction ends, II Mid Examinations for MBA/MCA I-I semester ends
12	25-04-2022 to 30-04-2022	Preparations and Practicals for MBA/MCA I-I semester
13	30-04-2022	MBA/MCA II-II semester - I Unit of Instruction ends
MAY		
1	02-05-2022	**End Examinations** for MBA/MCA I-I semester starts, I Mid Examinations for MBA/MCA II-II semester starts
2	03-05-2022	Ramzan
3	07-05-2022	I Mid Examinations for MBA/MCA II-II semester ends
4	09-05-2022	MBA/MCA II-II semester - II Unit of Instruction starts
5	14-05-2022	**End Examinations** for MBA/MCA I-I semester ends
6	23-05-2022	MBA/MCA I-II semester - I Unit of Instruction starts
7	28-05-2022	B.Tech II,III & IV/IV - II semester - II Unit of Instructions ends, B.Tech I-II semester - I Unit of Instruction ends
8	30-05-2022	II Mid Examinations for B.Tech II,III,IV - II semester starts, I Mid Examinations for B.Tech I-II semester starts

JUNE		
1	04-06-2022	II Mid Examinations for B.Tech II,III,IV - II semester ends,I Mid Examinations for B.Tech I-II semester ends
2	06-06-2022	B.Tech I-II semester - II Unit of Instructions starts
3	06-06-2022 to 11-06-2022	Preparations and Practicals for B.Tech II,III,IV-II semester
4	13-06-2022 to 25-06-2022	End Examinations for B.Tech II,III,IV-II semester
5	25-06-2022	MBA/MCA II-II semester - II Unit of Instruction ends
6	27-06-2022	II Mid Examinations for II year MBA/MCA II semester starts
JULY		
1	02-07-2022	II Mid Examinations for MBA/MCA II-II semester ends
2	04-07-2022 to 09-07-2022	Preparations and Practicals for MBA/MCA II-II semester
3	10-07-2022	Bakrid
4	11-07-2022	I Mid Examinations for MBA/MCA I-II semester starts, End Examinations for MBA/MCA II-II semester starts
5	16-07-2022	MBA/MCA I-II semester - I Unit of Instruction ends, I Mid Examinations for MBA/MCA I-II semester ends
6	18-07-2022	MBA/MCA I-II semester - II Unit of Instruction starts
7	23-07-2022	B.Tech I-II semester - II Unit of Instructions ends, End Examinations for MBA/MCA II-II semester ends
8	25-07-2022 to 30-07-2022	II Mid Examinations for B.Tech I-II semester
AUGUST		
1	01-08-2022 to 06-08-2022	Preparations and Practicals for B.Tech I-II semester
2	08-08-2022	End Examinations for B.Tech I-II semester starts
3	09-08-2022	Muharram
4	15-08-2022	Independence Day
5	19-08-2022	Krishna Janmashtami
6	20-08-2022	End Examinations for B.Tech I-II semester ends
7	31-08-2022	Vinayaka Chavithi
SEPTEMBER		
1	05-09-2022	Teacher's day
2	10-09-2022	MBA/MCA I-II semester - II Unit of Instruction ends
3	12-09-2022 to 17-09-2022	II Mid Examinations for MBA/MCA I-II semester
4	19-09-2022 to 24-09-2022	Preparations and Practicals for MBA/MCA I-II semester
5	26-09-2022	End Examinations for MBA/MCA I-II semester starts
OCTOBER		
1	08-10-2022	End Examinations for MBA/MCA I-II semester ends

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DEPARTMENT OF SCIENCE AND HUMANITIES
Department Academic Calendar 2021 – 2022 Semester II

S. No	Activity	Year/Class	Date
1	Notice	Time Table	04-04-2022
		Roll Call List	
2	Principal and Faculty Meeting	All Faculty Members	After releasing of university results
3	HOD and Faculty meeting	All Faculty Members	Every Month
4	Commencement of Class work	I B.Tech	11-04-2022
5	I Mid-term test/Online Examinations	I B.Tech	30-05-2022 to 04-06-2022
6	Feedback on Faculty	I B.Tech	11-07-2022 to 16-07-2022
7	Preparation &Internal lab Examinations	I B.Tech	18-07-2022 to 23-07-2022
8	II Mid-term test/Online Examinations	I B.Tech	25-07-2022 to 30-07-2022
9	Preparation & Practicals Examinations	I B.Tech	01-08-2022 to 06-08-2022
10	End Examinations	I B.Tech	08-08-2022 to 20-08-2022
10	Webinars/Seminars/FDPs /Workshops	For Students and Faculty	Every Month
11	Commencement of First Semester of Academic Year 2022-2023	B.Tech	22-08-2022(II/I)

Signature of HoD

SRK INSTITUTE OF TECHNOLOGY
VIJAYAWADA

Enikepadu, Vijayawada 521108
Department Of Science And Humanities

SRKIT / S&H / 09

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

Academic year: 2021-22 **Semester:** 2021-22

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
17.	Dr. J. Ashok	Applied physics	CSE-A	Applied physics	CSE-A	9+3	student counselling committe	J. Ash
					IT	3	R&D Cell	J. Ash
18.	Ms. M. Vidya Elizabeth	Applied physics	IT	Applied physics	IT	7+3	class Teacher CE, ME, IT	V. Mv
19.	Ms. B. Naga Jyothirmai	Applied physics	CSE-B CE/ME	Applied physics	CSE-B	08+3	Counsellor	B. N. Jyothirmai
		Engineering phy	CE/ME	Engineering physics	CE&ME	7		B. N. Jyothirmai
20.	Dr. T. V. Nagalakshmi	Applied chemistry	CSM	Applied Chemistry Lab	CSM	8+3	class Teacher	Lakshmi
		"	~~CSD~~	Applied Chemistry Lab	CSD	3		Lakshmi
				Applied Chemistry Lab	ECE-B	3		Lakshmi

HOD/ Date

Principal / Date

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada-521108
Department of Science and Humanities
CLASS TIME TABLE

SRKIT / S & H /10.2

Academic Year: 2021-22 **Branch: CSM** **Semester: I**

TIME	9:00-9:50	9:50-10:40	10:40-11:30	5 Min	11:35-12:25	12:25-01:15	01:15-02:00	2:00 - 2:45	2:45-3:30	3:30-04:15
Hours / Day	1	2	3	BREAK	4	5	LUNCH	6	7	8
MON	AC	ENG	LIB		M-I	CP		----------AC LAB----------		
TUE	M-I	ES	SPORTS		CP			ENG	M-I	AC
WED	CP	AC			COUNSELLING	CP		ENG	M-I	YOGA
THU	AC	CP	ENG		M-I			----------CEW LAB----------		
FRI	----------ENG LAB----------				AC	CP		ES	AC	M-I
SAT	---------CP LAB----------				M-I			AC	ENG	

Theory:

Communicative English(R201102) : Ms.V.Navatha

Mathematics - I (R201101) : Ms.S.Suman

App.Chemistry (R201115) : Dr.T.V.Naga Lakshmi

Programming for Problem Solving using C (R201110): Ms.G.Keerthi

Environmental Science(R201114): Dr.N.Sridevi

Labs:

English Communication Skills (R201106): Ms.V.Navatha

App.Chemistry(R201116): Dr.T.V.Naga Lakshmi / Ms.G.L.Sarvani

Computer Engineering Wokshop(R201118):Mr.T.Ganesh Kumar

Programming for Problem Solving using C (R201113): Ms. G.Keerthi

HOD

Principal

SRK INSTITUTE OF TECHNOLOGY
Enikepadu, Vijayawada-521108
Department of Science and Humanities
FACULTY INDIVIDUAL TIME TABLE

SRKIT / S & H /10.2

Faculty Name:Dr. T.V.Naga Lakshmi **Academic Year: 2021-22** **Semester: I**

TIME	9:00-9:50	9:50-10:40	10:40-11:30	5 Min	11:35-12:25	12:25-01:15	01:15-02:00	2:00 - 2:45	2:45-3:30	3:30-04:15
Hours / Day	1	2	3	BREAK	4	5	LUNCH	6	7	8
MON	CSM							----------CSM----------		
TUE	----------ECE-B----------									CSM
WED		CSM						----------CSD----------		
THU	CSM									
FRI					CSM				CSM	
SAT								CSM		

Faculty Sign

HOD

Principal

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of SCIENCE & HUMANITIES** **TEACHING PLAN CUM REALIZATION**	**SRKIT / S&H /12**

Department: **S&H** Name of faculty: **Dr.T.V.Nagalakshmi** Designation: **ASSOCIATE PROFESSOR**

Branch: **CSM** A.Y: **2021-22** Semester / Year: **I-I** Name of the subject: **APPLIED CHEMISTRY**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	UNIT-I POLYMER TECHNOLOGY		29/11/21	1	
1	**Polymerisation** Introduction-methods of polymerization		30/11/21	1	
2	Physical and mechanical properties.		01/12/21	1	
3	**Plastics**: Compounding-fabrication		01/12/21	1	
4	Preparation, properties and applications of PVC		2/12/21	1	
5	Polycarbonates and Bakelite-mention some examples of plastic.		03/12/21	1	
6	Materials used in electronic gadgets, recycling of e-plastic waste	**29-11-21**	03/12/21	1	
7	**Elastomers**: Natural rubber-drawbacks-vulcanization		04/12/21	1	
8	Preparation, properties and applications of synthetic rubbers	**To**	06/12/21	1	
9	Buna S, Thiokol and Polyurethanes	**18-12-21**	07/12/21	1	
10	**Composite materials**: Fiber Reinforced Plastics		08/12/21	1	
11	Conducting polymers		08/12/21	1	
12	Biodegradable, Biopolymers		09/12/21	1	
13	Biomedical polymers		10/12/21	1	
			10/12/21	1	

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of SCIENCE & HUMANITIES** **TEACHING PLAN CUM REALIZATION**	**SRKIT / S&H /12**

	UNIT-II ELECTROCHEMICAL CELLS AND CORROSION	**20-12-21**	13|12|21	1	
1	Single electrode potential		14|12|21	1	
2	Electrochemical series and uses of series		15|12|21	1	
3	Standard hydrogen electrode, Calomel electrode	**To**	15|12|21	1	
4	concentration cell		16|12|21	1	
5	Construction of glass electrode	**04-01-22**	17|12|21	1	
6	**Batteries**: Dry cell, Ni-Cd cells		17|12|21	1	
7	Ni metal hydride cells, Li ion battery, Zinc air cells		18|12|21	1	
8	**Fuel cells**: H_2-O_2, CH_3OH-O_2		20|12|21	1	
9	Phosphoric acid, molten carbonate		21|12|21	1	
10	**Corrosion:**-Definition-theories of corrosion		22|12|21	1	
11	Galvanic corrosion, differential aeration corrosion, stress corrosion,		22|12|21	1	
12	Waterline corrosion-passivity of metals-Galvanic series		23|12|21	1	
13	Protective coatings: Surface preparation, Cathodic and Anodic coatings		24|12|21	1	
15	Electroplating, Electroless plating (nickel).		24|12|21	1	
16	Paints (constituents, functions, special paints)		25|12|21	1	
	UNIT III: CHEMISTRY OF MATERIALS		27|12|21	1	
1	**Non-elemental semiconducting materials**:- Stoichiometric, controlled valency		28|12|21	1	

	SRK INSTITUTE OF TECHNOLOGY Enikepadu, Vijayawada 521108 Department of SCIENCE & HUMANITIES TEACHING PLAN CUM REALIZATION	SRKIT / S&H /12

2	Chalcogen photo/semiconductors	05-01-22 To 31-01-22	31/12/21	1	
3	Preparation of semiconductors- distillation, zone refining		03/01/22	1	
4	Czochralski crystal pulling, epitaxy, diffusion, ion implantation		04/01/22	1	
5	Semiconductor devices -p-n junction diode as rectifier, junction transistor		05/01/22	1	
6	**Insulators & magnetic materials:** electrical insulators-ferro and ferri magnetism		05/01/22	1	
7	Hall effect and its applications		08/01/22	1	
8	**Nano materials:-** Introduction-sol-gel method- characterization by BET, SEM and TEM methods-		10/01/22	1	
9	Applications of graphene- and fullerenes		11/1/22	1	
10	Carbon nanotubes-Types, preparation and applications		18/1/22	1	
11	**Liquid crystals:-** Introduction-types-applications		19/1/22	1	
	UNIT IV: SPECTROSCOPIC TECHNIQUES & NON CONVENTIONAL ENERGY SOURCES		24/1/22	1	
	PART A: **SPECTROSCOPIC TECHNIQUES**	01-02-22 To 19-02-22	3/2/22	1	
1	Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy		5/2/22	1	
2	Frank-Condon principle, Chromophores and Auxochromes		7/2/22	1	
3	Intensity shifts, applications		8/2/22	1	
4	**FT-IR** -Instrumentation and IR of some organic compounds		14/2/22	1	
5	**FT-IR** -Applications		16/2/22	1	

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of SCIENCE & HUMANITIES** **TEACHING PLAN CUM REALIZATION**	**SRKIT / S&H /12**

6	Magnetic Resonance Imaging and CT scan (procedure & applications)		17/2/22	1	
	Part B: NON CONVENTIONAL ENERGY SOURCES		18/2/22	1	
7	Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell		18/2/22	1	
8	Hydropower, geothermal power		23/2/22	1	
9	Tidal and wave power		25/2/22	1	
10	Ocean thermal energy conversion		28/2/22	1	
	UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY		4/3/22	1	
1	**Computational chemistry**: Introduction, Molecular modeling and Docking studies	**21-02-22**	5/3/22	1	
2	**Molecular switches:** characteristics of molecular motors and machines	**To**	7/3/22	1	
3	Rotaxanes and Catenanes as artificial molecular machines		8/3/22	1	
4	Prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle	**12-03-22**	12/3/22	1	
5	A molecular elevator, an autonomous light-powered molecular motor				

27/11/21
Faculty/ Date

HOD/Date 28/11/21

UNIT I: POLYMER TECHNOLOGY

[***Polymerisation:-*** Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties. ***Plastics:*** Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.
Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).
Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers- biopolymers-biomedical polymers.]

Introduction:

Polymer: Polymers are large molecules made up of many smaller molecules. 'Poly' means many and 'mer' means units.
Monomers: Small molecules of low molecular weight, which combine to give a polymer, are called monomers.
(mono = one, mer = unit) monomers are joined together through polymerisation to form polymers. A polymer contains hundreds of thousands of monomers.
Homo polymer: a polymer, in which a single type of monomer is used, is called homo polymer.
Examples : Polythene, polystyrene, Polyvinylchloride etc.
Copolymer: A polymer in which the monomers are more than one type is called copolymer (heteropolymer).
Examples : Buna-S is a copolymer of 1,3- butadiene and styrene.
Bakelite is a copolymer of phenol and formaldehyde.
Degree of polymerization:
The number of repeating units (or) monomer units available in the polymer is known as degree of polymerization. Polymers with a high degree of polymersation are called High polymers.
Polymers with low degree of polymerization are called Oligo polymers
Functionality:
The number of bonding sites (or) reactive sites (or) functional groups present in the monomer is called functionality.
When the functionality of monomer is two; it is bifunctional and Linear straight chain polymer is formed.
Examples for bifunctional monomers: a) ethylene b) styrene c) vinyl chloride d) vinyl cyanide.
When the functionality of monomer is three; it is tri-functional and three- dimensional net work polymer is formed.
Ex: phenol, glycerol.
when a trifunctional monomer is mixed in small amounts with a bifunctional monomer, a branched chain polymer is formed.
Classification of polymers: Based on their sources they are classified into;
1)Natural polymers: The polymers, which are obtained from natural sources such as plants and animals, are called natural polymers. Eg: Wood, starch, cellulose, Jute, Cotton, Wool, Silk, Proteins, Natural rubber etc.
2)Synthetic polymers: These are synthesized with the help of chemicals in industries
E.g.: polythene, nylon-6, 6, synthetic rubber etc.
3)Semi synthetic polymers: These are the synthetic derivatives of the natural polymers.
E.g.: Cellulose acetate (Rayon) and cellulose nitrate.
Classification based on structure:
a) Linear Polymers: These polymers consist of long and straight chains.
b) Branched chain polymers: These polymers contain linear chains having some branches.
c) Cross linked polymers (or) 3- dimensional network polymers:
Classification Based on Composition of Polymers: [1] Homopolymer [2] Copolymer
Classification Based on Backbone of the polymer chain: [1] Organic polymer [2] Inorganic Polymers.
A polymer whose backbone chain is essentially made of carbon atoms is termed as organic polymer.
If chain backbone contains no carbon atom is called inorganic polymer. Glass and silicone rubber are examples.
Polymerisation: The process of formation of polymers from respective monomers is termed as Polymerization.

Application: This method is used for the production of PVC, Poly vinyl acetate etc.

❖ Explain the Physical properties of Polymers?

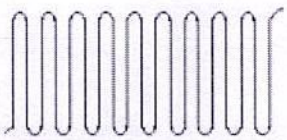
Physical properties of Polymers:

1.Crystallinity:

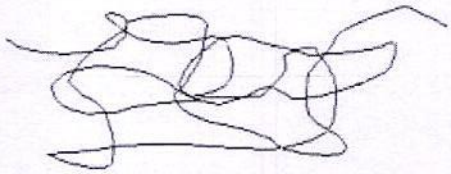
a. The orderly arrangement of polymeric molecule is known as crystallinity.
b. The properties like solubility, diffusion, toughness, density and transparency depend on degree of crystallinity.
c. In crystalline polymer, the polymeric molecules are packed close to each other through intermolecular forces of attraction.
d. Thus, these polymers have higher and sharper melting point, greater rigidity, greater density and strength.
e. A completely crystalline polymer tends to acquire brittleness.

2.Amorphous state:

a. Random arrangement of polymer molecules results amorphous state.
b. The intermolecular forces between polymer chains are weak.
c. So, amorphous polymers can be moulded to desired shape.
d. Both thermosetting and thermoplastics are amorphous.



Crystalline



Amorphous

❖ Explain the Mechanical properties of Polymers?

Mechanical properties of Polymers:

- **1.Strength:**
  - ✓ Strength of the polymer depends upon the intermolecular attractive forces.
  - ✓ Greater is the attractive forces; higher is the strength of the polymer.
  - ✓ Strength of the polymer increases with increasing molecular weight of the polymer or increasing polar groups such as –OH, -COOH, -OCH_3, -COOR & -X.
  - ✓ So, the lower molecular weight polymers have less strength, soft and gummy.
  - ✓ In cross linked polymers, the polymer chains are strongly linked to each other by covalent bonds which cause higher strength, toughness, brittleness etc.
  - ✓ Strength of the polymer depends on the shape of the molecule also.
  - ✓ If the shape of the molecule is simple and uniform, polymer molecule has less strength.
  - ✓ Ex: In PVC, large Cl atoms are present on alternative carbon atoms in the polymer.
  - ✓ These Cl atoms and strong attractive forces restrict the movement of molecules in the polymer.
  - ✓ So, PVC is tougher and stronger polymer.
  - ✓ In poly ethylene attractive forces are weak due to simple structure. Thus, PE is weaker than PVC.
- **2.Elastic character:**
  - ✓ Rubber is an elastomer, when applied stress is removed; the polymer gets original shape in case of elastomers.
  - ✓ In an elastomer, polymer chains are randomly arranged, coiled chains with slight cross links.
  - ✓ When the polymer is stretched, the cross links begin to disentangle and straight out.
  - ✓ As a result, chains are regularly arranged which cause hardness, stiffness and crystallinity due to increase of the attractive forces between the chains.
- **3.Plastic deformation:**
  - ✓ This is found in thermoplastics.

Differences between Thermo Plastics &Thermo Setting plastics :

S.no	THERMOPLASTIC RESINS	THERMOSET RESINS
1.	These resins become soft on heating and rigid on cooling.	During fabrication process these resins are moulded. Once moulded or shapened, they can not be softened.
2.	Thermoplastic resins are formed by chain polymerisation.	Thermoset resins are formed by step polymerisation.
3.	They can be reshaped.	They cannot be reshaped
4.	These plastics can be reclaimed from waste.	They cannot be reclaimed from waste.
5.	Thermoplastic resins are soft, weak and less brittle.	Thermoset resins are hard, strong and more brittle.
6.	These resins are usually soluble in organic solvents. Eg: Polyethylene, polyvinyl chloride etc.	Due to strong bonds and cross links, they are insoluble in almost all organic solvents. Eg: Bakelite, Nylon etc.

Explain the compounding of plastics with suitable examples?

Definition: "The process of mechanical mixing of various additives with polymers to impart some special properties to the end product is known as compounding of plastics". The additives get incorporated into the polymer to give a homogeneous mixture.

The principal additives used in compounding are; 1) Binders or Resins 2)Plasticizers 3)Fillers 4)Lubricants 5)Activators or accelerators 6)Stabilisers 7)Colourants

1) Binders or Resins:

Resin is the binder which holds the other constituents of the plastics together and it is the major constituent.

The binders used may be natural or synthetic resins with very high molecular mass. They undergo condensation and polymerization during moulding of plastics. The resin gives the desired properties like plasticity and electrical insulating properties to the plastic.

2) Plasticizers:

These are materials which are added to resins to increase their plasticity and flexibility.

commonly used plasticizers are tributyl phosphate, triphenyl phosphate, diiso-octyl phthalate, dibutyl phthalate etc.

3) Fillers:

Fillers are inert materials add to plastic to increase the bulk and there by to reduce the cost of production.

and also to impart certain specific properties to the finished product.

Commonly used fillers are mica, silica, graphite, carbon-black (C-black), chalk, china clay, clay, wood flavour etc.

4) Lubricants:

Lubricants such as oils, waxes, stearates, soaps etc help in easy moulding and give better glossy finish.

Prevent moulded article from sticking to the fabrication equipment.

5) Catalyst or Accelerators:

These are used in the case of thermosettings plastics to accelerate the condensation polymerization to form the linked products.

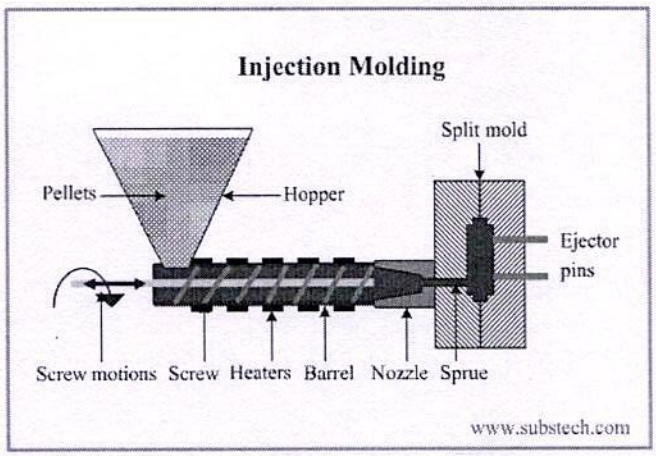
Examples, benzoyl peroxide, H_2O_2, metals like Ag, Cu, Pb etc

6) Stabilizers:

- ★ Many plastics undergo thermal (or) photo chemical degradation during their processing (or) when they are put into use.
- ★ Stabilizers protect the plastic from such degradation.
- ★ Natural rubber, PE, esters undergo such degradation.
- ★ Examples : PbO, lead silicate, , lead chromate, stearates of Pb & Ba etc

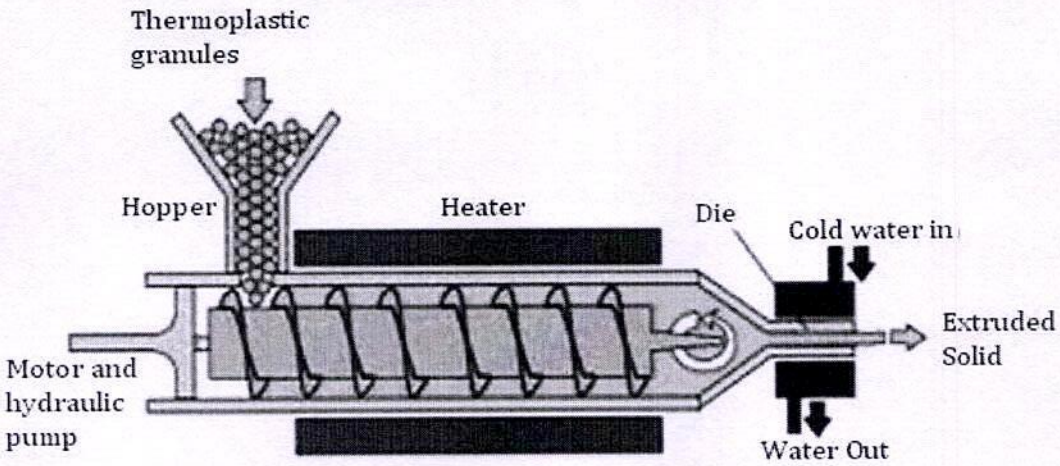
These are substances added to plastic to improve the thermal stability during moulding.

- The softened plastic mass in the cylinder is injected at a controlled rate by a screw (or) piston under high pressure into a cold mould.
- Curing of the softened plastic into rigid product occurs during cooling in the mould.
- The mould is opened after sufficient curing to remove the finished product.
- Thermosetting polymer can't be moulded by this method.



3) Extrusion moulding:

- Extrusion moulding method is used for thermoplastic resins
- This method is used to produce continuous sheets, rods, threads, tubes, cords and cables.
- It is similar to injection moulding.
- Dry plastic material is placed into heated injection chamber.
- At the end of the chamber, the material is forced out of a small ring opening (or) a die in the shape of the desired finished product.
- Extruded out plastic is placed on a moving conveyor belt for uniform cooling.



4) Blow moulding: This process involves blowing hot air into the cavity can be done in to ways such as Extrusion blow film and injection blow moulding

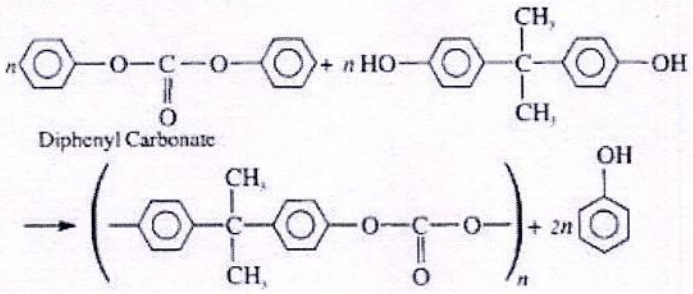
a)

a) Extrusion Blow Film Moulding: Plastic melt is extruded through an annular slit die, vertically to form thin walled tube. Air is introduced in the centre of the die to blow up the tube like a balloon. Air ring blows onto the hot film to cool it (outside and inside the tube). The tube passes through nip rolls where is flattened. Collapsed tube is taken back down the extrusion tower via idler rollers. On winder the tube or film is wound into rolls.

3. It is used for making pipes, hoses, etc.
4. It is used for making helmets, refrigerator components, etc.
5. It is used in making cycle and automobile parts.

ii) Polycarbonates:

Preparation:



Properties:

1. High melting points
2. Tensile strength and impact resistance.
3. It has excellent mechanical properties.
4. It is soluble in acids and alkali.

Uses: The polymer is used in the manufacture of safety goggles, telephone parts, automobile taillight lenses and unbreakable glazing appliances.

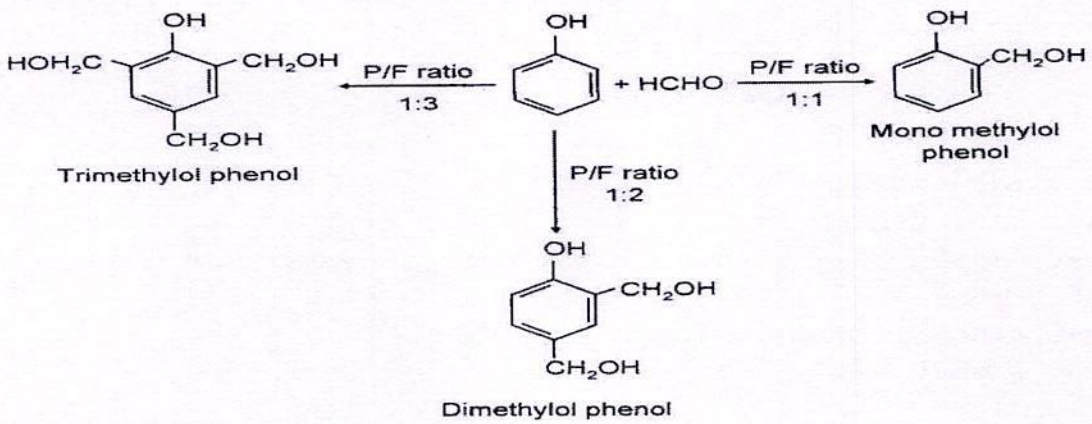
3.Phenol formaldehyde resins or Bakelite :

Bakelite is a condensation polymer of phenol and formaldehyde

Preparation :

I) stage:

Phenol is made to react with formaldehyde in presence of acid / alkali to produce non - polymeric mono, di, and tri methylol phenols depending on the phenol formaldehyde ratio (P/F ratio)



II) Stage:

The mono, di, and tri methylol phenols are heated to produce two types of straight chain resins by condensation of the methylol group with hydrogen atom of benzene ring or another methylol group.

6. In paints and varnishes.
7. For making bearings used in propeller shafts, paper industry and rolling mills.

Some examples of plastic materials used in electronic gadgets:

S.No.	Plastic materials	Uses in electronic gadgets
1	Phenol formaldehyde	Fuse boxes, knobs, switches, handles.
2	Polyamide	food processor bearings, adaptors.
3	Polycarbonate	Telephones.
4	Polyethylene	Cable & wire insulation.
5	Polypropylene	Kettles
6	Polystyrene	Refrigerator trays/linings, TV cabinets
7	Polysulphone	Microwave grills
8	Polytetrafluoroethene	Electrical applications.
9	Polyvinyl chloride	Cable and wire insulation, cable trunking.
10	Urea formaldehyde	Fuse boxes, knobs, switches
11	Polymethyl pentane	Circuit boards, microwave grills
12	Acrylonitrile butadiene styrene	Telephone handsets, keyboards, monitors, computer housings

Write a note on recycling of e-plastic waste.

e-plastic waste (electronic plastic waste) includes discarded electrical or electronic divices. Some examples of e plastic waste are ABS (acrylonitrile butadiene styrene), polycarbonate or PVC (polyvinyl chloride), phenol formaldehyde, polyamides etc.E-plastics are an environmental hazard, and have negative effects on human heath.

Recycling e-plastics is challenging. This is because most plastics are not truly recycled. Some plastics can be melted down and used to manufacture new items, but most kinds of plastics are not recycled in this way. Instead, many plastic recycling facilities prepare the plastic to be repurposed, or "down-cycled." For example, a plastic milk bottle cannot be used to manufacture a new plastic milk bottle. Instead, that milk bottle can be processed and "down-cycled" in the manufacturing of plastic lumber. E-plastics are so challenging to recycle because the brominated flame retardants prevent these plastics from being down-cycled. The e-plastics that contain those banned compounds cannot be reused; they must be disposed.

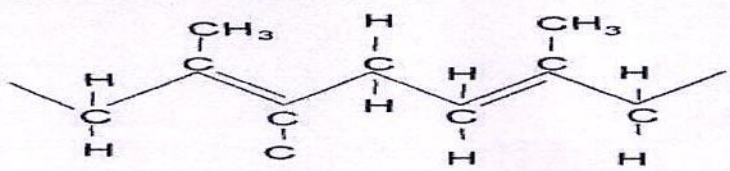
When recycling e-plastics, it is especially crucial to use a certified recycler. To maintain certification, a certified recycler must make sure that, when possible, e-plastics are processed and reintegrated back into the manufacturing process. All un-usable e-plastics, like those with banned brominated flame retardants, must disposed in carefully controlled conditions in a properly equipped facility.

Because e-plastics are so difficult to recycle, a better environmental strategy for this material is to reuse electronics. Reuse slows the production of scrap e-plastics, and mitigates the need for more plastics to be manufactured. If reusing your corporate electronics is not possible within your own company, reselling or donating the equipment allows it to be reused by others.

ELASTOMERS:

Definition: Elastomers are high polymers that undergo very long elongation (500 – 1000%) under stress, yet regain original size fully on released of stress. Those rubbers are therefore referred to as elastomers.

The property of elastomers is known as elasticity. This arises due to the coiled structure of elastomers.



Natural rubber:

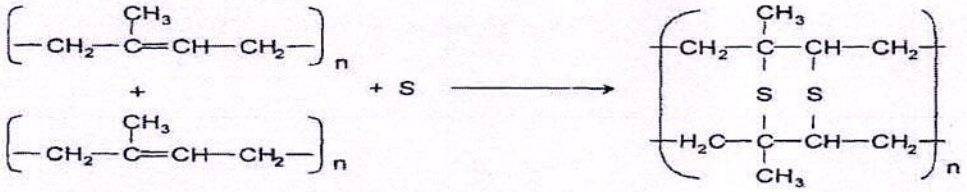
Compounding and vulcanisation of rubber:

In order give more strength and more elasticity, natural rubber is heated with sulphur (or) sulphur compounds at 150°C temperature for a few hours. The sulphur combines chemically at double bonds of different rubber springs and a crosslinked network is formed. This process is known as vulcanisation of rubber. The vulcanisation process is invented by charles Goodyear in 1839.

The following are materials added to natural rubber during Compounding and vulcanisation.

1. Vulcanisers:

Some chemicals like elemental sulphur, hydrogen sulphide, sulphur dichloride, benzoyl chloride and zinc oxide are added to both natural and synthetic rubbers. The most important vulcaniser is *sulphur* which combines chemically at the *double bonds* of the different chains producing *sulphur cross linkings,* imparting *strength* increases, the brittleness also increases.
2 to 4% Sulphur addition gives soft elastic rubber.
When sulphur content is more than 30%, we get hard rubber called 'Ebonite' (or) vulcanite.



2.Plasticizers :

Plasticizers are also called as softners, which impart greater *plasticity* and *adhesion* to the rubber. The most commonly used plasticizers are vegetable oils, waxes etc.

3.Accelerators:

They are added to speed up the vulcanization reaction of rubber.
They catalyse the vulcanisation process by reducing the time required for vulcanisation.
Examples: Magnesia and white lead.

4.Anti oxidants:

They reduce the deterioration of rubber by light and air.
Examples: phenylnaphthylamine, Phenolic substances and Phosphites.

5.Reinforcing agents :

They give strength, regidity, and toughness to the rubber and may form as much as 35% of rubber compound.
Examples: ZnO, $MgCO_3$, $BaSO_4$, and $CaCO_3$

6.Colouring agents :

They are added to give different colour to rubber.
Examples: TiO_2 - white, Ferric oxide - red , Lead chromate - Yellow, Chromium trioxide - green , Caron black - black, Ultra marine – blue .

7. Fillers:

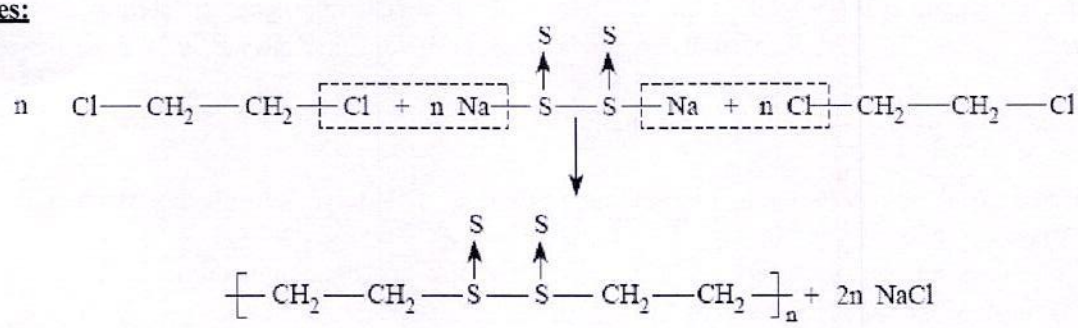
Fillers are added to i) reduce the cost, ii) increase the bulk and iii) introduce new characters.
Example: Textile wastes, Asbestos, Mica, Gypsum, Talc, etc.

Advantages of Vulcanisation:

1) Vulcanised rubber has good tensile strength and load bearing capacity.
2) Vulcanised rubber has good elasticity depending on the extent of vulcansiation.
3) It possess low water absorption tendency.
4) Vulcanised rubber has higher resistance to oxidation and atmospheric gases like O_2, CO_2, moisture, light and U.V.radiation.
5) Vulcanised rubber is a good electrical insulator and ebonite is a best electrical insulator.

Preparation :

Properties:



Thiokol (yellow solid)

Thiokol rubber possess strength and impermeability to gases.

This rubber cannot be vulcanized and it cannot form hard rubber.

Possess good resistance to mineral oils,fuels,oxygen,solvents,ozone and sunlight.

It is also resistant to the action of petrol lubricants and organic solvents

Applications:

Fabrics coated with thiokol are used for barrage balloons,life rafts and jackets.

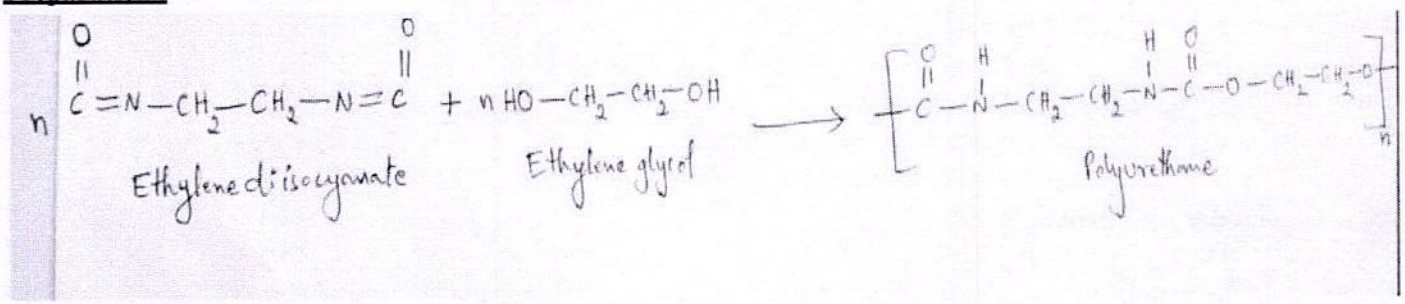
Thiokols are used for lining for canveying gasolin and oil.

Used for making gaskets and seals for printing rolls.

Thiokol mixed with oxidizing agents in used as a fuel in rocket engine.

Polyurethanes:

Preparation :



Polyurethanes are formed by the reaction between diisocyanate and diol

egs: Perlon-U is obtained by the reaction of 1,4-butane diol with 1,6-hexa methylene diisocyanate.

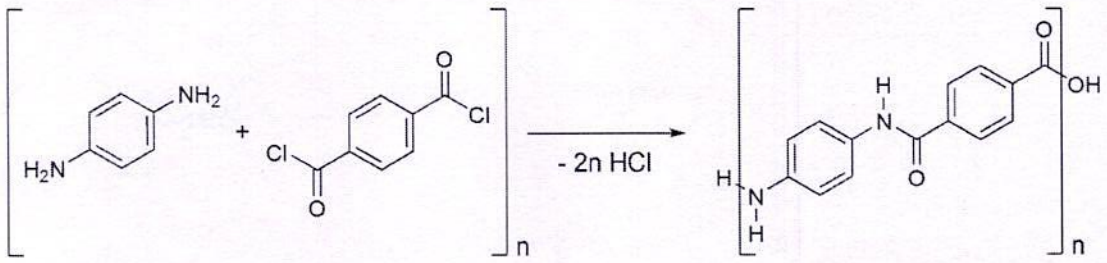
Properties:

1.polyurethanes are less stable than polyamides (nylons) at elevated temperature (because of the presence of additional oxygen in the chain which increases its flexibility,the M.P of polyurethanes is much less than that of the corresponding polyamides.)

2.They are characterized by excellent resistance to abrasion and solvents.

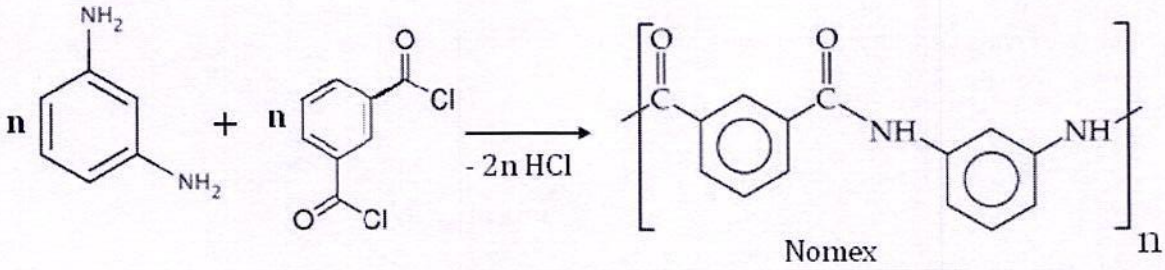
Applications:

1. It is used for floor coating for gymnasium and dance floors where high abrasion resistance is required.
2. Used as surface coatings, films, foams and adhesives.
3. They are used for cushions because of improved strength, lower density and easier fabrication.
4. It is used in lightweight garments and swim suits because of its stretching property.
5. They are used to cast to produce gaskets and seals.



Nomex:

➔ This is produced by condensation reaction from the monomers phenylene diamine & isophthaloyl chloride.



Nomex

Properties:

- ❖ It has higher tensile strength and modulus than fibreglass.
- ❖ It has high chemical inertness.
- ❖ It has very low coefficient of thermal expansion.
- ❖ It has flame resistance and high impact resistance.
- ❖ It has low weight.

Uses:

- ❖ Kevlar fibers are used for structures requiring good stiffness, high abrasion resistance and lightweight.
- ❖ It is used as inner lining for tires to prevent punctures (puncture resistant bicycle tyres).
- ❖ It is used in table tennis, tennis, badminton and squash racquets, cricket bats, hockey sticks.
- ❖ It is used in personal armor such as helmets, ballistic face masks, bullet proof vests etc.
- ❖ It is often used in the field of cryogenics for its low thermal conductivity and high strength.

It is used in boat hulls, helicopter blades etc.

CONDUCTING POLYMERS:

A polymer which conducts electricity is called conducting polymer.

Eg :- Polyaniline, polyacetylene, polypyrrole, etc

They are classified into two types : 1) Intrinsically conducting polymers.
2) Extrinsically conducting polymers

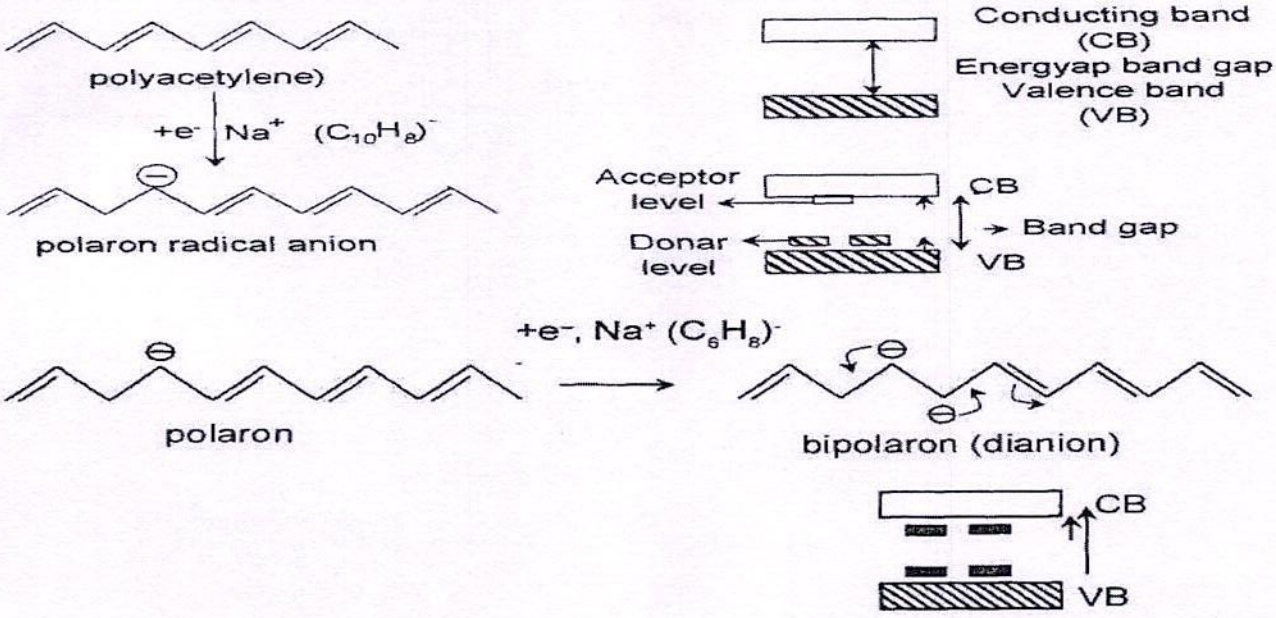
1. Intrinsically conducting polymers:

These have extensive conjugation in the backbone which is responsible for conductance. These polymers can be divided into two :

a) Conducting polymers having conjugated π – electrons in the backbone:

eg :- polyacetylene, polyaniline etc.

These type of polymers have backbones of continuous sp2 hybridized carbon centers. One valence electron on each center resides in a Pz orbital. Overlapping of conjugated π – electrons over the entire backbone results in the formation of valence bonds as well as conduction bands, which extends over the entire polymer molecule. But since the valence band and the conduction band are separated by a significant band gap, conductivity of these polymers is not very high.



2.Extrinsically conducting polymers:

Some of the polymers conduct electricity due to externally added ingradients to them. They are of two types.

a) Polymers with conductive elements filled Polymers. b) Blended conducting polymers.

a).Polymers with conductive elements filled:

In these polymers, the polymer acts as a 'binder' and holds the conducting element added so that the polymer becomes a conductor. Examples of conductive elements are carbon black, metallic fibers, metallic oxides etc.

Minimum concentration of conductive element to be added so that the polymer becomes a conductor is called percolation threshold. The conductive elements added to create a conducting path in the polymer.

b).Blended conducting polymers:

These polymers are obtained by blending a conventional polymer with a conducting polymer.

The polymer thus obtained has good chemical, physical, electrical properties and mechanical strength.

Ex; 40% pyrrole when blended with a conventional polymer, the combination gives conducting polymer with good impact strength.

Applications of conducting polymers in biomedical devices:

- ★ Conducting polymers are used in preparation of artificial devices like Heart valves, kidneys, and lungs.
- ★ Poly methyl methacrylate is used as bone cement used for some fracture repairs.
- ★ Poly methyl methacrylate is also used for artificial teeth.
- ★ Used in preparation other medical devices include sutures, pins, screws used during surgery on bones, ankles, hands etc.
- ★ They are used to prepare contact lenses which permit O_2 to the eyes. These lenses are called rigid gas permeable lenses (RGP).

Applications of conducting polymers in electronics:

- They are used in rechargeable batteries.
- They are used in analytical sensors of p^H, O_2, NO_2, SO_2, NH_3 etc.
- Used in photo voltaic cells. Ex; Al/polymer/Au.
- Used in telecommunication systems.
- Used in transistors and diodes.
- Used in solar cells.
- Used as wiring in air crafts and aerospace parts.

- ♣ Capable of controlled rates of degradation.

✈ Applications:

- ♠ It is used in drug delivery systems.
- ♠ It is used to coat a stent and release drugs in a controlled way.
- ♠ It is used in dental devices and orthopedic fixation devices.
- ♠ Ex: Poly lactic acid, Poly glycolic acid, Poly hydroxyl butyrovelarate (PHBV).

Write a short notes on Biopolymers.

Biopolymers are naturally occuring long chain molecules which are involved in biological changes important for our lives. These polymers are present in living matter.

Biopolymers are classified into four types. They are

a. Carbohydrates
b. Proteins
c. Lipids
d. Nucleic acids.

Carbohydrates:

Carbohydrates are a group of compounds represented by the general formula, $C_x(H_2O)_y$

Carbohydrates are classified into following classes depending upon whether these undergo hydrolysis and if so on the number of products form: Monosaccharides, Disaccharides, Trisaccharides, Oligosaccharides, Polysaccharides.

1) **Monosaccharides** (also known as simple sugars) are the simplest carbohydrates containing 3-7 carbon atoms. A sugar containing: – an aldehyde is known as an aldose – a ketone is known as a ketose.
2) **Disaccharides** :When two monosaccharides are combined together with elimination of a water molecule it is called disaccharide. Monosaccharides are combined by glycosidic bond.
3) **Oligosaccharide**s contain 2-10 monosaccharides bonded together (building block = residue) Example: Sucrose
4) **Polysaccharides**: Polysaccharides are polymerized products of many monosaccharide units.

Proteins:

Proteins are complex nitrogeneous organic compounds of high molecular masses, synthesized by plants and animals, which on hydrolysis yield amino acids. Proteins are essential for the growth and maintenance of life.

Role of proteins:

1) They serve as fuel to yield energy.
2) They help in maintenance of fluid-balance.
3) They are responsible for functional characteristics.
4) They help in the formation of haemoglobin,chromosomes, etc.

Lipids:

Lipids are a heterogeneous group of organic compounds, whih are essential constituents of all plants and animal cells. They may be defined as the group of naturally occurring substances of the higher fatty acids.

Types of lipids: Fats and oils, waxes, phospholipids, Glycolipids, Steroids.

Role of lipids:

1) They act as structural components of cell membranes.
2) They act as transport forms of various metabolic fuels.
3) They fecilitate the absorption of the fat soluble vitamins.(such as vitamin A,D,E and K).
4) Their presence in tissues of animals serve as good heat insulators and shock-absorbers.

Nucleic acids:

A nucleic acid is a polymer in which the monomer units are nucleotides. There are two Types of Nucleic Acids:

1) **DNA: Deoxyribonucleic Acid**: Found within cell nucleus for storing and transfering of genetic information that are passed from one cell to other during cell division

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION

[*Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H2-O2, CH3OH-O2, phosphoric acid, molten carbonate.*

Corrosion:-*Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)- Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless-plating (nickel). Paints (constituents, functions, special paints).*]

Introduction:

Electrochemistry deals with the study of electrochemical processes and their applications which involve:

i) the conversion of electrical energy into chemical energy and

ii) the conversion of chemical energy into electrical energy.

Substances which allow electric current to pass through them are known as conductors or electrical conductors. On the other hand, substances which do not allow electricity to pass through them are known as non-conductors or insulators.

Electrode Potential: When a metal or non metal is dipped in the solution of it's own ions, there exist a potential difference at the metal/metal ion interface. This potential difference is called as electrode potential.

(or) The tendency of an electrode to lose or gain electrons when it is in contact with its own ions in solution is called electrode potential.

Electrode potentials are of two types

- Oxidation potential: It shows the tendency of metal to lose electrons.
- Reduction potential: It shows the tendency of metal to gain electrons.

For a metal both of these potentials have same numerical value with opposite signs.

If the oxidation potential of a metal is +x volts, then its reduction potential will be –x volts.

Standard Electrode Potential: Electrode Potential determined at 25^0 C by taking 1 molar solution is called as Standard Electrode Potential. It is indicated with E^0.

Single Electrode Potential:

The Potential of half cell is known as Single electrode potential.

$$Zn \;/\; Zn^{+2} \quad \| \quad Cu^{+2} \;/\; Cu$$

$$\leftarrow \text{Half cell} \rightarrow \qquad \leftarrow \text{half cell} \rightarrow$$

$$\leftarrow \text{single electrode} \rightarrow \qquad \leftarrow \text{single electrode} \rightarrow$$

$$\text{(anode)} \qquad\qquad \text{(cathode)}$$

The total cell emf is equal to the sum of the single electrode potentials.

$E(cell) = E(anode) + E(cathode)$

or $E(cell) = E(oxidation) + E(reduction)$ or $E(cell) = E(right) - E(left)$

Where; E(cell) = e.m.f of cell

E(right) = reduction potential of right hand side electrode.

E(left) = reduction potential of left hand side electrode.

Nernst equation: (Expression for electrode potential):

For a reversible reaction, free energy change and equilibrium constant are related as

$$\Delta G = \Delta G^o + RT \times \ln \frac{[\text{Pr}\,oducts]}{[\text{Re}\,ac\,\text{tan}\,ts]}$$ Van't Hoff's equation

Ex: Zinc (-0.76V) displaces Cu^{2+} ions from $CuSO_4$ solution.

$$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$$

-0.76V +0.34V

3) Predicting spontaneity of the reactions:

Spontaneity of the reaction can be predicted from EMF values.

A reaction with +ve EMF is spontaneous.

A reaction with –ve EMF is non spontaneous.

4) Calculations of equilibrium constant:

The standard electrode potential is

$$E^o = \frac{RT}{nF} \ln K_{eq}$$

$$E^o = \frac{2.303RT}{nF} \log K_{eq}$$

$$\log K_{eq} = \frac{nFE^o}{2.303RT}$$

$$\log K_{eq} = \frac{nE^o}{0.059}$$

By measuring standard electrode potential for a cell reaction, its equilibrium can be calculated.

S.No:	Element name	Element	Electrode Reaction	Standard electrode potential (E^o) volts
1	Lithium	Li	$Li^+ + e^- \rightarrow Li$	- 3.05
2	Potassium	K	$K^+ + e^- \rightarrow K$	- 2.925
3	Sodium	Na	$Na^+ + e^- \rightarrow Na$	- 2.714
4	Magnesium	Mg	$Mg^{+2} + 2e^- \rightarrow Mg$	- 2.370
5	Aluminium	Al	$Al^{+3} + 3e^- \rightarrow Al$	- 1.66
6	Zinc	Zn	$Zn^{+2} + 2e^- \rightarrow Zn$	- 0.76
7	Iron	Fe	$Fe^{+2} + 2e^- \rightarrow Fe$	- 0.44
8	Tin	Sn	$Sn^{+2} + 2e^- \rightarrow Sn$	- 0.14
9	Lead	Pb	$Pb^{+2} + 2e^- \rightarrow Pb$	- 0.12
10	Hydrogen	H	$2H^+ + 2e^- \rightarrow H_2$	0.00
11	Copper	Cu	$Cu^{+2} + 2e^- \rightarrow Cu$	+ 0.34
12	Mercury	Hg	$Hg^{+2} + 2e^- \rightarrow Hg$	+ 0.88
13	Silver	Ag	$Ag^+ + e^- \rightarrow Ag$	+ 0.79
14	Platinum	Pt	$Pt^{+2} + 2e^- \rightarrow Pt$	+ 1.2
15	Gold	Au	$Au^{+3} + 3e^- \rightarrow Au$	+ 1.5

Limitations:

- Hydrogen electrode can't be used in the solutions containing compounds of Hg, As, S and oxidizing agents like Fe^{3+}, $Cr_2O_7^{2-}$, and $MnO4^-$.
- If can't be used in the presence of ions of many metals.
- It is difficult to set up a hydrogen electrode. It cannot be used in solutions containing redox systems.

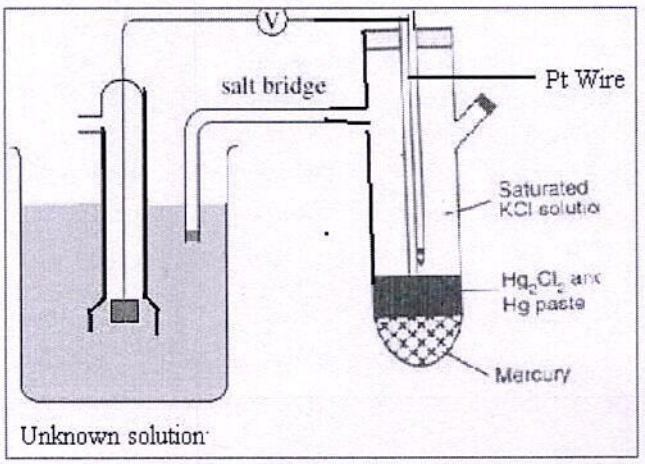
Explain the construction and working of Calomel electrode (Secondary reference electrode):

- Sometimes calomel electrode is used as reference electrode instead of NHE or SHE.
- The potential of saturated calomel electrode is 0.2422V.

Construction:

- A glass tube is filled with a layer of mercury at the bottom.
- It is covered with a paste of Hg + Hg_2Cl_2 and saturated KCl solution.
- A platinum wire is placed in the mercury layer for making electrical contact.

By combining calomel electrode with H_2 electrode, P^H of unknown solution can be determined.



$$E_{cell} = E_{right} - E_{left}$$

$$E_{cell} = 0.2422 - \left(-0.059P^H\right)$$

$$E_{cell} = 0.2422 + 0.059P^H$$

What are concentration cell? Explain the working of a concentration cell by taking suitable example.

Concentration cell: The cell which produces electrical energy by transfer of a substance from the solution of higher concentration to the solution of lower concentration is called concentration cell. The difference in concentration may be brought about by the difference in concentration of the electrodes or electrolytes.

Concentration cells mainly divided in to two types, they are

1. Electrode concentration cells.
2. Electrolyte concentration cells.

1). Electrode concentration cells:

In these cells, two like electrodes at different concentrations are dipping in the same solution.

For example, two hydrogen electrodes at different gas pressures P_1 and P_2 immersed in the same solution of hydrogen ions constitute a cell of this type.

Pt | H2 (pressure P1) | Solution of H^+ ions | H2 (pressure P2) | Pt

The reactions occurring are;

Oxidation reaction : H_2 (P1) $\rightarrow$ $2H^+ + 2e^-$

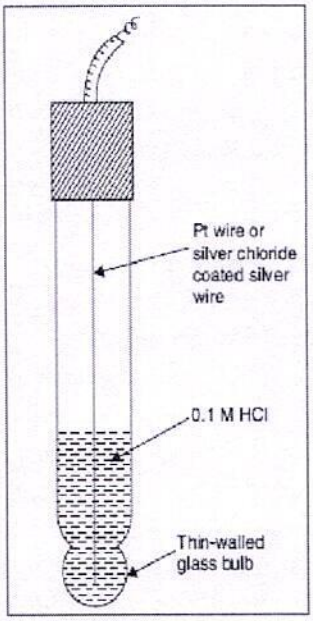
Reduction reaction : $2H^+ + 2e^-$ $\rightarrow$ H_2 (P2)

Overall reaction : H_2 (P1) $\rightarrow$ H_2 (P2) It is clear that in this process there is no overall chemical change and there is only transfer of H_2 gas from the electrode with pressure P_1 to the electrode with pressure P_2. The emf is independent of the concentration of the electrolyte.

➢ **Principle:**

- When two solutions of different P^H values are separated by a thin glass membrane, there develops a difference of potential between the two surfaces of the membrane.
- The potential difference developed is proportional to the difference in P^H value.
- The glass membrane functions as ion exchange resin and set up an equilibrium between Na^+ ions of glass and H^+ ions of solution.
- Potential of glass electrode is given by the expression

$$E_G = E_G^o + 0.059VP^H \quad \text{at } 25^oC$$



➢ **Construction:**

- It consists of a thin walled glass bulb containing AgCl coated Ag electrode in 0.1M HCl.
- It is shown as $Ag / AgCl_{(s)}; HCl(0.1M) / Glass$
- HCl in the bulb furnishes a constant H^+ ion concentration.
- Thus, it is a silver-silver chloride electrode, reversible w.r.t to chloride ions.

➢ In order to determine the P^H of a solution, the glass electrode is placed in the solution and this half cell is coupled with saturated calomel electrode, the EMF of the cell is measured.

The EMF of cell is given by

$$E_{cell} = E_{right} - E_{left}$$

$$E_{cell} = 0.2422V - \left[E_G^o + 0.059VP^H\right]$$

Then,
$$P^H = \frac{0.2422V - E_{cell} - E_G^o}{0.059V}$$

Here E_G^o value of glass electrode is determined by using a solution of known P^H.

Limitations:

- P^H beyond 12 cannot be measured because cations of solution affect the glass membrane.
- Since the resistance of glass membrane is 10 to 100 million ohms, a special potentiometer is used to measure P^H.

➢ **Advantages:**

- It can be used easily.
- Results are accurate.
- It is not easily poisoned.
- Equilibrium is rapidly achieved.

$$Zn_{(s)} \rightarrow Zn^{2+} + 2e^{-} \quad \text{(Oxidation)}$$

At cathode, reduction of MnO_2 takes place

$$2MnO_2 + 2NH_4Cl + Zn^{2+} + 2e^{-} \rightarrow [Zn(NH_3)_2]Cl_{2(s)} + Mn_2O_{3(s)} + H_2O$$

Net reaction is

$$Zn_{(s)} + 2MnO_{2(s)} + 2NH_4Cl_{(aq)} \rightarrow [Zn(NH_3)_2]Cl_{2(s)} + Mn_2O_{3(s)} + H_2O$$

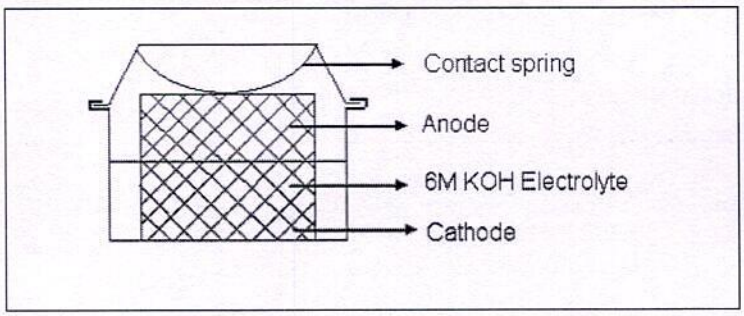
The dry cell is a primary cell, since various reactions involved cannot be reversed by passing electricity into the cell. The voltage of the cell is 1.5V.

Disadvantages: When current is drawn immediately from it, products formed at electrodes thereby causing drop in voltage. Since the electrolytic medium is acidic, Zinc dissolves slowly thereby the cell rundown slowly even it is not in use.

Uses: Dry cell finds applications in flash lights, transistor radios and calculators.

Explain the construction and working of Nickel Cadmium Cell (Or) Nicad Battery ?

This is a rechargeable battery.



Nickel Cadmium Cell (Ni – Cd) cell :	
Anode :	Cadmium (Cd)
Cathode :	Nickel dioxide (NiO_2)
Electrolyte :	Potassium hydroxide (KOH)

Description:

1) Nickel-cadmium cell consists of a cadmium anode and a metal grid containing a paste of NiO_2 acting as a cathode.
2) The electrolyte in this cell is KOH.
3) It is represented as: $Cd/Cd(OH)_2//KOH_{(aq)}/NiO_2/Ni$

Working :

- When the NiCad battery operates, at the anode cadmium is oxidized to Cd^{2+} ions and insoluble $Cd(OH)_2$ is formed.
- It produces about 1.4V.

Cell reactions:

At anode: Cadmium is oxidized to Cd+ and further it combines with OH- ions to form $Cd(OH)_2$.

$$Cd_{(s)} + 2OH^{-} \rightarrow Cd(OH)_{2(s)} + 2e^{-}$$

At cathode: NiO2 gains electrons, ie, Ni undergoes reduction at the cathode from +4 to +2. The Ni^{2+} ions then combine with OH^- ions to form $Ni(OH)_2$.

$$NiO_{2\,(s)} + 2H_2O + 2e^{-} \rightarrow Ni(OH)_{2(s)} + 2OH^{-}$$

Over all reaction:

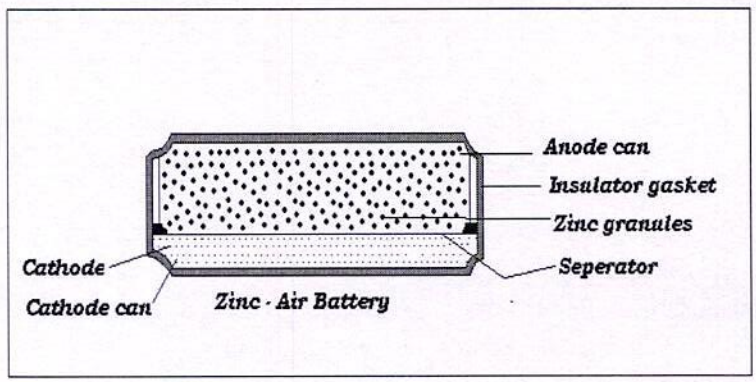
$$Cd_{(s)} + NiO_{2(s)} + 2H_2O \rightarrow Cd(OH)_{2(s)} + Ni(OH)_{2(s)} + \text{Energy}$$

Applications: In consumer electronic devices such as cellular phones, laptops, computers, comcorders and other portable applications and also in electric vehicles.

Explain the construction and working of Zinc air battery (or) Modern battery?

Zinc air cell : (Modern battery)	
Anode :	Zinc (Zn)
Cathode :	Oxygen
Electrolyte :	Potassium hydroxide (KOH)

Zinc air battery consisting of anode containing granules of zinc mixed with 20%NaOH electrolyte. Cathode can contains a porous carbon plate which provides site for the reduction reaction and do not involves in the reaction. Carbon is catalytically activated to absorb oxygen gas. The anode and cathode compartments are separated by a separator and both are encased in plastic or ebonite insulator. The reactions are as follows.



Cell reactions:

At anode: $Zn + 2OH^- \rightarrow Zn(OH)_2 + 2e^-$

At cathode: $\frac{1}{2} O_2 + H_2O + 2e^- \rightarrow 2OH^-$

Over all reaction: $Zn + \frac{1}{2} O_2 + H_2O \rightarrow Zn(OH)_2$

Advantages: 1) High energy density. **2)** Low cost and compact **3)** Does not produce harmful products.

Applications: Used in Military radio receivers, transmitters, hearing aids.

Write about Lithium ion battery:

Lithium ion battery	
Anode :	Lithium doped graphite
Cathode :	Lithium Cobalt (III) Oxide
Electrolyte :	Complex Lithium compounds dissolved in organic solvents.

Cell reactions:

At anode: $Li_nC \leftrightarrow nLi^+ + ne^- + C$

At cathode: $Li_{1-n}CoO_2 + nLi^+ + ne^- \leftrightarrow LiCoO_2$

Over all reaction: $Li_nC + Li_{1-n}CoO_2 \leftrightarrow C + LiCoO_2$

Advantages:

i. They have high energy density than other rechargeable batteries.
ii. They are light weight.
iii. They produce high voltage out of 4 V.
iv. They have improved safety, i.e., more resistance to overcharge.
v. No liquid electrolyte means they are immune from leaking.
vi. Fast charge and discharge rate.

Disadvantages:

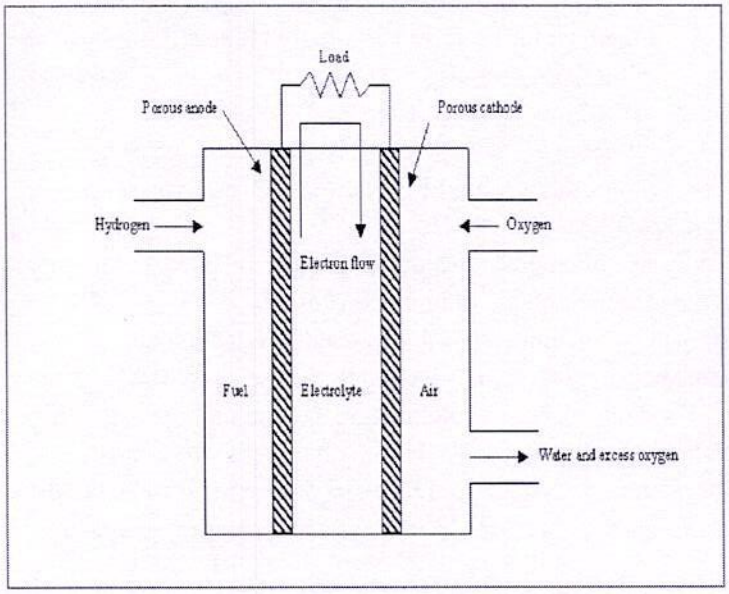
1) They are expensive. 2) They are not available in standard cell types.

Hydrogen – oxygen fuel cell:

In these cells, the reactants and electrolytes are continuously supplied to the cell. It is the simplest and most successful fuel cell. The fuel-hydrogen and the oxidiser-oxygen and the liquid electrolyte are continuously supplied to the cell.

Description: The cell has two porous electrodes, anode and cathode. The electrodes are made of compressed carbon containing a small amount of catalyst (Pt, Pd, Ag). Between the two electrodes an electrolytic solution, 25% KOH is filled.

Working: Hydrogen passes through the anode compartment, where it is oxidised. Oxygen passes through the cathode compartment, where it is reduced.



Cell reactions:

- ★ At anode $2H_2 + 4OH^- \rightarrow 4H_2O + 4e^-$
- ★ At cathode $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$
- ★ Net reaction $\underline{2H_2 + O_2 \rightarrow 2H_2O}$
- ★ The product discharged in water and the standard EMF of the cell is $E^\circ = 1.23V$.
- ★ A number such fuel cells are stacked together in series to make a battery.

Applications:

- ★ They are used as auxiliary energy source in space vehicles, submarines etc.
- ★ Because of light weight and pure drinking water formation, they are highly useful in space crafts.

Advantages:

- ★ The efficiency is high.
- ★ Drinking water is produced for astronauts.
- ★ No noise and thermal pollution.
- ★ Maintenance cost is low.

Limitations:

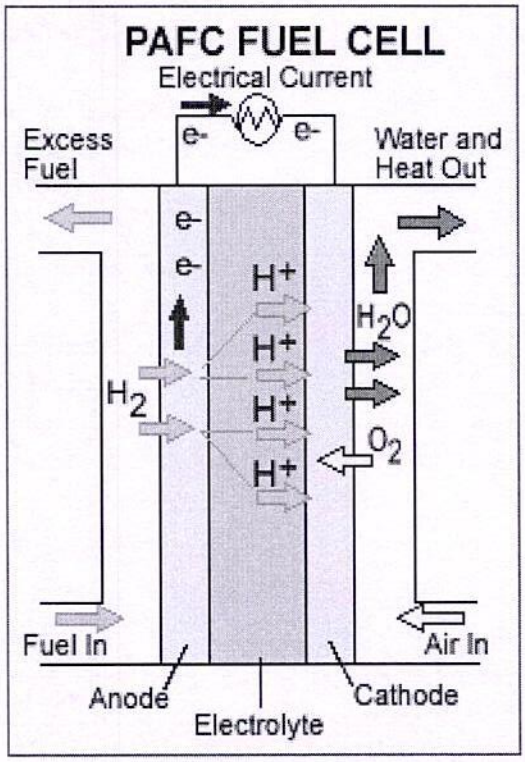
- ★ Life time of fuel cells is not known accurately.
- ★ Initial cost is high.
- ★ The distribution of H_2 is not proper.

Describe the construction and working of Methanol-Oxygen Fuel cell ?

Write a note on phosphoric acid fuel cells?

Phosphoric Acid Fuel cell:- (PAFC)

- ★ In phosphoric acid fuel cell the electrolyte is concentrated phosphoric acid.
- ★ Porous C + SiC + Teflon impregnated with Pt-catalyst acts as anode.
- ★ Porous C + SiC + Teflon impregnated with Ag-catalyst acts as cathode.
- ★ Pure H_2 gas is anodic fuel and pure O_2 gas is cathodic fuel.
- ★ These operate at a temp 190 to 200 ^{o}C . Platinum alloys such as platinum- cobalt- chromium, are used as electro catalyst.
- ★ It can produce electricity 1KW to 5KW.
- ★ **Uses:** These cells are used to provide light and heat in large buildings.



Anode reaction: $H_2 \rightarrow 2H^+ + 2e^-$

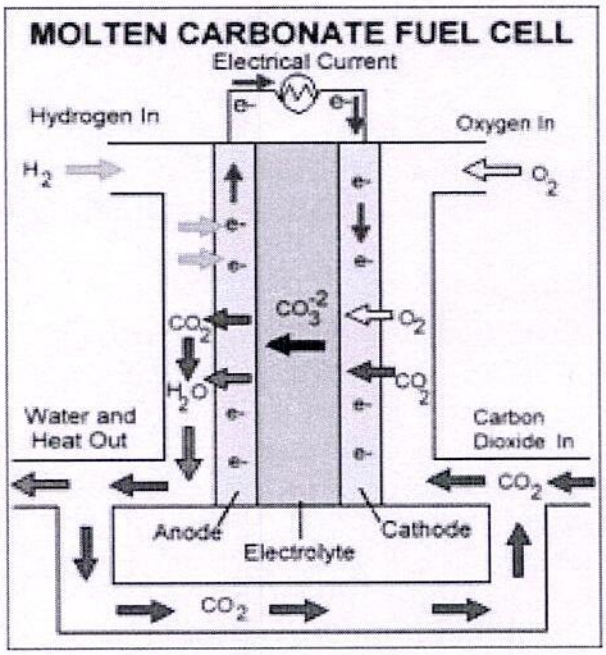
Cathode reaction: $\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$

Overall reaction: $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

Write a note on molten carbonate fuel cells?

Molten Carbonate fuel cell:- (MCFC)

- ★ In Molten carbonate fuel cell the electrolyte is a mixture of alkaline carbonates of sodium and potassium.
- ★ Anode is porous Ni/Ni-Cr alloy.
- ★ Cathode is porous NiO.
- ★ H_2 gas (or) CO gas is fuel at anode and O_2 gas is Fuel at cathode and operates b/w 600 ^{0}C -650 ^{0} C.
- ★ It is efficient than phosphoric acid fuel cell.
- ★ **Uses:** These are used in chemical industries such as aluminum Cloroalkali industries.



Anode reaction: $H_2 + CO_3^{2-} \rightarrow CO_2 + H_2O + 2e^-$

Cathode reaction: $\frac{1}{2}O_2 + CO_2 + 2e^- \rightarrow CO_3^{2-}$

Overall reaction: $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

Corrosion:

Definition: Corrosion is defined as the deterioration of a metal by chemical or electro chemical reactions with its environment.

$$\frac{n}{2}O_2 + 2ne^- \rightarrow n O^{-2} \quad \text{(Reduction)}$$

$$2M + \frac{n}{2}O_2 \rightarrow M_2O_n \quad \text{(Metal oxide)}$$

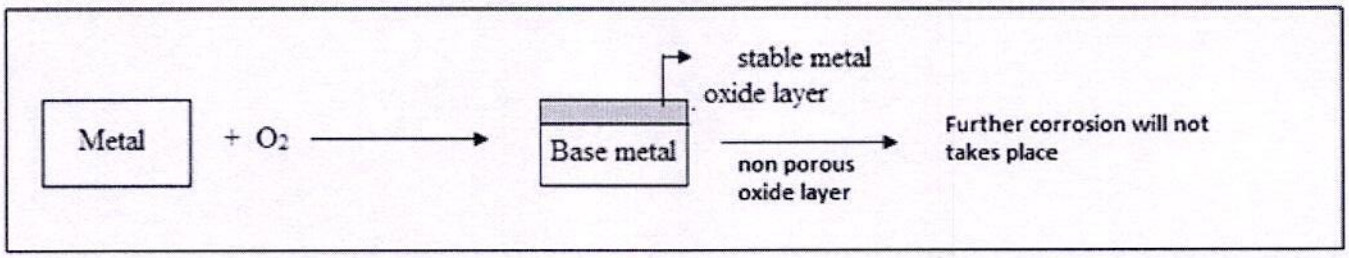
★ The extent of corrosion depends upon the nature of metal oxide.

★ The nature of metal oxide layer formed plays an important role in determining further corrosion.

a) <u>Stable oxide layer</u> (or) <u>Protective and non porous oxide film</u> :

If the metal oxide is stable, it behaves has a protective layer which prevents further corrosion.

E.g., The oxide films of Al, Sn, Pb, Cu, Cr, W etc. are stable and therefore further corrosion is prohibited.

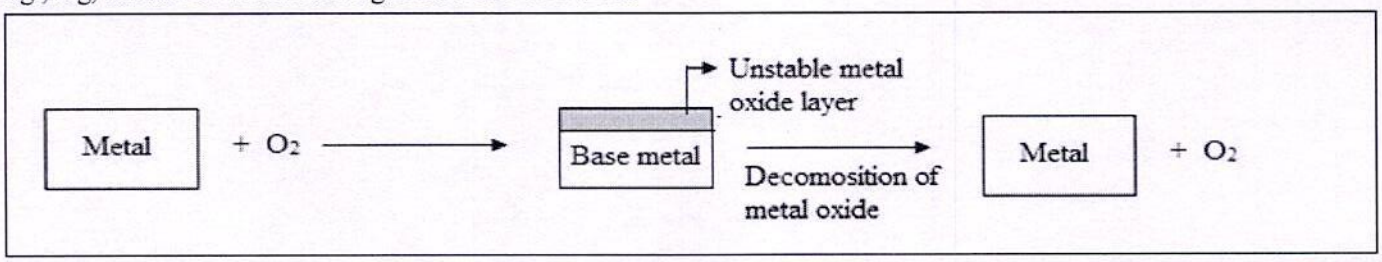


(b) <u>Unstable oxide layer</u>:

If the metal oxide layer is unstable, the oxide layer formed decomposes back into metal and oxygen.

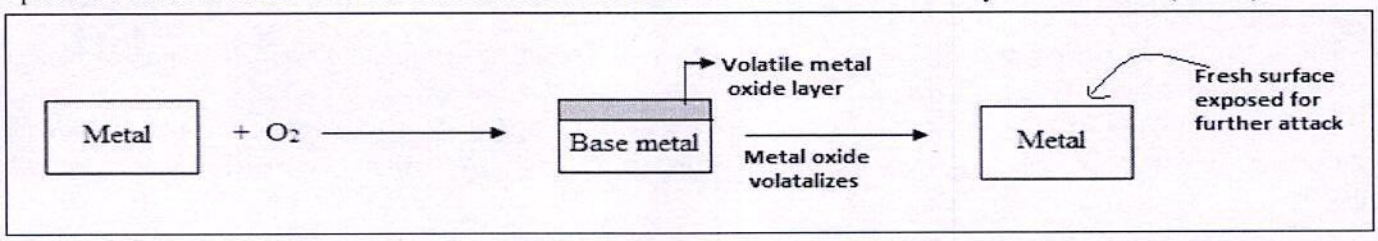
So, oxidation corrosion is not possible.

E.g., Ag, Au and Pt do not undergo oxidation corrosion.



(c) <u>Volatile oxide layer</u>:

If the metal oxide layer is volatile, then the oxide layer volatilizes after formation and leaves the underlying metal surface exposed for further attack. This causes continuous corrosion which is excessive in molybdenum oxide (MoO3)



(d) <u>Porous and non protective oxide layer</u>:

If the metal oxide layer is porous, the oxide layer formed has pores or cracks. In this case the atmospheric oxygen penetrates through the pores or cracks and corrode the underlying metal surface. This cause continuous corrosion till conversion of metal into its oxide is completed.

Ex: Alkali and alkaline earth metals (Li, Na, K, Mg etc.)

Wet Corrosion (or) Electrochemical corrosion:

- ★ This type of Corrosion occurs where a conducting liquid is in contact with the metal.
- ★ This corrosion occurs due to the existence of separate anodic and cathodic parts, between which current flows through the conducting solution.
- ★ At anodic area, oxidation reaction occurs thereby destroying the anodic metal either by dissolution or formation of compounds. Hence corrosion always occurs at anodic parts.

Mechanism: Electrochemical corrosion involves flow of electrons between anode and cathode.

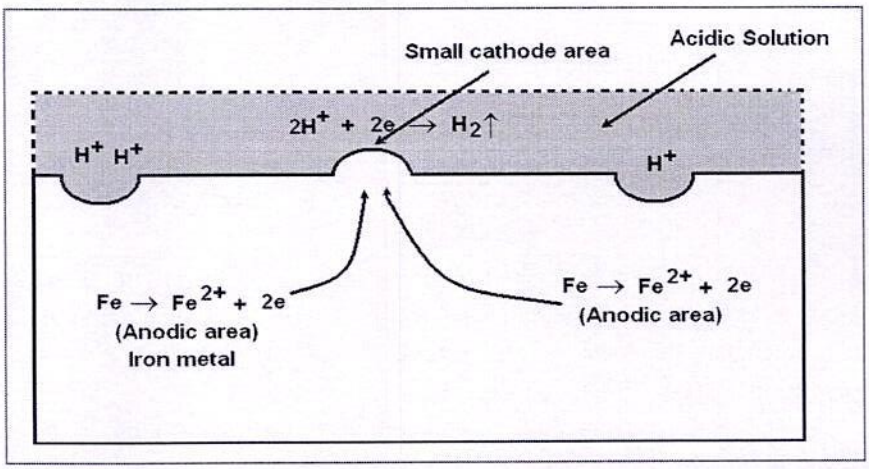
The anodic reaction involves dissolution of metal liberating free electrons.

$$M \rightarrow M^{+n} + ne^-$$

The cathodic reaction consumes electrons with either evolution of hydrogen or absorption of oxygen which depends on the nature of corrosive environment.

Evolution of hydrogen : [Formation of Rust with evolution of H_2 in Wet corrosion]:

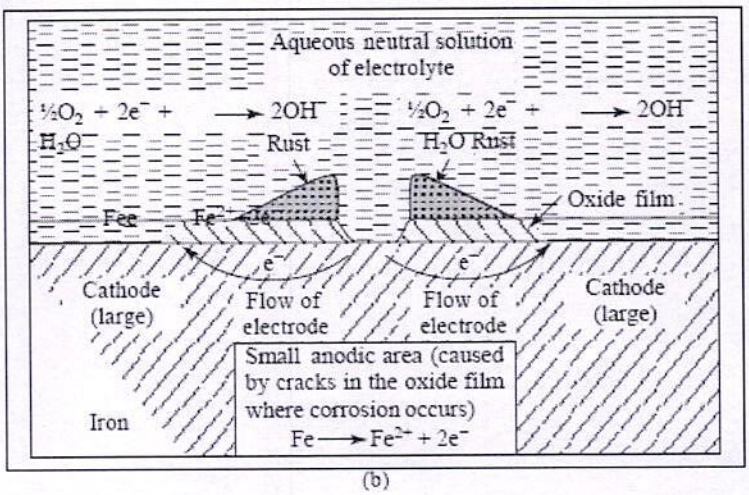
- ★ This type of corrosion occurs in acidic medium.
  E.g. Considering the metal Fe, anodic reaction is dissolution of iron as ferrous ions with liberation of electrons.
  Anode: $Fe \rightarrow Fe^{+2} + 2e^-$ (Oxidation)
- ★ The electrons released flow through the metal from anode to cathode, whereas H+ ions of acidic solution are eliminated as hydrogen gas.
  Cathode: $2H^+ + 2e^- \rightarrow H2$ (Reduction)



- ★ **The overall reaction** is: $Fe + 2H^+ \rightarrow Fe^{+2} + H_2$
- ★ This type of corrosion causes displacement of hydrogen ions from the solution by metal ions.
- ★ All metals above hydrogen in electrochemical series have a tendency to get dissolved in acidic solution with simultaneous evolution of H2 gas. The anodes are large areas, where as cathodes are small areas.

Absorption of oxygen: [Formation of Rust with evolution of O2 in wet reaction] :

For example, rusting of iron in neutral aqueous solution of electrolytes in presence of atmospheric oxygen. Usually the surface of iron is coated with a thin film of iron oxide. If the film develops cracks, anodic areas are created on the surface. While the metal parts act as cathodes. It shows that anodes are small areas, while the rest metallic part forms large cathodes. The released electrons flow from anode to cathode through iron metal.



(b)

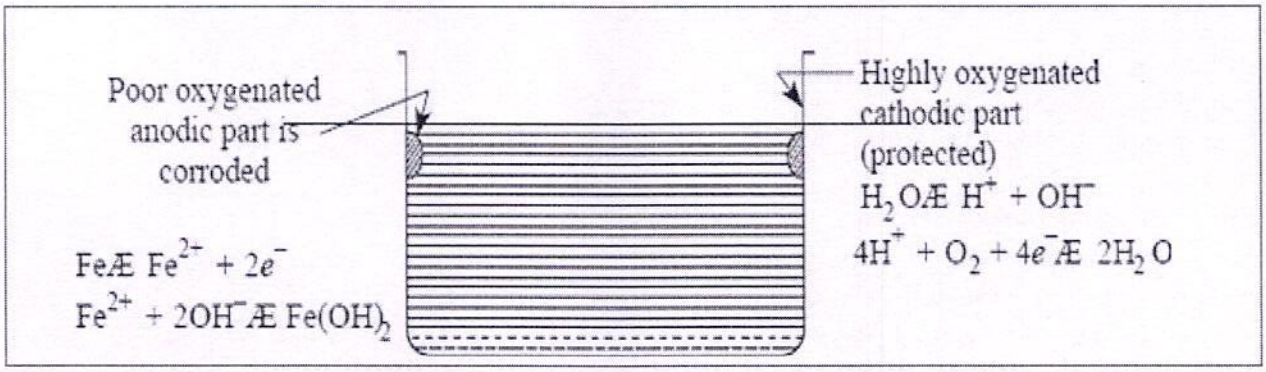
At anode: $Fe \rightarrow Fe^{+2} + 2e^-$ (Oxidation)

At cathode: $\frac{1}{2} O_2 + H_2O + 2e^- \rightarrow 2\ OH^-$ (Reduction)

- ★ Fe^{2+} ions and OH- ions combine to form $Fe(OH)_2$ precipitate.

Waterline corrosion:

It has been observed in the case of an iron tank contain- ing water, that the portion of iron tank just below the water level undergoes corrosion. It is due to the difference in oxygen concentration. Corroding portion is poor in oxygen and acts as anode.

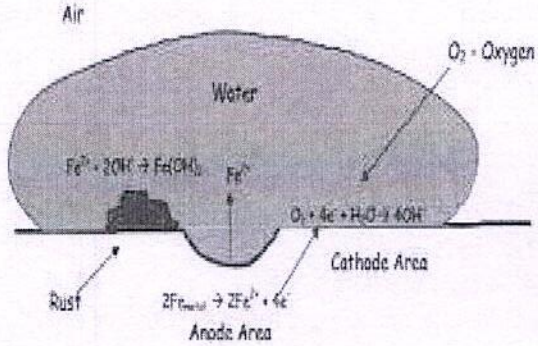


Drop corrosion:-

- ★ For instance iron metal surface is covered with a drop of water.
- ★ The area covered by a drop has low oxygen concentration and thus acts as an anode and suffers corrosion, the uncovered area of the metal acts as large cathode due to high O_2 concentration.

At anode $Fe \rightarrow Fe^{2+} + 2e^-$

At cathode $\frac{1}{2}O_2 + H_2O + 2e^- \rightarrow 2OH^-$



Stress corrosion cracking:-

- ★ When a metal is subjected to uneven stress and exposed to corrosion environment, it undergoes stress corrosion.
- ★ The stressed portion is in thermodynamically unstable state that's why areas under stress act as the anode and other areas act as the cathode.
- ★ It is due to the combined effect of static tensile stresses and corrosive environment.
- ★ Stressed areas of alloys are chemically active and they are attacked by even mild corrosive environment, as a result cracks are developed and they propagate in a direction perpendicular to operating stress.
- ★ Examples;

Season cracking (stress corrosion of brass):

- ⅄ Season cracking is observed in brass (Copper + Zinc alloy) articles.
- ⅄ Pure copper is immune to stress corrosion but presence of alloying agents such as Zn, Al etc makes it prone to corrosion.
- ⅄ In the presence of NH_3 or RNH_2, it undergoes corrosion due to formation of complexes like $[Cu(NH_3)_4]^{2+}$ and $[Zn(NH_3)_4]^{2+}$.

This leads to dissolution of brass which ultimately results in the formation of cracks in the presence of stress.

What is passivity? Explain.

The process in which a metal exhibits higher corrosion resistance is called passivity. When a very thin, invisible and highly protective film is formed on the surface of a metal or an alloy, it is called passivity. This film is insoluble and non-passive. A metal is passive in a certain environment if its corrosion rate is very low. By the change of the environment, the passivity of a metal may change and may become active towards corrosion.

The formation of a passive film on the metal surface in determined by the Pourbaix diagram, which depends on the elec-trode potential and pH of the medium. Low carbon steel does not corrode in conc. HNO 3 due to protection effect of passive film. However, in dil. HN 3 does not form a stable passive film and therefore dissolves steel. Passive film is formed

% Purity	99.999	99.99	99.95	99
Corrosion rate	1	2650	5000	7200

3. **Relative areas of the anodic and cathodic parts:**
When two dissimilar metals or alloys are in contact, the corrosion of the anodic part is directly proportional to the areas of the cathodic and anodic parts. i.e, the corrosion is more rapid, severe and highly localised if the anodic area is small. For example, a small pipe made of steel fitted in a large copper tank.

$$In\ general\ \ Rate\ of\ corrosion\ of\ \ anodic\ region \propto \frac{CathodicArea}{AnodicArea}$$

4. **Nature of surface film:**
In aerated atmosphere, practically all metals produce a thin surface film of metal oxide.
The ratio of the volumes of the metal oxide formed to the metal is called "specific volume ratio".

$$specific\ \ ratio \ = \ \frac{volumeofmetalOxide}{VolumeofMetal}$$

If the specific volume ratio is more, the rate of corrosion is less, because the surface of the metal is completely covered by the film, offering protection to the metal surface.
For example, the specific volume ratios of Ni, Cr, and W are 1.6, 2.0 and 3.6 respectively. The rate of corrosion for tungsten (W) is least even at elevated temperatures.

5. **Physical state of metal:**
The grain size, orientation of crystals, stress etc. of the metals influence the rate of corrosion. The smaller the grain size of the metal or alloy greater will be the rate of corrosion, because of its high solubility. The areas under stress become anodic and corrosion takes place in these areas.

6. **Volatility of corrosion products:**
If the corrosion produced volatilizes as soon as it is formed, the metal surface is exposed for further attack. This creates rapid and excessive corrosion.
For example the corrosion product of molybdenum as molybdenum oxide (MoO3) is volatile.

7. **Solubility of corrosion product**: If the oxide film formed as corrosion product is soluble in corroding medium, the corrosion proceeds at a faster rate. The corrosion product acts as a physical barrier between the metal and environment. For example PbSO4 film formed by Pb on sulphuric acid medium.

8. **Passive character of metal**:
Metals like Ti, Al, Cr, Mg, Ni and Co are passive and they exhibit much higher corrosion resistance than expected from their position in the electrochemical series. This is because the metal forms very thin, highly protective corrosion film, by reacting with atmospheric oxygen. If the film is broken, it compensates the film by re exposure to oxidising conditions. Thus they produce "self healing film". This property is called passive character of metal.
For example the corrosion resistance of "stainless steel" is due to passivating character of chromium present in it.

Nature of corroding environment:

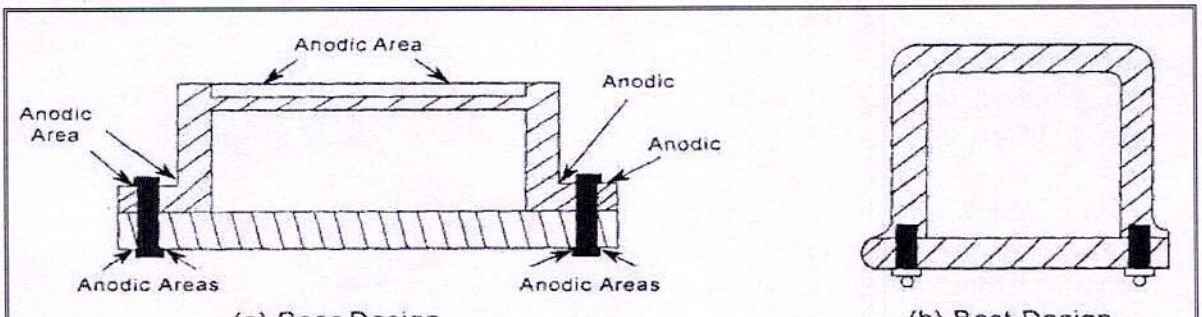
1. **Temperature:**

3) Using metal alloys
4) Modifying the environment
5) Use of inhibitors
6) Cathodic protection
7) Application of protection coatings.

Proper designing & Selection of material:

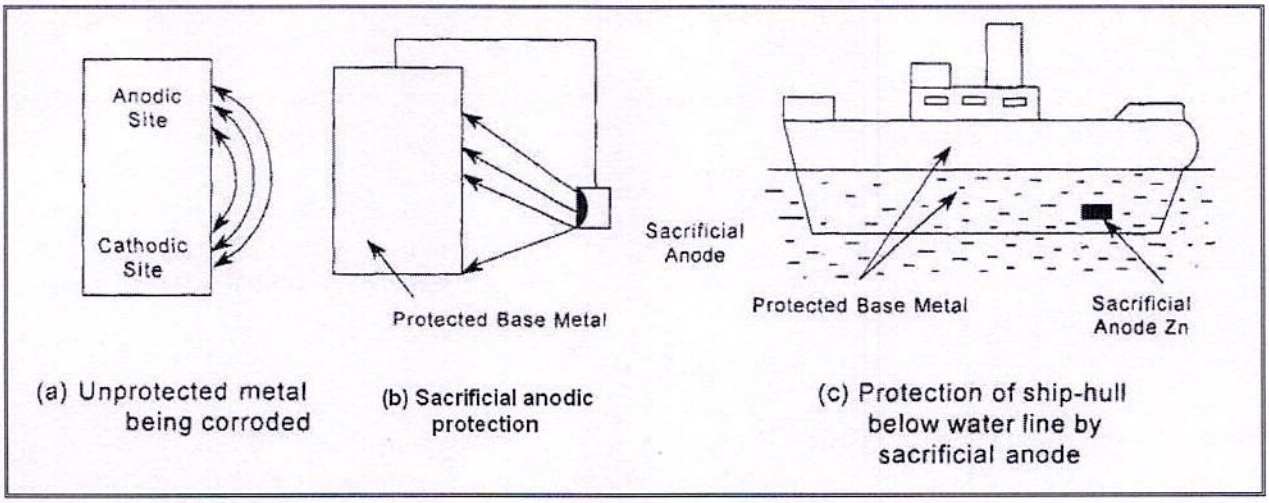
The design of the metal under corroding atmosphere must be such that it is uniform and does not produce intense and localised corrosion, important principles of proper designing are:

1. Avoid the contact of two dissimilar metals in the presence of corroding solution.
2. When two dissimilar metals are in contact, the anodic metal must possess large surface area, where as cathodic metal must possess smallest surface area so that the corrosion takes place is minimum.
3. If two dissimilar metals are in contact, their position in the electrochemical series must be very close, so that minimum corrosion occurs.
4. A direct metal to metal contact between two dissimilar metals must be avoided by fixing an insulating fitting in between them, so that the corrosion velocity can be minimised.
5. The anodic metal should not be painted or coated. When the anodic metal is in contact with the cathodic metal, the anodic metal should not be painted or coated, because any break in the paint would lead to rapid localisation corrosion.
   A proper design should avoid the presence of crevices, between the adjacent parts of the structure, even in the case of the same metal.
   For example, electrical box is shown as below. The design (a) is such that rain water collects at the top and also seeps between the bolt and two housing and remains there because of capillary action producing anodic parts.
   The defects can be corrected by slight modification in the designs shown in (b).



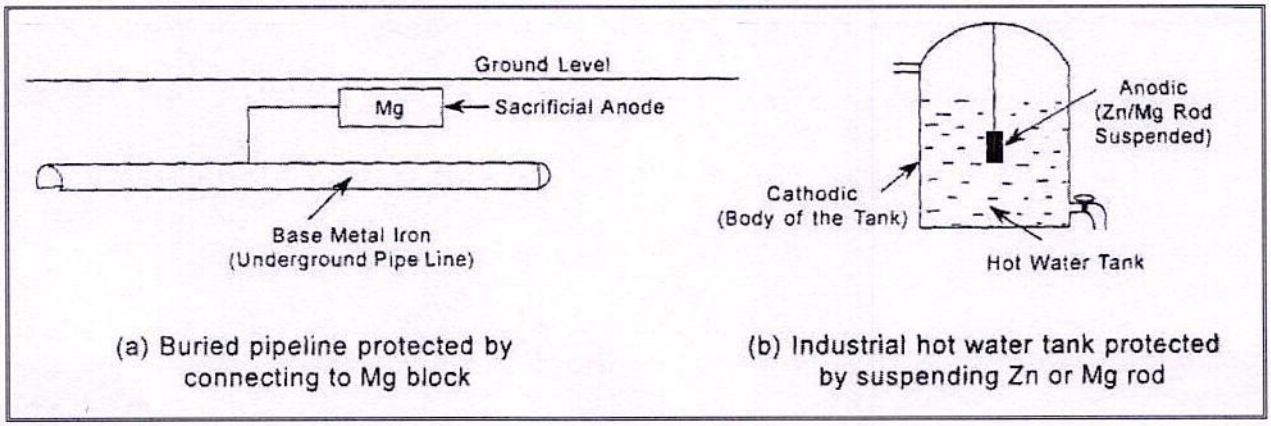
Prevention of corrosion by proper design

The design of the equipment should allow free circulation of air proper drainage and easy washing as shown below.



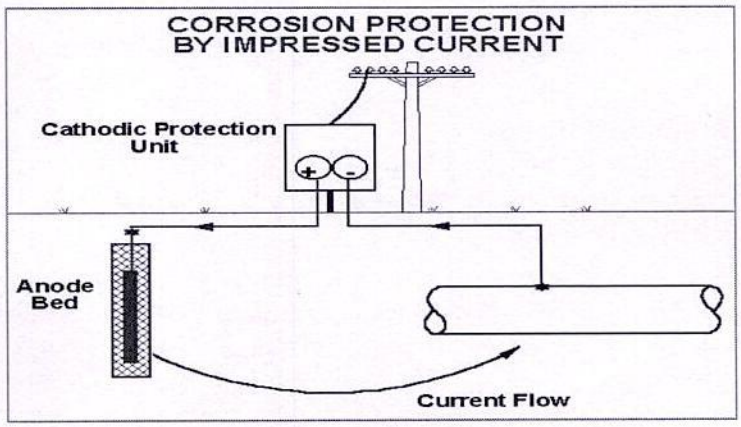
Example 2:

The underground water pipelines and water tanks are also protected by sacrificial anode method. By referring to the electrochemical series, the metal with low reduction potential is connected to the base metal which acts as anode.



(b) <u>Impressed current cathodic protection</u>:

- ★ In this method an impressed current little more than corrosion current is applied in the opposite direction to nullify the corrosion current producing a reverse cell reaction.
- ★ Thus the anodic corroding metal becomes cathodic and protected from corrosion.
- ★ The impressed current is taken from a battery or rectified on A.C. line.
- ★ The anode is usually insoluble anode like graphite, high silica iron, scrap iron, stainless steel, or platinum.
- ★ Usually a sufficient D.C. current is passed on to the insoluble anode kept in a 'back fill' composed of coke or gypsum, so as to increase the electrical contact with the surrounding soil.



- ★ This type of impressed current cathodic protection is given to
  (1) open water box coolers (2) water tanks (3) buried water pipe lines or oil pipelines
  (4) condensers (5) transmission line towers (6) marine pipes

Metallic coatings :

Metallic coatings are produced by coating one metal on the surface of another metal. The metal which is protected is called base metal and the metal which is coated on the surface of the base metal is called coating metal.

Metallic coating are of two types: **1. *Anodic coating:*** **2. *Cathodic coating:***

1. ANODIC COATINGS:

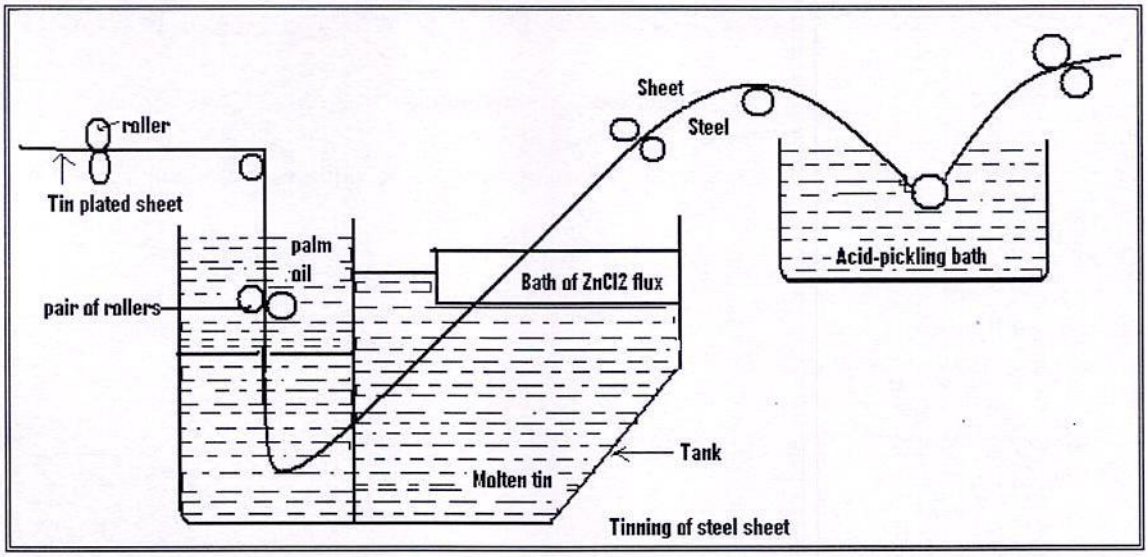
The metal used for the surface coating is more anodic than the base metal which is to be protected.

For examp le, coating of Al, Cd and Zn on steel surface are anodic because their electrode potentials are lower than that of the base metal iron. Therefore, anodic coatings protect the underlying base metal sacrificially. The formation of pores and cracks overthe metallic coating exposes the basemetal and a galvanic cell is formed between the base metal and coating metal. The coating metal dissolves anodically and the base metal is protected.

1. CATHODIC COATINGS:

Cathodic c oatings are obtained by coating a more noble metal (i.e. metals having higher electrode potential like Sn, Au, Ag, Pt etc.) tha the base metal. They protect the base metal as they have higher corrosion resistance than the base metal due to cathodic na ture. Cathodic coating protect the base metal only when the coating is uniform and free from pores. The formation of pores ov er the cathodic coating exposes the base metal (anode) to environment and a galvanic cell is set up. This causes more dama e to the base metal.

Anodic coatings	Cathodic coatings
1) These coatings involve coating of an anodic metal on the surface of base metal.	1) These coatings involve coating of anoble metal on the surface of base metal
2) Protects the underlying base metals "Sacrificially"	2) Protects the base metal by theirnoble character and higher corrosion resistance.
3) The redction potential of the coating metal is lower than the base metal	3) The redction potential of the coating metal is higher than that of base metal
4) If pores, breaks or discontinues are produced in the metallic coating, the base metal is not corroded beacuase it is cathodic to coating metal. The coating metal undergo severe corrosion	4) If pores, breaks or discontinues are produced in the metallic coating, the base metalbecomes anodic and faces severe corrosion due to smaller anodic area and the protecting metal becomes cathodic and does not undergo corrosion
5) The coating metal posses lower reduction potential than base metal	5) The coating metal possess higher reduction potential than base metal
6) Ex: Galvanisation	6) Ex: Tinnings



Appliations of tinning:

1. Tin metal possess good resistance against atmosphere corrosion. Tin is non toxic and widely used for coating steel, copper, and brass sheet.
2. The containers coated with tin are used for storing food stuffs, ghee, oils etc., and packing food materials.
3. Tinned copper sheets are used for making cooking utensils and refrigeration equipment.

Comparison of Galvanization with Tinning :

Galvanization	Tinning
The process of coating Zn on the surface of iron or steel is called galvanization.	The process of coating tin on the surface of iron or steel is called tinning.
Zinc is anodic to the base metal iron or steel.	Tin is cathodic to the base metal iron or steel.
Zinc protects iron " sacrificially"	Tin protects iron due to its noble coating.
Zinc is more electropositive than iron , it does not permit iron to pass into the outside solution in other words corrosion does not occur to iron.	Tin is less electropositive than iron, it protects the iron till the coating is perfect.
Any break in the protective Zinc layer does not cause corrosion to the base metal.	Any break in the protective tin layer severe corrosion to the base metal.
Galvanised containers cannot be used for food storing.	Tin coated containers are used for food storing materials.
After galvanization , the galvanized sheet is subjected to annealing process.	No annealing process.

Write a note on Electroplating:

- ★ Electroplating is the process of coating metals and protect them from corrosion.
- ★ Electroplating is the method of electro-deposition of metal by means of electrolysis over surface of metals and alloys.
- ★ The base metal is first subjected to acid pickling to remove any scales, oxides etc.
- ★ The base metal is made as cathode of the electrolytic cell and the coating metal is made as anode.

Step 3: Procedure:

The pretreated object is immersed in the plating bath for the required time.

At Cathode : $Ni^{+2} + 2e^- \rightarrow Ni$

At Anode : $H_2PO_2^- + H_2O \rightarrow H_2PO_3^- + 2H^+ + 2e^-$

Net Reaction : $Ni^{+2} + H_2PO_2^- + H_2O \rightarrow Ni + H_2PO_3^- + 2H^+$

Applications:

1. Electroless Ni plating is extensively used in electronic appliances.
2. Electroless Ni plating is used in domestic as well as automotive fields.

Advantages of electroless plating over electro plating:

i) Electricity is not necessary

ii) Complicated parts are uniformly coated

iii) Plastics, glass etc, are easily coated

iv) Good mechanical, chemical and magnetic properties are obtained.

PAINT:

Paint is a mechanical dispersion of one or more fine pigments in a medium (thinner + vehicle). When a paint is applied to metal surface, the thinner evaporates. The vehicle undergoes slow oxidation to form a pigmented film.

Requirements or requisites of a good paint

A good paint should,

1) have good covering power
2) spread easily on the surface
3) not crack on drying
4) adhere well to the surface
5) give a glossy film
6) be corrosion and water resistant
7) have stable colour

What are the Constituents of Paint. Write their functions.

1) Pigment
2) Vehicle
3) Thinner
4) Drier
5) Filler
6) Plasticizer
7) Anti skinning agent

1. Pigment : It is a solid that gives colour to the paint.

Functions:

a) To give colour and opacity to the film.
b) To provide strength to the film.
c) To protect film by reflecting U.V. rays.
d) To provide resistance to abrasion and weather.

Example:

White pigment - White lead, TiO2

Blue pigment - Prussion blue

Green pigment - Chromium oxide

Red pigment - Red lead, Fe3O4

2. Heat Resistance paints:

When the surfaces are exposed to high temperatures such as in chimneys, exhaust pipes, furnaces, oil stills, etc. Oil paints tend to decompose or get charred, they being organic in nature. Then the surfaces become liable for corrosion. To overcome this problem, a suspension of graphite or lamp black in small amounts of drying oils and more thinners can be used. But more recently, silicone paints are used for heat resistance.

3. Fire-retardant paints:

These are paints containing chemicals which are fire-resistant in nature. In other words, they produce gases like CO_2, NH_3 , HCl,HBr on heating which are themselves non-combustible and do not support combustion, there by minimizing the rate of burning or extinguishingthe fire.

4. Antifouling paints:

Oil paints are liable for attack by living organisms because of the organic content in them. So, in places where living organisms are handled or are present, such paints cannot be used. For use in breweries and biochemical laboratories, the paint is mixed with compounds having fungicidal properties. The active ingredients employed are HgO, Cu_2O, Hg_2Cl_2, DDT, pentachlorophenol, etc.

Such paints are called Antifouling paints.

5. Cement Paint

Cement paint is the coating, which is applied on plastered brickwork, concrete work, etc. The ingredients are

1. White cement (about 70%)
2. Hydrated lime [$Ca(OH)_2$]
3. Pigment (a colouring agent)
4. Very fine sand (an inert filler) and
5. Water- repellentcompound

Such paints of different colors are marked in powder form (eg Snowcem, Smocem). The powder is mixed with a suitable quantity of water to get a thin slurry, and applied on surfaces. For good results, a 1.5% to 2% aqueous solution of sodium silicate and Zinc sulphate is applied as primer coat.

UNIT III: CHEMISTRY OF MATERIALS

Part- A: Nano materials:- Introduction-sol-gel method-characterization by BET, SEM and TEM methodsapplications of graphene-carbon nanotubes and fullerenes:Types, preparation and applications Thermal analysis techniques: Instrumentation and applications of thermogravimetric analysis (TGA), differential thermal analysis (DTA), differential scanning calorimetry (DSC).

Part-B: Refractories: - Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories. Lubricants: - Definition, mechanism of lubricants and properties (definition and importance). Cement: - Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.

Part- A: Nano materials:

1) **Explain top–down and bottom–up approach for nanomaterial preparation with examples.**

The nanomaterials can be synthesized in two ways, namely Bottom –up approach and Top-down approach

Bottom-up approach:

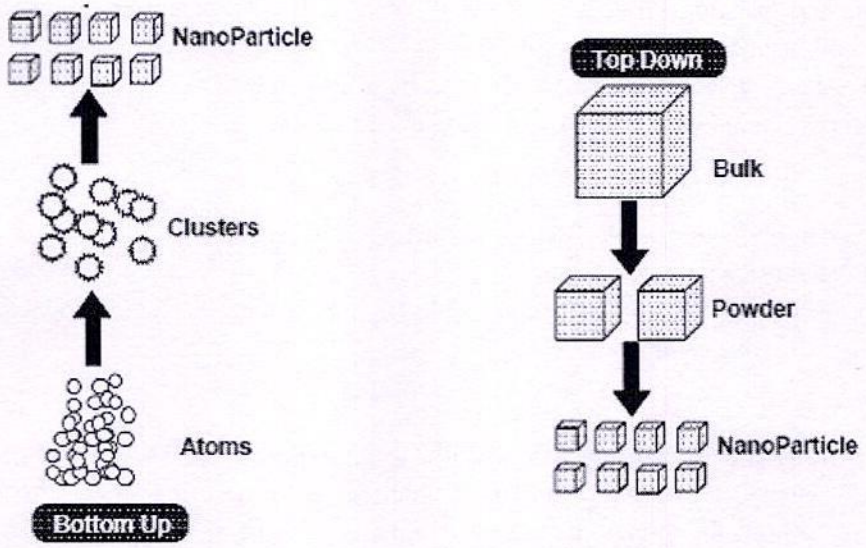
In this method, the nanomaterials are synthesized by assembling the atoms and molecules together.

Examples: Ball milling and Sol-gel method.

Top-down approach:

In this method, the nano materials are synthesized by dis-assembling the solids into finer pieces until the particles are in the order of nanometres.

Examples: plasma arching, chemical vapour deposition method.



2) **Define nano materials? Describe sol-gel method of synthesis of nano materials?**

Nano materials: Nano materials are defined as a set of substances where at least one dimension is less than approximately 100 nanometers. A nanometer is one millionth of a millimeter - approximately 100,000 times smaller than the diameter of a human hair.

Sol-Gel process:

This is an example for Bottom-Up approach comes under chemical method.

Examples: Zinc oxide nanoparticles, TiO_2 nanoparticles can be synthesized by this method.

- ❖ The sample material is placed in a vacuum chamber at a constant and very low temperature, usually at the temperature of liquid nitrogen (77.4 K), and subjected to a wide range of pressures, to generate adsorption and desorption isotherms.
- ❖ The amounts of gas molecules adsorbed or desorbed are determined by the pressure variations due
- ❖ to the adsorption or desorption of the gas molecules by the material (the adsorbent).
- ❖ Various amounts of gas molecules will be adsorbed or desorbed at different doses of the gas (the adsorbate).
- ❖ Knowing the area occupied by one adsorbate molecule, (for example, 16.2 Å 2 for nitrogen), and using an adsorption model, the total surface area of the material can be determined.
- ❖ The specific surface area that can be determined by gas sorption ranges from 0.01 to over 2000 m 2 g -1.
- ❖ Determination of pore size and pore size distribution of porous materials can also be made from the adsorption/desorption isotherm using an assessment model, suitable for the shape and structure of the pores. The range of pore sizes that can be measured using gas sorption is from a few Angstroms up to about half a micron.

4) Explain SEM method for characterization of nano materials?

Electron Microscopes are scientific instruments that use a beam of highly energetic electrons to examine objects on a very fine scale.

This examination can yield information about the

1) Topography.
2) Morphology.
3) Composition and
4) Crystallographic information.

Electron Microscopes are mainly 2 types:

1) Transmission Electron Microscope (TEM) - allows one the study of the inner structures.
2) Scanning Electron Microscope (SEM) - used to visualize the surface of objects.

Principle of SEM:

Incoming (primary) electrons can be "reflected" (backscattered) from a bulk specimen and can release secondary electrons. Primary electrons are focused into a small- diameter electron probe that is scanned across the specimen. Electrostatic or magnetic fields, applied at right angles to the beam, can be used to change its direction of travel. By scanning simultaneously in two perpendicular directions, a square or rectangular area of specimen (known as a raster) can be covered. Image of this area can be formed by collecting secondary electrons from each point on the specimen.

Working of SEM:

1) The electron gun produces an electron beam when tungsten wire is heated by current.
2) This beam is accelerated by the anode.
3) The beam travels through electromagnetic fields and lenses, which focus the beam down toward the sample.
4) A mechanism of deflection coils enables to guide the beam so that it scans the surface of the sample in a rectangular frame.
5) When the beam touches the surface of the sample, it produces:
    a) Secondary electrons (SE).
    b) Back scattered electrons (BSE)
    c) X - Rays.
6) The emitted SE is collected by SED and convert it into signal that is sent to a screen which produces final image.
7) Additional detectors collect these X-rays, BSE and produce corresponding images.
8) A secondary electron detector attracts the scattered electrons and, depending on the number of electrons that reach the detector, registers different levels of brightness on a monitor.
9) By reducing the size of the area scanned by the scan coils, the SEM changes the magnification of the image.

3) TEMs provide information on element and compound structure.
4) Images are high-quality and detailed.

Disadvantages:

1) TEMs are large and very expensive.
2) Operation and analysis requires special training.
3) Samples are limited to those that are electron transparent.
4) TEMs require special housing and maintenance.
5) Images are black and white .

6) Discuss the application of Nano materials in various fields.

In Industries:

1) **As catalyst:**
The nano materials have more no. of surface atoms which make them catalytically active. For example, bulk gold chemically inert white nano gold possess excellent catalytic property.
2) **Water purification:**
Dissolved salts and colour producing organic compounds can be filtered very easily from water by using nano porous membrane having pores smaller than 10nm. Magnetic nano particles are used to remove heavy metal contamination from waste water.
3) **In Fabric industry:** Embedding of Nano particles on fabrics make them stain repellent. Socks embedded with silver nano particles remove the bacteria and makes them odour free.
4) **In automobiles:**
Fuel consumption in automobiles can be reduced by using specially designed nano particles as fuel additives. Incorporation of small amount of nano particles in car bumpers make them stronger than steel
5) **In food industry:**
Nano particles are used to make packing material and containers to store food.
6) **In Solar cells:**
Absorption of solar radiation in solar cells containing nano particles are higher than the bulk materials.

In Medicine :

1) **Nanodrugs:**
Nano materials are used as drugs for the treatment of cancer and TB.
2) **Nano medibots :**
Nano particles act as nano medibots which identify and penetrate the cancer cells and destroy them by supplying anti cancer drugs
3) **Gold coated Nano shells:**
Gold coated nano shells containing silicon core are administered near the tumours . When IR light is irradiated on the skin externally, the gold nano shells absorb the light and convert in to heat which destroys the cancer cells responsible for tumour.
4) **Gold nano particles as sensors:**
Nano gold when mixed with different type microorganisms show different colours which is used to identify the harmless and dangerous micro organisms.
5) **Protein analysis:**
Gold nano particles injected in to the body reacts with the protein and the protein concentration can be detected by passing laser beam externally.
6) **Gold nano shells for blood Immune assay:**
Gold nano shells are used to detect WBC count in blood.
7) **Gold nano shells in Imaging:**
Gold nano shells is used as a scanning probe which gives the magnified image of cells in a body

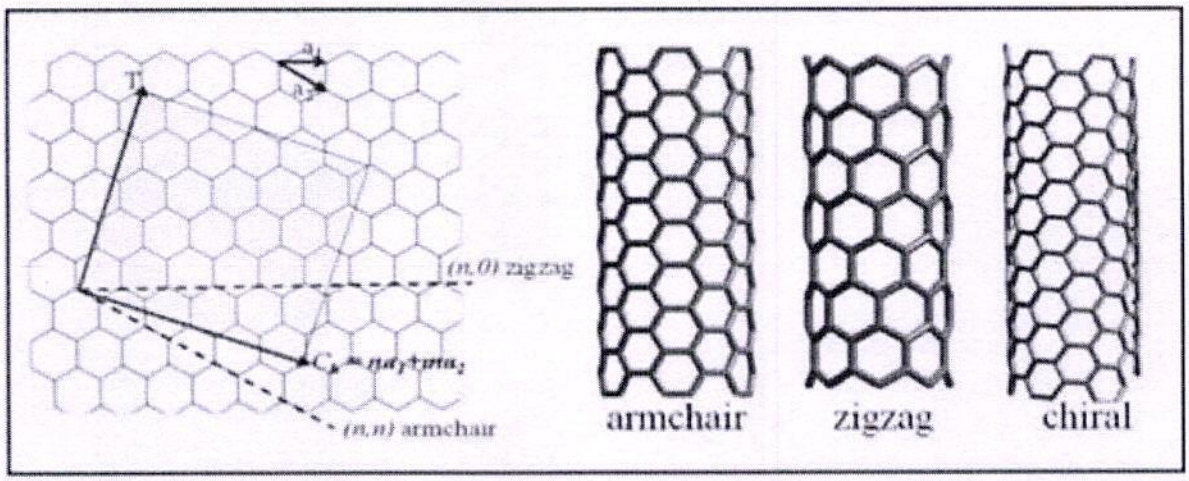
e) If n=m, the nanotubes are called arm- chair. The lines of hexagons are parallel to the axis of the nanotubes.
f) Otherwise, they are called 'chiral'. They have a twist or spiral around the nanotubes.

2) Multi Walled Nano Tubes (MWNT):

Multi- walled nanotubes consist of multiple rolled concentric tubes of graphite. The interlayer distance in multi-walled nanotubes is close to the distance between grapheme layers. In graphite it is approximately 3.3A.U. They have diameter close to 10 nm.

There are two models which can be used to describe the structures of multi-walled nanotubes

a) In the Russian Doll model, sheets of graphite are arranged in concentric cylinders E.g:- A (0,8) single walled nanotube within a larger (0,10) Single – walled nanotube.
b) In the Parchment model, a single sheet of graphite is rolled around itself, resembling a rolled newspaper.



8) Discuss any TWO methods for preparation of carbon nanotubes.

Carbon nanotubes are generally prepared by three main techniques.

1) Arc discharge method.
2) Laser ablation method.
3) Chemical vapour deposition method.

1) Arc discharge method:

a) It is the most common and easy method to prepare carbon nano tubes. (CNTs).
b) This method uses high temperature electric discharge.
c) Arc discharge method can be used to prepare both SWCNTs and MWCNTs.
d) In this method two graphite rods are placed end to end, separated by approximately 1mm distance.
e) These are placed in closed container filled with Helium gas to maintain inert atmosphere.
f) The two graphite rods are connected to external battery.
g) A direct current of 50 to 100A, produced from the battery creates a high temperature discharge between the two electrodes.
h) This discharge vaporizes the surface of one of the graphite electrodes, and forms a small rod-shaped deposit on the other electrode.
i) It is a technique that produces a complex mixture of components, and requires further purification- to separate the CNTs from the soot and the residual catalytic metals present in the crude product.

Carbon Nano Tubes [CNTs] have several unique chemical, optical, electrical and structural properties that make them attractive. The nano-materials possess very good catalytic activity due to increased area of contact. Due to edges and points, their catalytic activity is maximum. They exhibit good ability for easy dispersion. But CNTs possess toxicity and can cause harmful effects to vital organs with cell decay.

Properties of CNTs:

(1) Mechanical Properties:

Young's modulus of carbon nano tubes is 10 times greater than that of steel. CNTs have very structural defects in their walls, and hence, do not fracture on bending. The tensile strength of CNTs is about about 20 times that of steel.

(2) Electrical Properties:

The electrical properties of CNTs vary between metallic to semiconducting materials. The very high electrical conductivity of CNT is due to the minimum defects in the structure.

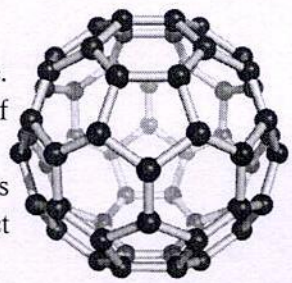
(3) Thermal Conductivity:

The thermal conductivity of CNT is very high due to the vibration of covalent bonds due to minimum defects in the structure.

Due to the unusual and unique properties of CNTs they find potential **applications** in the following field:

1) Carbon nanotubes play an important role in the battery technology, because some charge carriers can be successfully stored inside the nanotubes.
2) Multi-walled CNTs can be used as storage devices to store hydrogen gas in fuel cells.
3) CNTs are used as catalyst in chemical reactions.
4) CNTs can be used for drug delivery within the body by placing the drugs within the tubes or by attaching the drug to the sides of the tubes.
5) CNTs are used as light weight shielding materials to protect electronic equipments from electromagnetic radiation.

10) What are Fullerenes? How are they prepared? Explain their types.



Fullerenes are class of molecules made only carbon atoms having closed cage like structure. Fullerenes can be of a different type C 60, C 70, C 76, C 78, etc; depending on the number of carbon atoms.

The most important fullerene is C60 containing 60carbon atoms which is commonly known as Buckminster fullerene, the' name of Buckminster fullerene comes from the name of an architect Richard Buckminster fuller who had built the geodesic-dome with spherical shape.

The third newly discovered allotrope of carbon is Buck minister's fullerene during laser spectroscopy experiments. The structure of C60 resembles the geodesic dome (foot ball type).

Fullerenes can be made by vaporizing carbon With in a gas medium.

Preparation of fullerenes:

Fullerenes are prepared by vaporizing a graphite rod in He atmosphere when mixture of fullerenes formed are separated by multi step solvent extraction methods. C 60 is isolated by column chromatography using alumina/hexane solvent system.

Types of fullerenes:

A fullerene is any molecule entirely composed of carbon, in the form of hollow sphere, ellipsoid , tube or plane.

Thus fullerenes are of the following types:

1) Spherical fullerenes: They look like soccer (foot ball) ball and are often called bucky balls. Fullerenes are similar in structure to graphite composed of stacked graphene sheets, linked mostly of hexagonal or sometimes pentagonal / heptagonal rings. Buck minister's fullerene C60 is the simplest of all.
2) Cylindrical fullerenes: These are called carbon nanotubes or bucky tubes
3) Planar fullerenes: Graphene is an example of planar fullerene sheet.

11) Discuss the properties and applications of fullerenes?

TGA is a technique in which the mass of a substance is measured as a function of temperature while a substance is subjected to a controlled temperature program.

Principle: In thermogravimetric analysis, the sample is heated in a given environment (air, N2, CO2, He, Ar, etc.) at controlled rate. The change in the weight of the substance is recorded as a function of temperature or time. The temperature is increased at a constant rate for a known initial weight of the substance and the changes in weights are recorded as a function of temperature at different time interval. This plot of weight change against temperature is called thermogravimetric curve or thermogram, this is the basic principle of TGA.

Instrumentation of TGA :

The apparatus required for TGA analysis are;

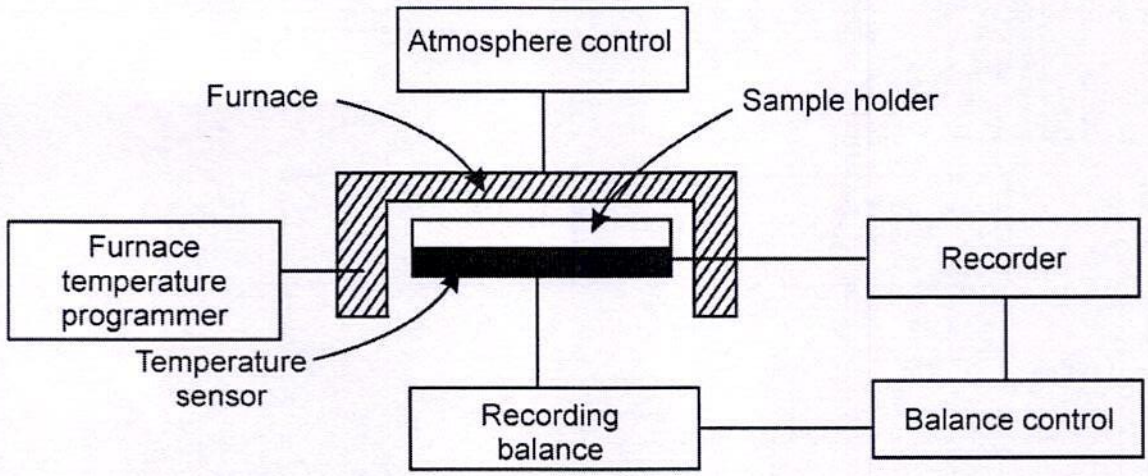
(a) A furnace which can be heated so that the temperature gives linearity with time.

(b) A furnace controlled thermobalance

(c) A known weight of the sample is taken in a crucible which is enclosed by a furnace(F).

The furnace(F) temperature is raised slowly, the temperature of the sample and the corresponding weight are taken. A platinum/platinum rhodium thermocouple is used to measure the sample temperature, and the change in weights are found out by finding the beam deflection on adding a known weight to the pan.(i.e) the change in the weight are recorded from the beam deflection.

A recorder records the change in weight in y axis and w.r.to temperature on the x-axis. We get a thermogram.



Applications of TGA:

1) From TGA, we can determine the purity and thermal stability of both primary and secondary standard.
2) Determination of the composition of complex mixture and decomposition of complex.
3) For studying the sublimation behaviour of various substances.
4) TGA is used to study the kinetics of the reaction rate constant.
5) TGA can be used as a technique to characterise materials used in various environmental, food , pharmaceutical & petrochemical applications.
6) Used in the study of catalyst: The change in the chemical states of the catalyst may be studied by TGA techniques. (Zn-ZnCrO4) Zinc-Zinc chromate is used as the catalyst in the synthesis of methanol.

14) What is Differential Thermal analysis (DTA). Explain instrumentation and applications.

DTA is a technique in which the temperature between sample and thermally inert reference substance is continuously recorded as a function of temperature.

Principle: DTA is a technique in which the temperature of the substance under investigation is compared with the temperature of a thermally inert material. This differential temperature is then plotted against time or against temperature. If zero temperature difference between sample and reference material, sample does not undergo any chemical or physical change. If any reaction takes place temperature difference will occur between sample and

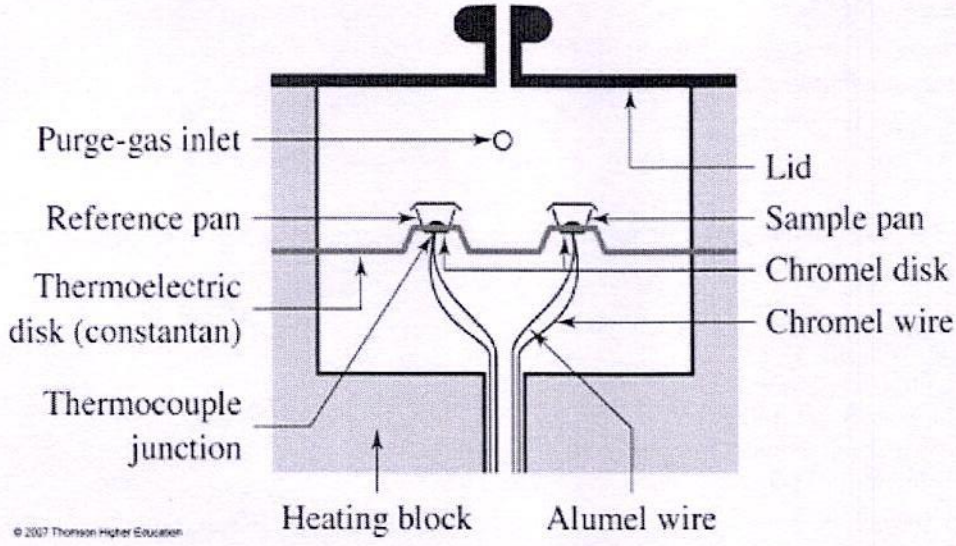


Figure 1: Heat Flux DSC

DSC apparatus is enclosed in a heating block.

The heat is transferred to the sample with the help of thermoelectric disk (or) constantan.

The disk has two raised platforms on which the sample and reference pans are placed.

A chromel disk and connecting wire are attached to the underside of each platform and the resulting chromel-constantan thermocouples are used to determine the differential temperatures of interest.

Alumel wires attached to the chrome discs provide the chromel – alumel junctions for independently measuring the sample and reference temperature.

In heat flux DSC, we can write the total heat flow dH/dt as ,

$$dH/dt \quad C_P dT/dt + f(T,t)$$

Where, H = enthalpy in J/mol

C_P = Specific heat capacity in J/K/mole

f (T,t) = Kinetic response of the sample in J/mol

Thus the total heat flow is the sum of the two terms one related to the heat capacity and one related to the kinetic response.

2) Power compensated DSC:

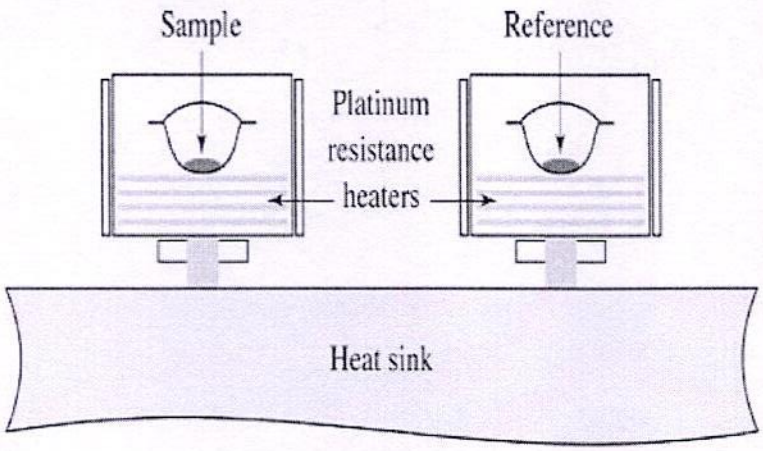


Figure 6: power compensation DSC

In power compensation DSC the temperature of the sample and reference are kept equal to each other while both

PART - B

16) Define Refractories. Give the classification of refractories with suitable examples.

Refractories:- A substance that is difficult to fuse is called a refractory. A refractory is a material which does not melt easily and its fusion temperature is very high. They are inorganic materials which can with stand high temperatures, abrasive and corrosive actions with out any deformation in shape.

Classification:- **Based on fusion temperature**, they are of 3 types:

a) Normal refractories:-They have fusion temperature in the range of 1580-1780 ^{0}C. Eg:- fire clay.
b) High refractories:- They have fusion temperature in the range of 1780-2000 ^{0}C. Eg;- chromite.
c) Super refractories:- They have fusion temperature in the range of about 2000 ^{0}C. Eg:- zircon.

Classification:- **Based on chemical composition**, they are of 3 types:

a) Acidic refractories:- They consists of acidic materials like alumina and silica. These refractory materials are resistant to acid slags and are readily attacked by basic slags.
   Eg:- Alumina, silica and fire clay refractories.
b) Basic refractories:- They consist of basic materials like CaO, MgO etc. and are resistant to basic slags. They are widely used in steel making open hearth furnaces.
   Eg:- magnesite and dolomite bricks.
c) Neutral refractories:- They are made from weakly basic or acidic materials like carbon, zirconia and chromite. Neutral refractories show resistance to the action of basic and acidic materials. They show good chemical stability.
   Eg:-graphite, zirconia and carborundum.

Classification:- **Based on oxide content**, the refractories are classified in to 3 types:

a) Single oxide refractories:- Eg:- alumina, magnesia and zirconia.
b) Mixed oxide refractories:- Eg:- zircon, spinel.
c) Non oxide refractories:- Eg:- Borides, carbides, silicides etc.

17) Write short notes on properties of refractories.

1) Refractoriness.
2) RUL. [Refractoriness Under Load]
3) Porosity.
4) Thermal spalling.
5) Dimensional stability.
6) Thermal conductivity.

1) Refractoriness:-

i) It is the ability of a material to with stand high temperature without deformation under working conditions.
ii) It is the softening temperature of the material.
iii) Higher the softening temperature, more valuable is the refractory.
iv) The prime function of a refractory is to withstand high temperatures.
v) So its softening temperature should be above the operating temperature.

Measurement of refractoriness:

It is determined by pyrometric cone or segar cone test. The test refractory in the form of a cone (38 mm height &19 mm base) is kept along with similar sized standard cones. They are heated uniformly at 100C per minute .Each standard cone is made of a particular refractory with a definite softening temperature. These standard cones are assigned

RUL test is performed to know the safe upper temperature limit up to which the refractory can be used. The RUL test is done in rectangular container by applying a load of 75 kg/cm2 on to the refractory and heating at a constant rate of 10oC per minute. During this process, the specimen will soften and its height will decrease under the load. This decrease in height is measured and when there is 10% decrease to that of original height, the temperature is noted. The RUL is then expressed as the temperature at which this 10% deformation occurs.

3) **Porosity**: It is defined as the ratio of pore volume to the bulk volume.

$P = (W- D/W- A) \times 100$

W – weight of saturated specimen in air

D – weight of dry specimen

A – weight of saturated specimen in water

It is the measure of number of pores incorporated during the manufacture of refractory bricks.
Porosity reduces strength, corrosion resistance, thermal conductivity, thermal spalling and abrasion resistance.

4) **Thermal spalling**: It is the property of breaking, cracking or peeling of refractory material under high temperature. Thermal spalling may be due to rapid change in temperature or slag penetration. A good refractory should show good resistance to thermal spalling.

Spalling can be minimised by:

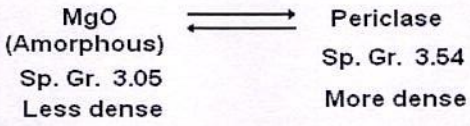
a) Avoiding sudden fluctuations in temperature.
b) Proper selection of refractory material with high thermal conductivity, uniformity and high porosity.
c) by over firing the refractory materials.
d) improved furnace design to minimise stress and strain during operation.

5) Dimensional stability (Thermal expansion & contraction):

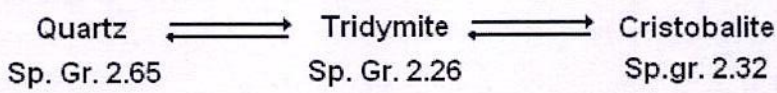
The resistance of refractory material to any change in volume due to exposure to high temperature is known as its dimensional stability. Refractories may undergo reversible or irreversible dimensional changes. Irreversible or permanent changes may be due to contraction or expansion of brick material

A good refractory should show minimum level of reversible dimensional changes with temperature.

Examples: Some materials like magnesite, chrome magnesite, fire brick shrinkage due to transformation of one crystalline form to another.



Some materials like silica bricks undergo phase transformations.



6) Thermal conductivity:-

1) The first and foremost function is to reduce friction.
2) It reduces surface deformation, wear and tear because the direct contact between the rubbing surfaces is avoided.
3) It reduces waste of energy. Hence the efficiency of the machine is enhanced.
4) It reduces expansion of metal by local frictional heat.
5) It avoids seizure of moving surfaces as the lubricant minimises the liberation of frictional heat.
6) It avoids unsmooth relative motion of moving parts.
7) It reduces the maintenance and running cost of machine, by preventing rust and corrosion.
8) It also acts as a seal.

20) Discuss the Classification of Lubricants?

Classification of Lubricants: Lubricants may be broadly classified as follows:

1) Solid lubricants : Eg:(a) Graphite, (b) Molybdenum disulphide , (c) Talc, (d) Mica.
2) Semi – solid Lubricants: (a) Greases (b) Vaseline's
3) Liquid lubricants:
   (a) Vegetable oils – eg: palm oil & castor oil
   (b) Animal oils - eg: Whale oil & lard oil
   (c) Mineral oils – eg: petroleum fractions.
   (d) Blended or compounded oils: Eg:Mineral oils with various additives to induce desired properties.
   (e) Synthetic oils – eg: Silicones.

21) Explain the different theories of the mechanism of lubrication.

Mechanism of lubrication:-

There are mainly three types of mechanisms by which lubrication takes place. They are:

1) Fluid-film lubrication (Thick-film lubrication).
2) Boundary lubrication (Thin-film lubrication).
3) Extreme pressure lubrication.

1) Fluid-film lubrication:

It is known as thick film lubrication or hydrodynamic lubrication. It is done by lubricants which are liquid in nature. The thickness of lubricants in this case is about 1000 A0, hence the name 'Thick-Film lubrication'

In this type of lubrication, the moving or sliding surfaces are separated from each other by a thick film of fluid, so that there is no direct contact between them. The lubricant film covers the irregularities of the surfaces and reduces friction and wear and tear. The resistance to movement of sliding or moving parts is due to internal resistance between the particles of the lubricant moving over each other. For this, the lubricant should have minimum viscosity under working conditions. It should remain in place and separate the surfaces.

This type of lubrication is used in delicate and light machines like watches, clocks, guns, sewing machines and in heavy machines like turbines, submarines etc. Fluid film lubrication is satisfactory done by hydrocarbon oils. Hydrocarbon oils used are generally mixed with long chain polymers in order to maintain the viscosity of the oil constant in all the season of the year.

very high temperature and pressure, the ordinary liquid lubricants either vaporises or decomposes. In such cases, extreme pressure lubrication is done.

For this, special additives are used along with the liquid lubricants. Chlorinated esters, sulphurized oils and tricrysl phosphates are some examples. These additive compounds combine with the metallic surfaces at high temperatures and form metallic chlorides, sulphides or phosphides in the form of a durable film. These films can withstand very high loads and temperatures due to their high melting point.

Extreme pressure lubricants have great advantages:

i) They are used in wire drawing machining of tough metals etc.
ii) In cutting fluids in machining of tough metals.

21) Write short notes on the following properties of lubricants: (a) Cloud and Pour point (b) Flash and Fire point. (c) Viscosity and Viscosity index. d) Aniline point.

The properties of lubricants:

1. Viscosity
2. Viscosity Index
3. Flash and Fire Point
4. Cloud and Pour Point
5. Oiliness.
6. Aniline point.

1. Viscosity:

Viscosity of lubricating oil is the property which creates internal resistance to its flows. Good lubricating oil should always have moderate viscosity. Lower the viscosity, greater the flow ability. If the viscosity of the lubricating oil is high, then restriction of moving or sliding parts of a machine will occur leading to wear and tear. Lubricating oil with low viscosity will not be able to form a film and it will be squeezed out of the machine leading to a friction.

Viscosity of oil can be determined with the help of red wood viscometer or sayboltz viscometer. Viscosity of oil is inversely proportional to its temperature.

Significance:

Viscosity helps in the selection of good lubricating oil. Viscosity helps in the selection of good lubricating oil. Light oils have low densities and easy flow abilities and are used on parts moving a high speed. Heavy oils are used on parts moving at slow speed under heavy loads.

2. Viscosity Index (V.I)

It is the rate of change of viscosity of oil with temperature . It is also called as viscosity temperature curves.
The viscosity of a good lubricating oil should not change much with change in temperature. But in general, for every 1 ^{0}C rise in temperature, the viscosity index decreases by 2%

3. Flash and Fire Point:

Flash point: It is the minimum temperature at which the lubricating oil produces enough vapor to ignite for a moment when the flame is brought near it.
Fire point: It is the minimum temperature at which the vapors of the lubricating oil burn continuously for 5 seconds when a tiny flame is brought near it.

Significance: flash and fire point determination helps in identifying a type of lubricant for particular machinery.

4. Cloud And Pour Point:

2. Argillaceous materials, Al_2O_3 and SiO_2 [such as clay, slate, shale etc.].

3. Powdered Coal or fuel oil and

4. Gypsum ($CaSO_4 . 2H_2O$).

Various stages in the manufacture of cement:

1) Mixing of raw materials:

The properly ground raw materials are mixed either by dry process or wet process.

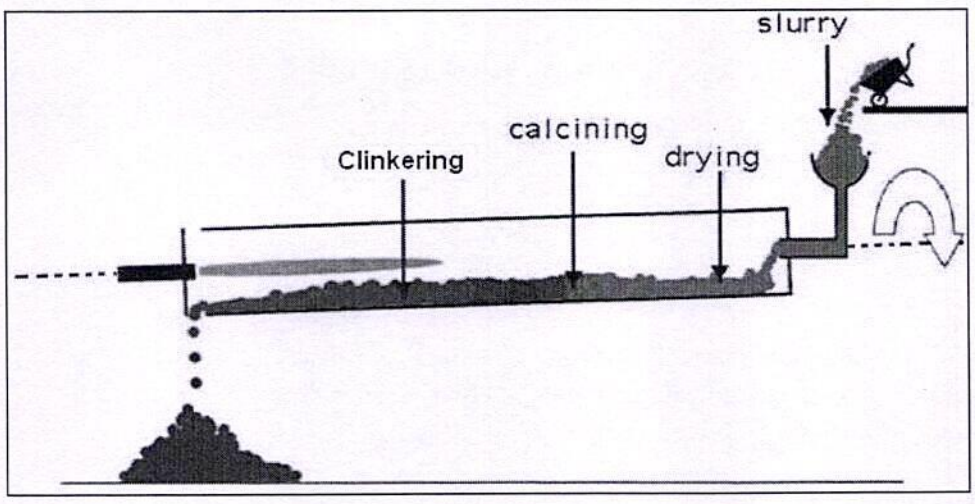
Dry process:

- This process is used for the raw materials are quite hard (cement rock or slag).
- The raw materials are crushed and ground separately to a fine powder.
- Each of these is separately stored in a separate hopper.
- The two are then mixed in required proportions to form a raw mixture which is stored in bins.

Wet process:

- In this process, the raw materials are crushed and ground to particles of suitable size and then mixed with 30 – 40% water to make it slurry by using compressed air.
- The slurry is pumped to correction basin where its composition is adjusted.
- The slurry is stored in storage tanks.
- By this method, the composition can be easily controlled.
- But this process requires more energy (fuel) than dry process since water used has to be removed.

Dry process	Wet process
✓ Slow process	✓ Relatively fast process
✓ Cost of production is less	✓ Cost of production is more
✓ Inferior quality cement is produced	✓ Superior quality cement is produced
✓ This is meant for hard materials.	✓ This is meant for soft materials.
✓ Shorter kiln is sufficient	✓ Longer kiln is required.



2) Calcination.(burning) :

initial set, the cement water paste become stiff, but the gypsum retards the dissolution of C 3 A by forming tricalcium sulphoaluminate. The insoluble tricalcium sulphoaluminate prevents too early further reactions of setting and hardening.

4. Packing:

The ground cement is stored in silos, from which it is fed to automatic packing machines.Each bag contains 50Kg of cement.

24) Explain with equations Setting and hardening of cement? (or) Write a brief account on setting and hardening of cement?

Setting and Hardening of cement:-

Cement when mixed with water forms a plastic mass called cement paste. During hydration reaction, gel and crystalline products are formed. The inter-locking of the crystals binds the inert particles of the aggregates into a compact rock like material.

This process of solidification comprises of

(i) setting and then

(ii) hardening.

Setting: Setting is defined as stiffening of the original plastic mass due to initial gel formation.

Hardening: Hardening is development of strength, due to crystallisation. Solidification of stiffened mass to form a rock like material is known as hardening.

Mostly setting requires 24 hours where as hardening requires 15 – 20 days. The setting and hardening of cement is due to hydration and hydrolysis of its constituents.

Due to the gradual progress of crystallisation in the interior mass of cement, hardening starts after setting. The strength developed by cement paste at any time depends upon the amount of gel formed and the extent of crystallisation. The setting and hardening of cement is due to the formation of inter locking crystals reinforced by rigid gels formed by the hydration and hydrolysis of the constitutional compounds.

Chemical reactions involved in setting and hardening of cement:

When the cement is mixed with water, the paste so formed becomes stiff due to hydration of tri calcium aluminate (C_3A).

$$3\,CaO\,Al_2O_3 + 6H_2O \longrightarrow 3\,CaO\,Al_2O_3\,6H_2O + 210\ cal/g$$

$$(Or)\ C_3A + 6H_2O \longrightarrow C_3A\,6H_2O + 210\ cal/g$$

- This type of hydration is not desirable because it does not allow hydration of other constituents.
- It is delayed by adding gypsum.

✓ Gypsum reacts with C_3A to form insoluble complex calcium sulpho aluminate which does not hydrate rapidly.

$$3\,CaO\,Al_2O_3 + XH_2O + YCaSO_4\,2H_2O \longrightarrow 3\,CaO\,Al_2O_3\,YCaSO_4\,ZH_2O$$

$$(Or)\ C_3A + XH_2O + YCaSO_4\,2H_2O \longrightarrow C_3A\,YCaSO_4\,ZH_2O$$

Insoluble complex

✓ Tetra calcium alumino ferrite undergoes hydration forming crystalline compound.

Effect of carbon dioxide:

If concrete is exposed to an excessive CO_2 atmosphere during the first 24 hours of life, a soft, chalk like carbonate layer is formed.

- Carbonation occurs when CO_2 from air penetrates the concrete and reacts with calcium hydroxides to form carbonates.

$$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$$

- This reaction reduces the P^H of the pure solution to as low as 8.5, at which the passive film on the steel becomes weak.

Corrosion of concrete due to carbonation occurs in the areas of construction

- Where there is more rain fall
- The area shaded from sunlight
- The rein forced steel not covered by concrete

Carbonation of concrete lowers the amount of chloride ions needed for corrosion.

- In new concrete with a P^H 12 – 13, needs 7000 – 8000ppm chloride ions to start corrosion.
- If P^H is reduced to 10 – 11 due to carbonation, 100ppm chloride ions are enough to start corrosion.

♦ Carbonation destroys passive film on the reinforcement but not influence the rate of corrosion.

Effect of sulphur dioxide:

♠ SO_2 causes deterioration of cement concrete.
♠ This process of concrete deterioration by SO_2 is called sulphation.
♠ SO_2 corrodes more than CO_2.
♠ SO_2 is converted into H_2SO_3 followed by H_2SO_4 on combination with air and moisture.
♠ This H_2SO_4 combines with lime to form $CaSO_4$ which is weak.
♠ Water containing sulphates effects concrete.
♠ Tri calcium aluminate present in cement reacts with sulphate ions in the presence of lime to form calcium sulpho aluminate hydrates (Ettringite).
♠ The Ettringite expands and creates stress in the structure.
♠ This leads to cracking followed by disintegration.

Effect of chlorides:

♣ At P^H 12 – 13 in concrete, the steel is protected by self protective layer.
♣ This layer reduces the corrosion rate.
♣ Without the protective layer, steel would corrode more.
♣ The destruction of passive layer occurs when the P^H is reduced or chloride concentration increases to certain level.
♣ Chlorides dissolved in water can permeate through concrete cracks and cause corrosion.
♣ As the concentration of chloride ions increases, corrosion of steel increases.
♣ The rate of corrosion by chloride ions is influenced by
  - Availability of oxygen
  - Electrical resistivity
  - Relative humidity of the concrete
  - P^H and Temperature

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

I Year I Semester B.Tech Course CSM Branch AC Subject

Theory ✓
Drawing
Practical

Name of Teacher (s) 1. Dr. T.V. Nagalakshmi

2.

Academic Year : 2021 – 22

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1	Monday	9:00 9:50	29/11/21	UNIT-I Polymerization, methods of polymerization. Emulsion & Suspension.	21	Saturday	2:00-2:40	18/12/21	Anodic coatings, electroplating, electroless plating nickel
2	Tuesday	3:30-4:15	30/11/21	mechanical properties, compounding of plastics.	22	Monday	9:00-9:50	20/12/21	Paints – constituents, functions & Special Pai
3	Wednesday	9:50-10:40	1/12/21	Fabrication – compression, injection, Blow film molding, extrusion moulding.	23	Tuesday	3:30-4:15	21/12/21	UNIT-III non-elemental semiconducting mate
4	Wed	10:40-11:30	1/12/21	Preparation, Properties and applications of PVC, RF Bakelite	24	Wed.	9:50-10:40	22/12/21	Stoichiometric, controlled valency & photo semiconduct photo
5	Thu	9:00-9:50	2/12/21	" " " " Bakelite	25	Thu.	9:00-9:50	23/12/21	Preparation of semiconductors – distillation, zone refining extract
6	Saturday	11:35-12:25	3/12/21	mention some examples of plastics in electronic gadgets	26	Sat	2:00-2:40	25/12/21	CZochralski crystal pulling. epitoxy,
7	Saturday	12:45-3:30	3/12/21	Recycling of e-plastic waste.	27	Monday	9:00-9:50	27/12/21	diffusion; ion implantation; p-n junction, de as rectifie
8	Sat.	2:00-2:40	4/12/21	Elastomers, Preparation, Properties & applications of	28	Wed.	9:50-10:40	29/12/21	Insulators & magnetic materials, electrical insulators
9	Monday	9:00-9:50	6/12/21	" " " polyurethane	29	Thursday	9:00-9:50	30/12/21	Ferro & Ferri magnetism – Hall effect, Applicat
10	Tuesday	3:30-4:15	7/12/21	Composite materials, Fiber reinforced plastics	30	Mon.	9:00-9:50	3/1/22	PART-B Nano materials – Sol-Gel method, SEM, TEM, BET,
11	Wednesday	9:50-10:40	8/12/21	Conducting polymers, biodegradable, bio-bio-medical Polymer	31	Tue	3:30-4:15	4/1/22	Applications of Graphene and fullerenes.
12	"	10:40-11:30	8/12/21	UNIT-II : single electrode potential, ECS and types	32	Wed	9:50-10:40	5/1/22	Types, preparation and applications of CNTs.
13	Thursday	9:00-9:50	9/12/21	SHE, calomel electrode, construction of glass electrode	33	Fri	11:35-12:25	7/1/22	Liquid crystals – Types – Applications –
14	Friday	11:35-12:25	10/12/21	Batteries – Dry cell, Li ion battery, zinc-air battery.	34	Sat.	2:00-2:40	8/1/22	Super conductors – Types-I, II applications Characteristics
15	Friday	12:45-3:30	10/12/21	Fuel cells H_2-O_2, CH_3OH-O_2, H_3PO_4 – molten carbonate	35	Mon.	9:00-9:50	10/1/22	UNIT-IV Electromagnetic spectrum – UV.
16	Monday	9:00-9:50	13/12/21	UNIT-III Definition, Theories of corrosion chemical & wet.	36	Tuesday	3:30-4:15	11/1/22	laws of absorption, instrumentation, Theory of UV
17	Tues	3:30-4:15	14/12/21	Galvanic corrosion, DAC, stress corrosion	37	Tuesday	3:30-4:15	18/1/22	Frank-Condon Principle, Chromophores, Auxochro
18	Wed.	9:50-10:40	15/12/21	Galvanic series, Factors influencing rate of corrosion.	38	Wed.	9:50-10:40	19/1/22	Intensity shifts, Applications of UV, Spectroscopy and IR
19	Thurs	9:00-9:50	16/12/21	Corrosion control – proper designing, CP.	39	Thurs	9:00-9:50	20/1/22	FT-IR instrumentation, differentiation of
20	Friday	11:35-12:25	17/12/21	Protective coatings – surface preparation cathodic coatings.	40	Friday	11:35-12:25	21/1/22	IR. Applications.

cathodic coatings.

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

Theory / **Drawing** / **Practical**

Name of Teacher (s) 1.

2.

I Year I Semester B Tech Course CSM Branch AC Subject

Academic Year

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	~~Payne~~ Day	~~Time~~ Day	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	3:30-4:15	Tuesday	25/1/22	MRI Procedure and Applications.	61				
42	9:00-9:50	Monday	31/1/22	CT scan procedure and Applications.	62				
43	9:00-9:50	Monday	7/2/22	Design, working, diagram, advantages & disadvantages of	63				
44	9:50-10:40	Wednesday	9/2/22	" " " Hydro power	64				
45	11:35-12:25	Friday	18/2/22	" " " Geothermal power	65				
46	9:00-9:50	Monday	28/2/22	" " Tidal & wave power	66				
47	2:45-3:30	Friday	4/3/22	" " ocean thermal energy conversion.	67				
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H/c Bureau →

Website: www.jntuk.edu.in
Email: dap@jntuk.edu.in

Phone: 0884-2300991
Mobile: 8008631555

Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. JNTUK/DAP/AC/MBA/MCA/I Year/2021-22 *Date: 31-12-2021*

Dr. KVSG Murali Krishna,
M.E, Ph.D.,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Revised Academic Calendar for I Year MBA/MCA
Academic year 2021-22

I SEMESTER			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**03.01.2022**		
I Unit of Instruction	**03.01.2022**	26.02.2022	8W
I Mid Examinations	21.02.2022	26.02.2022	
II Unit of Instructions	28.02.2022	23.04.2022	8W
II Mid Examinations	18.04.2022	23.04.2022	
Preparation & Practicals	25.04.2022	30.04.2022	1W
End Examinations	02.05.2022	14.05.2022	2W
Commencement of II Semester Class Work	**23.05.2022**		
II SEMESTER			
I Unit of Instructions	**23.05.2022**	16.07.2022	8W
I Mid Examinations	11.07.2022	16.07.2022	
II Unit of Instructions	18.07.2022	10.09.2022	8W
II Mid Examinations	12.09.2022	17.09.2022	
Preparation &Practicals	19.09.2022	24.09.2022	1W
End Examinations	26.09.2022	08.10.2022	2W
Commencement of next Year Class Work	**10.10.2022**		

31.12.21

Director Academic Planning

Director
Academic Planning
JNTUK Kakinada

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SRK INSTITUTE OF TECHNOLOGY

Enikepadu, Vijayawada 521108

Department of Master of Computer Applications

SRKIT / MCA / 09

RECORD OF SUBJECT WISE ALLOTMENT & RESPONSIBILITIES

Academic year: 2021-2022 **Semester: II**

S. No	Name of the Faculty	Theory subjects		Labs		Work Load / week (Periods)	Other responsibilities	Signature
		Subject Title	Branch	Lab Title	Branch			
1	Ms.M. ANITHA	HRM,DWDM	MCA	NIL	NIL	12	ISO incharge	
2	Mr.T. GANESH KUMAR	R Programming	MBA	R Lab,CN Lab	MBA,MCA	25	Project co-ordinator,network admin,Edu-skills SPOC	
3	Mr.CH. SATYANARAYANA REDDY	C	I-CE	C Lab,SEDP Lab	I-CE,MCA	6+6	Attendance,Mid marks maintenance	
4	Mr.Y. NAGA MALLESWARA RAO	NIL	NIL	DBMS Lab	MCA	3	System Admin	
5	Ms.G. KEERTHI	DS	CSM,CSD	DS Lab	CSM,CSD	12+6	Mentor-mentee system	
6	Mr.E. NAGARAJU	IRS,NOSQL	III-CSE,MCA	NIL	NIL	12+12	College Website Developer,Project co-ordinators	
7	Ms.K.PAVANI	STM,DBMS	MCA	DBMS Lab	MCA	12+3	Placement Incharge	

HoD

Principal

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Approved by AICTE, Affiliated to JNTUK, Kakinada** **(ISO 9001:2015 Certified Institution)** **Department of Master of Computer Applications** **CLASS TIME TABLE**	**SRKIT / MCA/ 10.1**

Academic Year: 2021-2022 **Class: I MCA** **Semester: II Wef: 23-5-2022**

Time	9:00 To 9:50	9:50 To 10:40	10:50 To 11:40	11:40 To 12:30	LUNCH	1:15 To 2:00	2:00 To 2:45	2:50 To 3:35
Period	1	2	3	4		5	6	7
MON	SEDP	NOSQL	DWDM	DBMS		DWDM	CN	NOSQL
TUE	SEDP	DBMS LAB				NOSQL	CN	DWDM
WED	SEDP	DWDM	DBMS	NOSQL		CN	EMPLOYABILITY SKILLS	
THU	SEDP	DBMS	DWDM	NOSQL		CN LAB		
FRI	SEDP	DBMS	NOSQL	DWDM		DBMS	CN	Counselling
SAT	SEDP	SEDP LAB				CN	DBMS	CN

SUBJECT		**FACULTY**
Database Management Systems	--	Ms.K.Pavani
Computer Networks	--	Ms.D.Nalini Kumari
Software Engineering and Design Patterns	--	Mr.Ch.SatyanarayanaReddy
Data Warehousing and Mining	--	Ms.M.Anitha
Elective-I		
•No SQL Databases	--	Mr.E.Naga Raju

Labs:

CN Lab --Ms.D.Nalini Kumari/Mr.T.Ganesh Kumar

SE &DP Lab --Mr.Ch.Satyanarayana Reddy/Mr.Y.NagaMalleswara Rao

DBMS Lab --Ms.K.Pavani/Mr.Y.NagaMalleswara Rao

M. Anitha

HOD

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Approved by AICTE, Affiliated to JNTUK, Kakinada** **(ISO 9001:2008 Certified Institution)** **Department of Master of Computer Applications** **INDIVIDUAL TIME TABLE**	**SRKIT / MCA / 10.2**

Academic Year: 2021-2022 **Class: MCA- I** **Semester: II** **Wef: 23-5-2022**

Faculty Name: Ch. Satyanarayana Reddy

Time	9:00 To 9:50	9:50 To 10:40	10:45 To 11:35	11: 35 To 12:25		1:10 To 2:00	2:00 To 2:45	2:50 To 3:35	3:35 To 4:30
Period	1	2	3	4		5	6	7	8
MON	SEDP		PPS I CIVIL						
TUE	SEDP			PPS I CIVIL					
WED	SEDP				LUNCH		PPS I CIVIL		
THU	SEDP	PPS I CIVIL							PPS I CIVIL
FRI	SEDP	← PPS LAB I CIVIL →							
SAT	SEDP	← SEDP LAB →					PPS I CIVIL		

Signature of the Faculty : Signature of the HOD : M. Anitha

Faculty Name: M. Anitha

Time	9:00 To 9:50	9:50 To 10:40	10:45 To 11:35	11: 35 To 12:25		1:10 To 2:00	2:00 To 2:45	2:50 To 3:35	3:35 To 4:30
Period	1	2	3	4		5	6	7	8
MON	HRM II MCA		DWDM IMCA			DWDM IMCA			
TUE		HRM II MCA			LUNCH			DWDM IMCA	
WED	HRM II MCA	DWDM							
THU		HRM II MCA	DWDM IMCA						
FRI		HRM II MCA		DWDM IMCA					
SAT	HRM II MCA								

Signature of the Faculty : M. Anitha Signature of the HOD : M. Anitha

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Master of Computer Applications** **TEACHING PLAN CUM REALIZATION**	**SRKIT / MCA/12**

Department: MCA **A.Y: 2021-22** Name of faculty: M.ANITHA Designation: Assistant Professor

Semester / Year: **II/I** Name of the subject: **DATA WAREHOUSING AND MINING**

S. No	Unit / Topic	Teaching Planned	Taught on (Date)	No of Periods (actual taken)	Remarks (if any deviation)
	UNIT – I				
1.	Introduction to Data mining		23/5,24/5	2	
2.	Types of Data	From:23/5/22	25/5	1	
3.	Data Quality		26.5	1	
4.	Data Processing	To:05/6/22	27/5,28/5	2	
5.	Measures of Similarity and Dissimilarity		30/5,31/5	2	
6.	Exploring Data		1/6	2	
7.	Data Set		1/6	1	
8.	Summary Statistics		2/6	1	
9.	Visualization		3/6	1	
10.	Data Warehouse		4/6	1	
11.	OLAP		6/6	1	
12.	multi dimensional data analysis.		7/6	1	
13.	Tutorial Class		8/6	1	
	UNIT -II	From: 6/6/22			
14.	Classification	To: 30/6/22	9/6	1	
15.	Basic Concepts		10/6	1	10/6

	SRK INSTITUTE OF TECHNOLOGY Enikepadu, Vijayawada 521108 Department of Master of Computer Applications TEACHING PLAN CUM REALIZATION	SRKIT / MCA/12

	Decision Trees and model evaluation		13/6,	1	
	General approach for solving a classification problem,		14/6, 15/6	2	
	Decision Tree induction		16/6	1	
	Model over fitting		17/6	1	
	due to presence of noise		18/6	1	
	due to lack of representation samples		20/6	1	
	Evaluating the performance of classifier		20/6	1	
	Nearest Neighborhood classifier		23/6	1	
	Bayesian Classifier		27/6	1	
	Support vector Machines: Linear SVM		29/6	1	
	Separable and Non Separable case.		29/6	1	
	Tutorial Class		28/6	1	4/7
	UNIT -III	From:-1/7/22			
	Problem Definition		1/7	1	
	Frequent Item-set generation	To:-27/7/22	2/7, 4/7	2	
	rule generation		5/7	1	
	compact representation of frequent item sets		6/7	1	
	FP-Growth Algorithms.		7/7, 8/7	2	
	Handling Categorical		19/7, 19/7	2	

	SRK INSTITUTE OF TECHNOLOGY Enikepadu, Vijayawada 521108 Department of Master of Computer Applications TEACHING PLAN CUM REALIZATION	SRKIT / MCA/12

	Continuous attributes		20/7, 21/7	2	
	Concept hierarchy		22/7, 25/7	2	
	Sequential		26/7, 27/7	2	
	Sub graph patterns		27/7	1	
	Tutorial Class		21/7	1	
	UNIT – IV				
	Over view		28/7	1	
	K-means	From:01/8/22	29/7	1	
	Agglomerative Hierarchical clustering		30/7	1	
	DBSCAN	To:20/8/22	1/8, 2/8	2	
39.	Cluster evaluation: overview		3/8, 4/8	2	5/8
40.	Unsupervised Cluster Evaluation using cohesion and separation		5/8	1	
41.	using proximity matrix		6/8, 8/8	2	
42.	Scalable Clustering algorithm		9/8	1	
45.	Tutorial Class		10/8	1	
	UNIT – V				
46.	Introduction	From:30/8/22	11/8	1	
47.	Web terminology and characteristics		16/8	1	
48.	Web content mining	To:9/9/22	17/8, 18/8	2	
49.	Web usage mining		19/8	1	

SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Department of Master of Computer Applications** **TEACHING PLAN CUM REALIZATION**	**SRKIT / MCA/12**

50.	web structure mining		20/8	1	
51.	Search Engines: Characteristics		22/8, 24/8	2	
52.	Functionality		25/8, 26/8	2	
53.	Architecture		29/8, 1/9	2	
54.	Ranking of WebPages		2/9	1	
55.	Enterprise search		3/9	1	10/10
62.	Tutorial Class		3/9 & 8/9	4	

TEXT BOOKS

1. **Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zak**
2. **Operating System concepts, 7th ed, Abraham Siliberschatz, Galvin, John Wiley & Sons, Inc**

Faculty/ Date M. Anitha 24/5

HOD/Date M. Anitha 24/5

Association Analysis

→ Association analysis is useful for discovering interesting relationships hidden in large data sets. The uncovered relationships can be represented in the form of association rules & sets of frequent items

Some Basic definitions:-

Apriori:- It is an algorithm that generates association rules

Association Rules:- represent relationships between individual items & item sets within the data. These are often written in {A} → {B}. format.

A market basket:- is a group of one & more items that a customer purchases in one transaction.

Confidence (c):- is an estimate of the conditional probability that one item (for example, {A}) is in the basket given that another {B} is already present.

High confidence:- rules meet & exceed a predefined confidence threshold.

→ An item is an individual unit, especially when described as part of a set, list, basket & other grouping.

Support (s):- of a individual item is "the fraction of transactions that contain [it]" & the frequentist probability with which it occurs within a set of transactions It is, therefore, an estimate of the proportion of future baskets that will contain the item.

→ An item set is any grouping of one & more items.

Frequent Item sets :- are individual item sets that meet & exceed a given minimum support threshold.

Support b/w item sets :- is an association rule that gives the frequency at which both item sets occur in the same basket. It is also an estimate of the proportion of future baskets that will contain the item sets.

Association Rule Mining :-

Given a set of transactions, find rules that will predict the occurence of an item based on the occurences of other items in the transaction.

Market-Basket Transactions :-

Tid	Items
1	Bread, Milk
2	Bread, Diaper, Beer, Eggs
3	Milk, Diaper, Beer, Coke
4	Bread, Milk, Diapes, Beer
5	Bread, Milk, Diapes, Coke.

Eg :- of Association Rules :-

{Diaper} → {Beer},

{Milk, Bread} → {Eggs, Coke},

{Beer, Bread} → {Milk},

Itemset:- A collection of one or more items.

Eg:- {Milk, Bread, Diaper}

-K-itemset :- An itemset that contains K-items.

Support Count (σ):- Frequency of occurence of an itemset.

Eg:- $\sigma(\{Milk, Bread, Diaper\}) = 2$

Support:- Fraction of transaction that contain an itemset.

Eg:- $s(\{Milk, Bread, Diaper\}) = 2/5$

Frequent Itemset:- An itemset whose support is greater than or equal to a minsup threshold

Association Rule:- An implication expression of the form $X \rightarrow Y$, where X & Y are itemsets

Eg:- {Milk, Diaper} → {Beer}

Rule Evaluation Metrics:-

Support (s):- Fraction of transactions that contain both X & Y.

Confidence (c):- Measures how often items in Y appear in transactions that contain X.

Eg:- {Milk, Diaper} → Beer

$$s = \frac{\sigma(Milk, Diaper, Beer)}{|T|} = \frac{2}{5} = 0.4$$

$$c = \frac{\sigma(Milk, Diaper, Beer)}{\sigma(Milk, Diaper)} = \frac{2}{3} = 0.67$$

Association Rule Mining Task:-

Given a set of transactions T, the goal of association rule mining is to find all rules having.

- support ≥ minsup threshold
- confidence ≥ minconf threshold.

Brute-force approach:-

- List all possible association rules.
- Compute the support & confidence for each rule
- Prune rules that fail the minsup & minconf thresholds

Mining Association Rules:-

Eg of Rules:-

{Milk, Diaper} → {Beer} (s=0.4, c=0.67)

{Milk, Beer} → {Diaper} (s=0.4, c=1.0)

{Diaper, Beer} → {Milk} (s=0.4, c=0.67)

{Beer} → {Milk, Diaper} (s=0.4, c=0.67)

{Diaper} → {Milk, Beer} (s=0.4, c=0.5)

{Milk} → {Diaper, Beer} (s=0.4, c=0.5)

Observations:-

- All the above rules are binary partitions of the same itemset {Milk, Diaper, Beer}
- Rules originating from the same itemset have identical support but can have different confidence.

→ Thus, we may decouple the support & confidence requirements.

Two-step Approach:-

1. Frequent itemset Generation:-
   - Generate all itemsets whose support ≥ minsup
2. Rule Generation:-
   - Generate high confidence rules from each frequent itemset, where each rule is a binary partitioning of a frequent itemset.

Formulation of association rule mining problem:-

In brute force approach for mining of association rule is to compute the support & confidence of every possible rule.

→ For a small dataset with d-items can form

$$R = 3^d - 2^{d+1} + 1$$

→ If no. of items $d=6$ then no. of rules, we can write as.

$$R = 3^6 - 2^{6+1} + 1 = 602$$

→ In total no. of rules we discard 80% rules because they don't support minimum support & minimum confidence.

minsup = 20%.

minconf = 50%

Eg:- Let $I = \{I_1, I_2, I_3, \text{etc}\}$ be collections of all possible items in a given environment.

Item-set:- Any subset of I is called an Item-set.

Eg:- {Bread, Diaper}, { }, {Eggs}.

→ A 'k' element subset will be called k item-set

Eg:- {beer, eggs} will be called a 2 item-set.

Disjoint item-sets:- Any two item-sets without any common item.

Eg:- {Bread, Diaper} & {Eggs, Beer} are disjoint of each other

Transactions:- Transactions are item-set in the training data using which we ~~have~~ need to figure out the association between items.

Association Rule:-

If $I1$ & I_2 are associated, then $I_1 \rightarrow I_2$

Eg:- If $I1 = \{Beer\}$ & $I_2 = \{Diaper, Eggs\}$ if they are associated, then,

$\{Beer\} \rightarrow \{Diaper, Eggs\}$

→ This means if a transaction has 'Beer'. It might have 'Diaper & Eggs' as well but not vice-versa.

→ This means if we are able to establish such rules, we can say that if Beer is bought, Diaper & Eggs

are also bought & hence all these can be kept close.

→ To know how strong the rule $I_1 \rightarrow I_2$ can be we calculate 2 things.

Let $I_1 = \{Bread\}$ & $I_2 = \{Milk\}$. we need to figure out whether Bread → Milk holds or not.

Support:- For a rule $I_1 \rightarrow I_2$, it is =

$$\frac{\text{Frequency}(I_1 \cup I_2)}{N} \text{ i.e } \frac{\text{Frequency (Item-set)}}{\text{Total Transactions}}$$

where:

N = Totals transactions

$I_1 \cup I_2 = \{Bread\} \cup \{Milk\} = \{Bread, Milk\}$

An, frequency for $\{Bread, Milk\} = 3$

$$\text{Support} = \frac{3}{5} = 0.6$$

Confidence:- For a rule $I_1 \rightarrow I_2$, it is.

Frequency $(I_1 \cup I_2)$ / Frequency (I_1) or

Frequency $(\{Bread, Milk\})$ / Frequency $(\{Bread\})$

$$= \frac{3}{4} = 0.75$$

Hence, for $\{Bread\} \rightarrow \{Milk\}$, we have

$s = 0.6$, $c = 0.75$

Apriori Algorithm:-

It is used for identifying the most frequently occuring itemsets in a dataset using the boolean association rule. Since it makes use of previous knowledge about common itemset features, the method is referred to as Apriori.

This algorithm uses two steps "join" & "prune" to reduce the search space. It is an iterative approach to discover the most frequent itemsets.

Steps in Apriori Algorithm:-

1. Join Step:- This step generates $(K+1)$ itemset from K-itemsets by joining each item with itself.

2. Prune step:- This step scans the count of each item in the database. If the candidate item does not meet minimum support, then it is regarded as infrequent & thus it is removed. This step is performed to reduce the size of the candidate itemsets.

→ Apriori algorithm is a sequence of steps to be followed to find the most frequent itemset in the given database. This data mining technique follows the join & the prune steps iteratively until the most frequent itemset is achieved. A minimum support

threshold is given in the problem & it is assumed by the user.

Step1:- In the 1st iteration of the algorithm, each item is taken as a 1-itemsets candidate. The algorithm will count the occurence of each item.

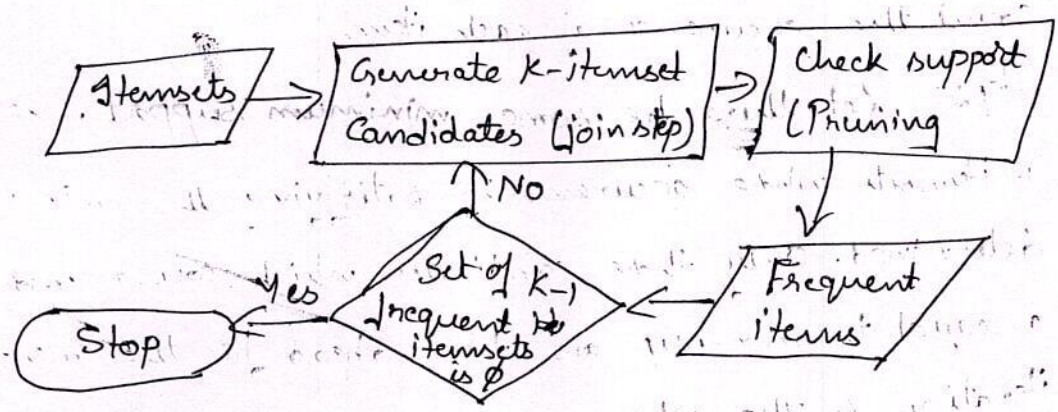
Step2:- Let there be some minimum support. The set of 1-itemsets whose occurence is satisfying the min sup are determined. Only those candidates which count more than or equal to min-sup are taken ahead for the next iteration & the others are pruned.

Step3:- Next, 2-itemset frequent items with min-sup are discovered. For this in the join step, the 2-itemset is generated by forming a group of 2 by combining items with itself.

Step4:- The 2-itemset candidates are pruned using min-sup threshold value. Now the table will have 2-itemsets with min-sup only.

Step5:- The next iteration will form 3-itemsets using join & prune step. This iteration will follow antimonotone property where the subsets of 3-itemsets, that is the 2-itemset subsets of each group fall in min-sup. If all 2-itemset subsets are frequent then the superset will be frequent otherwise it is pruned.

Step 6:- Next step will follow making 4-itemset by joining 3-itemset with itself & pruning if its subset does not meet the min-sup criteria. The algorithm is stopped when the most frequent itemset is achieved.



Eg:-

Tid	Items
T_1	I_1, I_2, I_5
T_2	I_2, I_4
T_3	I_2, I_3
T_4	I_1, I_2, I_4
T_5	I_1, I_3
T_6	I_2, I_3
T_7	I_1, I_3
T_8	$I_1, I_2, I_3 I_5$
T_9	I_1, I_2, I_3

min-sup = 2

min_conf = 60%

Step 1:- $K=1$

(i) Create a table containing support count of each item present in dataset called C1 (candidate set).

itemset	sup count
I_1	6
I_2	7
I_3	6
I_4	2
I_5	2

(ii) Compare candidate set items support count with min-sup count (here min-sup = 2. if sup-count of candidate set items is less than min-sup then remove those items). This gives us itemset L1.

itemset	sup-count
I_1	6
I_2	7
I_3	6
I_4	2
I_5	2

Step2:- $K=2$

→ Generate candidate set C2 using L1 (this is called join step). Condition of joining L_{k-1} & L_{k-1} is that it should have $(k-2)$ elements in common.

→ Check all subsets of an itemset are frequent & not if not frequent remove that itemset.

→ Now find support count of these itemsets by searching in dataset.

itemset	sup-count
I_1, I_2	4
I_1, I_3	4
I_1, I_4	1
I_1, I_5	2
I_2, I_3	4
I_2, I_4	2
I_2, I_5	2
I_3, I_4	0
I_3, I_5	1
I_4, I_5	0

→ compare candidate (C2) support with minimum support count gives us itemset L_2.

itemset	sup-count
I_1, I_2	4
I_1, I_3	4
I_1, I_5	2
I_2, I_3	4
I_2, I_4	2

I_2, I_5 2

Step 3

Step 4:

So n

found

Step 3:- Generate C_3 using L_2.

→ Check all subsets of these itemsets are frequent or not & if not remove that itemset.

$I_1\ I_2\ I_3$	2
$I_1\ I_2\ I_5$	2
$I_1\ I_3\ I_5$	1
$I_2\ I_3\ I_4$	1
$I_2\ I_4\ I_5$	1
$I_2\ I_3\ I_5$	1

→ Compare with min-sup which gives L_3.

L_3

$I_1\ I_2\ I_3$	2
$I_1\ I_2\ I_5$	2

Step 4:- Generate C_4 using L_3.

Check all subsets.

$I_1\ I_2\ I_3\ I_5$	1

It contains $I_1\ I_3\ I_5$ which is not frequent. So no items in C_4.

We stop here because no frequent itemsets are found further.

Thus, we discover all frequent itemset. Now generation of strong association rules. For this we need to calculate confidence of each rule.

Confidence = 60%.

$$\text{Conf}(A \rightarrow B) = \frac{\text{support\_count}(A \cup B)}{\text{support\_count}(A)}$$

Itemset $\{I_1, I_2, I_3\}$ // from L3.

So rules can be

$I_1 \wedge I_2 \Rightarrow I_3 \Rightarrow$ confidence $= \frac{\sup I_1 \wedge I_2 \wedge I_3}{\sup I_1 \wedge I_2} = \frac{2}{4} * 100 = 50\%$

$I_1 \wedge I_3 \Rightarrow I_2 \Rightarrow c = \frac{\sup I_1 \wedge I_2 \wedge I_3}{\sup I_1 \wedge I_3} = \frac{2}{4} * 100 = 50\%$

$I_2 \wedge I_3 \Rightarrow I_1 \Rightarrow c = \frac{\sup I_1 \wedge I_2 \wedge I_3}{\sup I_2 \wedge I_3} = \frac{2}{4} * 100 = 50\%$

$I_1 \Rightarrow I_2 \wedge I_3 \Rightarrow c = \frac{\sup I_1 \wedge I_2 \wedge I_3}{\sup I_1} = \frac{2}{6} * 100 = 33\%$

$I_2 \Rightarrow I_1 \wedge I_3 \Rightarrow c = \frac{\sup I_1 \wedge I_2 \wedge I_3}{\sup I_2} = \frac{2}{7} * 100 = 28\%$

$I_3 \Rightarrow I_1 \wedge I_2 \Rightarrow c = \frac{\sup I_1 \wedge I_2 \wedge I_3}{\sup I_3} = \frac{2}{6} * 100 = 33\%$

So if min-con is 50% then first 3 rules can be considered as strong association rules.

Eg:-

FP-

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the

FP

tra

Aws'4 rules min-sup = 3

Eg:-

TID	items
1	Hot Dogs, Buns, Ketchup
2	Hot Dogs, Buns
3	Hot Dogs, Coke, chips
4	Chips, Coke
5	Chips, Ketchup
6	Hot Dogs, Coke, Chips

min-sup = 33.33 / 100 x =

s = 33.33% c = 60%

$$min\text{-}sup = \frac{33.33}{100} \times 6 = 2.$$

— X —

FP- growth algorithm:-

FP- growth avoids the (representation) repeated scans of the database of Apriori by using a compressed representation of the transaction database using a data structure called FP-tree.

→ Once an FP-tree has been constructed, it uses a recursive divide-and-conquer approach to mine the frequent itemsets.

FP-tree:-

1) FP-tree is a compressed representation of the transaction database.

Now generation to calculate

3)

1/3 = 2/4 *100 = 50%

= 2/4 *100 = 50%

= *100 = 50%

2/6 * 100 = 33%

= 2/7 *100 = 28%

2/6 *100 = 33%

les can be

2. Each transaction is mapped onto a path in the tree.

3. Each node contains an item & the support count corresponding to the number of transactions with the prefix corresponding to the path from root

4. Nodes having the same item label are cross-linked, this helps finding the frequent itemsets ending with a particular item.

FP-tree construction:-

Eg:-

TID	Items
1	{A, B}
2	{B, C, D}
3	{A, C, D, E}
4	{A, D, E}
5	{A, B, C}
6	{A, B, C, D}
7	{B, C}
8	{A, B, C}
9	{A, B, D}
10	{B, C, E}

After

After

B:1

After

After

path in

support

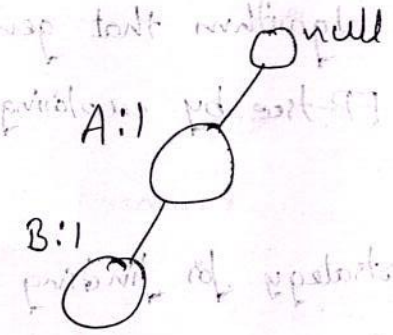
ansactions

- from root

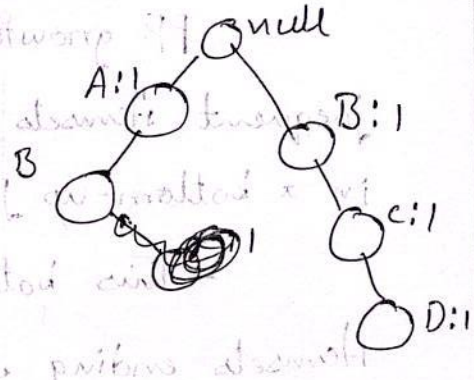
are

ent itemsets

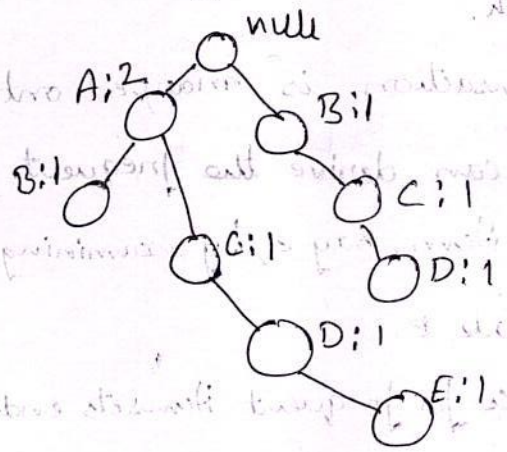
After reading TID=1



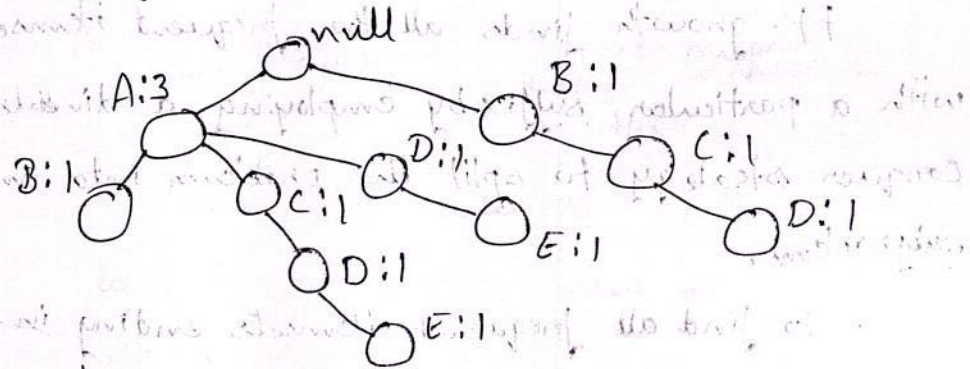
After reading TID=2



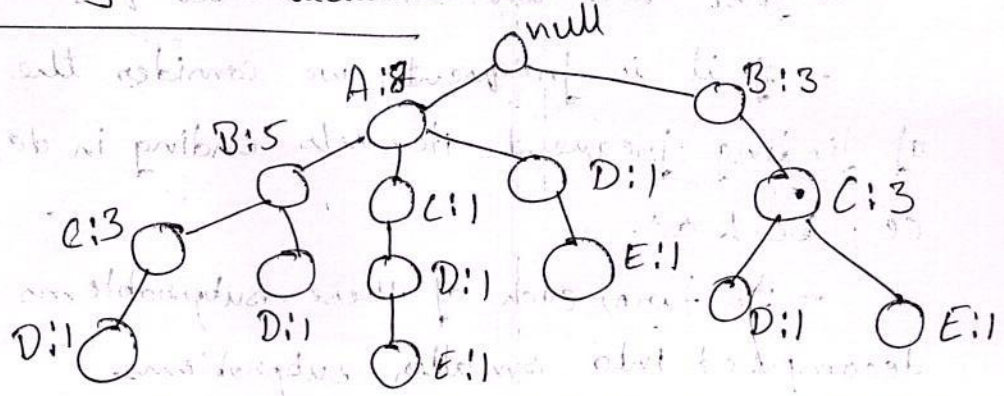
After reading TID=3



After reading TID=4



After reading all transactions:-



Frequent Itemset Generation in FP-Growth Algorithm:-

FP-growth is an algorithm that generates frequent itemsets from an FP-tree by exploring the tree in a bottom-up fashion.

- This bottom-up strategy for finding frequent itemsets ending with a particular item is equivalent to the suffix-based approach.

- Since every transaction is mapped onto a path in the FP-tree, we can derive the frequent itemsets ending with a particular item, say e, by examining only the paths containing node e.

- The algorithm looks for frequent itemsets ending in first, followed by d, c, b & finally a.

FP-growth finds all the frequent itemsets ending with a particular suffix by employing a divide-and-conquer strategy to split the problem into smaller subproblems.

- To find all frequent itemsets ending in e, we must first check whether the itemset {e} itself is frequent.

- If it is frequent, we consider the subproblem of finding frequent itemsets ending in de, followed by ce, be & ae.

- In turn, each of these subproblems are further decomposed into smaller subproblems.

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-By merging the solutions obtained from the subproblems, all the frequent itemsets ending in e can be found.

Finding Frequent itemsets Ending with e:-

1. The first step is to gather all the paths containing node e. These initial paths are called prefix paths.
2. From the prefix paths, the support count for e is obtained by adding the support counts associated with node e. Assuming that the minimum support count is 2, {e} is declared a frequent itemset because its support count is 3.
3. Because {e} is frequent, the algorithm has to solve the subproblems of finding frequent itemsets ending in de, ce, be & ae. Before solving these subproblems, it must first convert the prefix paths into a conditional FP-tree, which is structurally similar to an FP-tree, except it is used to find frequent itemsets ending with a particular suffix.

-First, the support counts along the prefix paths must be updated because some of the counts include transactions that do not contain item e.

-The prefix paths are truncated by removing the nodes for e.

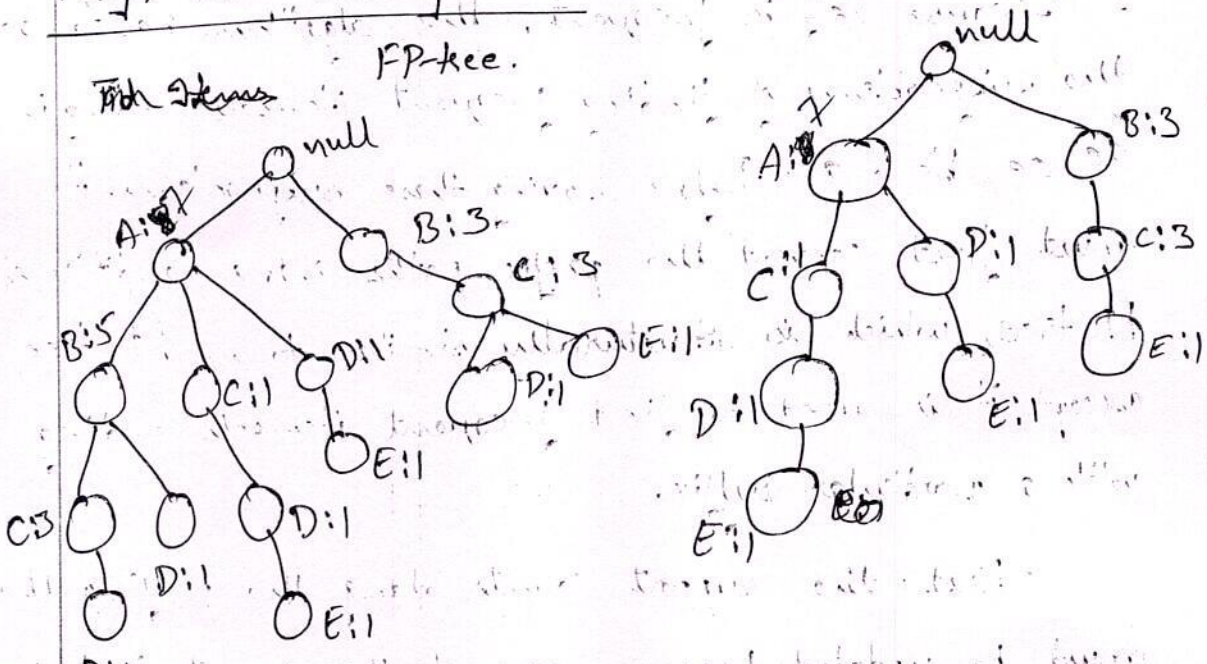
- After updating the support counts along the prefix paths, some of the items may no longer be frequent.

• the node b appears only once & has a support count equal to 1, which means that there is only one transaction that contains b & i.e. Item b can be safely ignored from subsequent analysis because all itemsets ending in 'be' must be infrequent.

4. FP-growth uses the conditional FP-tree for e to solve the subproblems of finding frequent itemsets ending in de, ce & ae.

Prefix Paths Ending with e:-

FP-tree.



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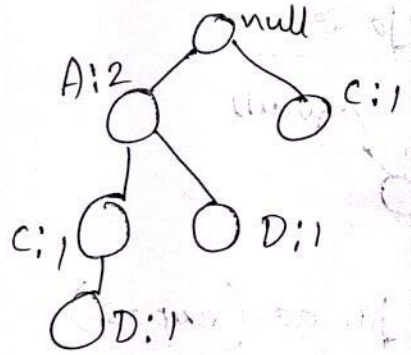
B:3
C:3
E:1
:1

To create conditional FP-tree for c.

1.) Update support counts because paths without e are removed.

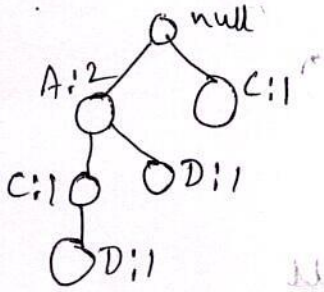
2.) e is frequent. (sup=3), Remove e nodes from prefix paths.

3.) Remove infrequent nodes.

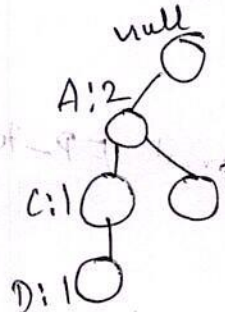


Conditional FP-tree for de:-

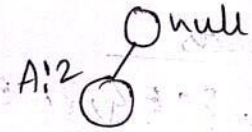
minsup = 2



Prefix paths ending with de

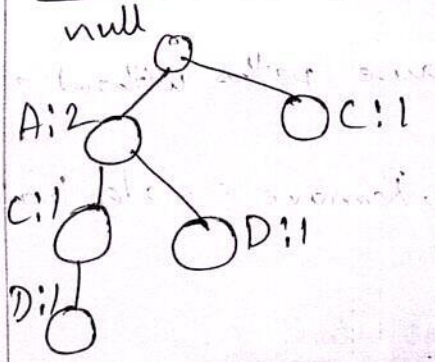


Conditional FP-tree for de:

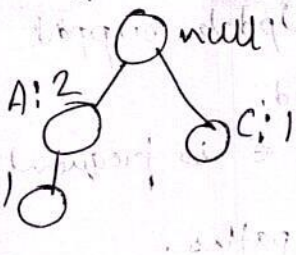


de is frequent (support=2)

Conditional FP-tree for ce:-

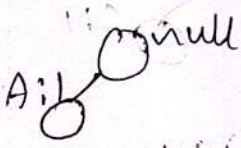


Prefix Paths ending with ce

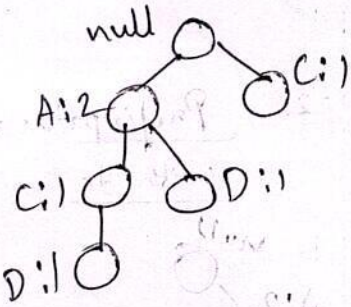


minsup=2

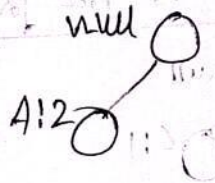
Conditional FP-tree for ce:-



Conditional FP-tree for ae. (sup:=2)



Prefix paths ending with ae.



Conditional FP-tree for ae.

null

Frequent Itemsets ordered by suffixes:-

Suffix	Frequent itemsets
E	{E}, {DE}, {A D E}, {CE}, {A,E}
D	{D}, {C D}, {B C D}, {A C D} {B D} {A B D} {A D}
C	{C} {B C} {A B C} {A, C}
B	{B}, {A, B}
A	{A}

PROGRAMME OF INSTRUCTION ACCORDING TO TIME TABLE AND ALMANC

I Year II Semester MCA Course _____ Branch DWDM Subject

Theory ✓
Drawing
Practical

Name of Teacher (s) 1. M. ANITHA
2.

Academic Year 2021-22

Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1	Mon	10:50	23/5	U-I Introduction	21	Thu	10:50	16/6	Decision Tree Induction
2	Tue	2:50	24/5	to Data Mining	22	Fri	11:35	17/6	Model over fitting
3	Wed	9:50	25/5	Types of Data	23	Sat	1:10	18/6	Evaluating classifier
4	Thu	10:50	26/5	Data Quality	24	Mon	10:50	20/6	Nearest Neighborhood
5	Fri	11:35	27/5	} Data Preprocessing	25	Mon	2:00	20/6	} Bayesian classifier
6	Sat	1:10	28/5	}	26	Tue	2:50	21/6	} Examples
7	Mon	10:50	30/5	} Measures of Similarity	27	Wed	9:50	22/6	SVM:- Linear
8	Tue	2:50	31/5	} & Dissimilarity	28	Thu	10:50	23/6	Separable & Non
9	Wed	9:50	1/6	Data Sets	29	Mon	10:50	27/6	Separable case
10	Thu	10:50	2/6	Summary Statistics	30	Tue	2:50	28/6	Tutorial class 1/7
11	Fri	11:35	3/6	Visualization	31	Wed	9:50	29/6	U-III Association Problem
12	Sat	1:10	4/6	Data warehouse	32	Thu	10:50	30/6	Frequent Item Set
13	Mon	10:50	6/6	} OLAP & multidimensional	33	Fri	11:35	1/7	Rule generation
14	Tue	2:50	7/6	} data Analysis.	34	Sat	1:10	2/7	} Compact representation
15	Wed	9:50	8/6	Tutorial class 8/6	35	Mon	10:50	4/7	} of frequent itemsets
16	Thu	10:50	9/6	U-II Classification Basics	36	Tue	2:50	5/7	} FP-growth Algorithms
17	Fri	11:35	10/6	Decision Tree	37	Wed	9:50	6/7	}
18	Mon	10:30	13/6	Evaluation	38	Thu	10:50	7/7	Handling Categorical
19	Tue	2:50	14/6	General approach for solving	39	Fri	11:35	8/7	Continuous attributes
20	Wed	9:50	15/6	a classification problem	40	Tue	2:50	19/7	Concept hierarchy

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Sl. No.	Periods			Topic Covered	Sl. No.	Periods			Topic Covered
	Day	Time	Date			Day	Time	Date	
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
41	Tue	3:35	19/7	Sequential data	61	Tue	2:50	16/8	Web Terminology
42	Wed	9:50	20/7	Sub graph patterns.	62	Wed	9:50	17/8	Characteristics
43	Thu	11:35	21/7	Tutorial class.	63	Thu	10:50	18/8	Web Content Mining
44	Fri	11:35	22/7	U-IV Clustering overview	64	Fri	11:35	19/8	Web Usage Mining
45	Mon	10:50	25/7	2 K-Means Algorithms	65	Sat	3:35	20/8	Web Structure Mining
46	Tue	2:50	26/7	1 Example	66	Mon	9:50	22/8	Search Engines
47	Wed	9:50	27/7	Agglomerative & Divisive	67	Wed	9:50	24/8	Characteristics
48	Thu	10:50	28/7	Hierarchical	68	Thu	10:50	25/8	Functionality
49	Fri	11:35	29/7	Clustering Algorithm	69	Fri	11:35	26/8	Architecture
50	Sat	2:00	30/7	DBScan Alg.	70	Sat	2:00	27/8	Ranking of Web Pages
51	Mon	10:50	1/8	Evaluation - Overview	71	Thu	10:50	1/9	2 Enterprise Search
52	Tue	2:50	2/8	Unsupervised Evaluation	72	Fri	11:35	2/9	1
53	Wed	9:50	3/8	Using Cohesion	73	Sat	2:00	3/9	Tutorial class
54	Thu	10:50	4/8	Using Separation	74	Mon	10:50	5/9	Revision-1
55	Fri	11:35	5/8	Using Proximity matrix	75	Tue	2:50	6/9	Revision-2
56	Sat	2:00	6/8		76	Thu	10:50	8/9	Revision-3 10/9
57	Mon	10:50	8/8	Scalable clustering Algorithm	77				
58	Tue	2:50	9/8		78				
59	Wed	9:50	10/8	Tutorial class	79				
60	Thu	10:50	11/8	U-IV Web data mining	80				