	Lakireddy Balireddy College of Engineering College L.B.Reddy Nagar, Mylavaram , Krishna District, A.P **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**				
	LESSON PLAN				
	Subject **:**	**ADVANCED SENSORS(AS) - T106**			
	Academic Year :	**2016-17**	Semester :	**VIII**	**Date: 15.12.2016**
	Year :	**IV(2013-17)**	Section :	**--**	**To** **15.04.2017**

T106 – ADVANCED SENSORS

Lecture: 7 Periods/week **Internal Marks : 25**

Tutorial: 1 **External Marks : 75**

Credits : 4 **External Examination : 3**

Hrs

UNIT - I

SEMICONDUCTOR SENSORS: Metal Oxide Semiconductors, Hall Elements, Silicon Sensors, Silicon plannar technology, Micromachine technology, silicon sensors for sensing radiation, mechanical, magnetic, chemical and other signals, IC sensors.

UNIT - II

CHEMICAL AND BIOMEDICAL SENSORS: Polymers, chemically modified electrodes, Membrane electrodes, Thick Film Devices, catalytic devices, Gas sensors.

OPTICAL SENSORS: Lasers, photo-detectors and optical fibre as sensors, Integrated optics

UNIT - III

MICRO SENSORS: Thin film sensors, Micro sensors for sensing thermal Radiation, Mechanical, Magnetic and Chemical signals.

UNIT - IV

INTERFACING AND SIGNAL PROCESSING: Intelligent and smart sensors, concepts of redundant and multi – sensory systems, operation in coded mode and mapping mode.

UNIT - V

SMART SENSORS : Basics of smart sensors, salient features of smart sensors, various components in smart sensors, TEDS, IEEE-1451 standards.

TEXT BOOK

Middle Hock S and Andel SA – Silicon Sensors, Academic Press, London, 1989

REFERENCES

1. Chemical Sensors Edmonds TE - , Blackie London 1988
2. Patranabis D – Sensors and Transducers, Wheeler Publishing

Pre-requisite:

- Students should have a good knowledge in EDC,SENSORS & MEMS

ADVANCED SENSORS

Course Educational Objectives(CEOs):

To make students familiar with:

- Fundamental concepts of Silicon based Sensors
- Fabrication process of MEMS, Bulk Micromachining: Etching-Isotropic & Anisotropic, Wet Etching & Dry etching (Plasma, Deep reactive ion) comparison.
- Design & analysis the characteristics of MICRO Sensors for different signals like Magnetic, Mechanical & chemical
- Interfacing of Smart sensors & operations in different coded modes
- Adequate knowledge on Various types of Smart sensors
- Smart sensor standards such as TEDS, IEEE-1451 standards

Course Outcomes(COs):

By the completion of the course, the students are able to:

CO1: Understand the properties of the different semiconductor materials & different fabrication methods using planar technology & Micromachining

CO2: Analyze the different advanced material & techniques used in various areas

CO3: Judge whether a micro system is the right solution for a given application

CO4: Describe & perform calculations of micro systems for different signals like Radiation, Mechanical, Magnetic & Chemical

CO5: Comprehend the operating principles, characteristics and advantages of fibre optic sensors & obtain an overall view of the chemical, biological and medical fibre sensors and their trends

CO6: Evaluate current developments and potential future directions in sensing techniques and measurement system design.

Mapping Course Outcomes with Programme Outcomes:

Course Code	Unit	Course Outcomes							Programme Outcomes										
		1	2	3	4	5	6	7	a	b	c	d	e	f	g	h	i	j	k
T-106	I											2	3				2		
	II											3					2		
	III															2			
	IV										2								

	V											2					2		

1=Slightly (Low) **2=Moderate (Medium)** **3=Substantially (High)**

S.No	Teaching Learning Process (TLP)	Delivery Methods (DM)	Assessment Methods (AM)
1	Solving Real world problem	Chalk & Talk	Assignments
2	Explaining application before theory	ICT tools	Quiz
3	Solving problems	Group discussions	Tutorials
4	Designing of experiments	Industrial visit	Surprise Tests
5	Problems on environmental, economics, health & safety	Field work	Mid Exams
6	Problems on professional & ethics	Case studies	Model Exam
7	Seminar	Mini Projects	QAs
8	Problems using software000	Numerical treatment	
9	Self study	Design / Exercises	

Detailed Lesson Plan

S.NO	TOPIC TO BE COVERED	Date		TLP	DM	AM
		Tentative	Actual			
UNIT –I:						
1	Introduction to subject	15-12-2016		2	1	1,3, 5,7
2	Basic Introduction to Advanced sensors	16-12-2016		2	1	

3	Semiconductors definition & types	16-12-2016		2	1	
4	Semiconductor materials & their properties	19-12-2016		2	1	
5	List of semiconductor components	19-12-2016		2	1	
6	Metal oxide semiconductor	20-12-2016		2	1	
7	Hall effect working principle	21-12-2016		2	1	
8	**Tutorial-1**	21-12-2016				
9	Hall Sensor materials features & applications	22-12-2016		2	1	
10	Silicon Planar technology	26-12-2016		2	1	
11	**Tutorial-2**	26-12-2016				
12	Micromachining Bulk & surface	27-12-2016		2	1	
13	Radiation sensors	28-12-2016		2	1	
14	Magnetic sensors & Chemical Sensor	28-12-2016		2	1	
15	**Tutorial-3**	30-12-2016				
16	IC sensors	02-01-2017		2	1,2	
17	**Assignment-I**	02-01-2017				
UNIT –II:						
18	**Unit-2**:Chemical & Biomedical Sensors	03-01-2017				1,3, 5,7
19	Polymers	04-01-2017		2	1	
20	Chemically modified electrodes	04-01-2017		2	1	
21	Membrane & thick film electrodes	05-01-2017		2	1	
22	Gas sensor	06-01-2017		2	1	
23	**Tutorial-4**	06-01-2017				
24	Lasers	16-01-2017		2	1	
25	Optical Fibre as a Sensor	16-01-2017		2	1	

26	Integrated Optics	17-01-2017		2	1	
27	Revision	18-01-2017		2	1	
28	**Assignment-II**	18-01-2017				
	I-MID Exams	**09-02-2017** **To** **11-02-2017**				
UNIT –III:						
29	**Unit-3:**Introduction to MEMS sensors	19-01-2017		2	1	1,3, 5,7
30	Thin film sensors	19-01-2017		2	1	
31	Micro sensors for sensing thermal Radiation	20-01-2017		2	1	
32	Micro sensors for Mechanical signals	20-01-2017		2	1	
33	**Tutorial-5**	23-01-2017				
34	Micro sensors for Magnetic signals	23-01-2017		2	1	
35	Micro sensors for chemical signals	24-01-2017		2	1	
36	**Assignment-III**	25-01-2017				
UNIT –IV:						
37	**Unit-4:**Introduction to Interfacing & signal processing	25-01-2017		2	1	
38	Intelligent and smart sensors			2	1	
39	**Tutorial-6**	27-01-2017				
40	Intelligent and smart sensors	27-01-2017		2	1	
41	Concepts of redundant and multi – sensory systems	30-01-2017		2	1	
42	Concepts of redundant and multi – sensory systems	30-01-2017		2	1	

43	Concepts of redundant and multi – sensory systems	31-01-2017		2	1	
44	**Tutorial-7**	01-02-2017				1,3, 5,7
45	Operation in coded mode	01-02-2017		2	1	
46	Operation in coded mode	03-02-2017		2	1	
47	Operation in mapping mode	03-02-2017		2	1	
48	Operation in mapping mode	06-02-2017		2	1	
49	**Tutorial-8**	06-02-2017				
50	**Assignment-IV**	07-02-2017				
UNIT –V:						
51	**Unit 5:I**ntroduction Smart Sensors	08-02-2017		2	1,2	
52	Basics of smart sensors	13-02-2017		2	1	
53	Smart sensors types	13-02-2017		2	1	
54	Salient features of smart sensors	14-02-2017		2	1	
55	**Tutorial-9**	15-02-2017				
56	Various components in smart sensors	15-02-2017		2	1	
57	Various components in smart sensors	16-02-2017		2	1	
58	TEDS Standards	17-02-2017		2	1	
59	TEDS Standards	17-02-2017		2	1	
60	**Tutorial-10**	20-02-2017				
61	IEEE-1451 standards	20-02-2017		2	1	
62	IEEE-1451 standards	21-02-2017		2	1	
63	**Assignment-V**	22-02-2017				
64	**Revision**	22-02-2017				
65	**Revision**	23-02-2017				

66	**Revision**	24-02-2017				1,3, 5,7
67	**Revision**	24-02-2017				
68	**Revision**	27-02-2017				
69	**Revision**	27-02-2017				
70	**Revision**	28-02-2017				
71	**Revision**	01-03-2017				
72	**Revision**	01-03-2017				
73	**UNIT-1 Test**	02-03-2017				
74	**UNIT-2 Test**	03-03-2017				
75	**UNIT-3 Test**	06-03-2017				
76	**UNIT-4 Test**	08-03-2017				
77	**UNIT-5 Test**	10-03-2017				
	II-MID EXAMS	**17-04-2017 TO 19-04-2017**				

Assessment Summary:

Assessment Task	Weightage (Marks)	**Course Outcomes**						
		CO1	CO2	CO3	CO4	CO5	CO6	CO7
Assignments	--							
Quizzes	--							
Tutorials	--							
Surprise Tests	--							
Mid Exams	20							

Model Exams	--							
End Exam	75							
Attendance	05							
Total	100							

	Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Name	**Ms.D.Venkata Lakshmi** **(Assistant Professor)**	**Mr.M.Vasu Babu** **(Associate Professor)**	**Mr.M.Vasu Babu** **(Associate Professor)**	**Mr.R.A.Naik** **(Associate Professor)**
Sign with Date				

	LakireddyBalireddy College of Engineering College L.B.Reddy Nagar, Mylavaram , Krishna District, A.P **DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING**				
	LESSON PLAN				
	Subject **:**	**BIO MEDICAL INSTRUMENTATION - T128**			
	Academic Year :	**2016-17**	Semester :	**VIII**	**Date: 15.12.2016**
	Year :	**IV (2013-17)**	Section :		**To 15.04.2017**

T128 – BIOMEDICAL INSTRUMENTATION

Lecture	:	3 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT-I

Components of medical instrumentation system, Bio signals, Static& Dynamic characteristics, Bio Amplifier, Problems with components of Medical system, Cell structure, Nernst equation, Action and Resting potentials.

UNIT-II

Bio-potential electrodes, Bio chemical electrodes, Internal Electrodes, External electrodes

UNIT-III

ECG-Heart cardiac cycle, Electrical & Mechanical activities of heart, Cardiovascular system,

ECG Recorder, Einthoven triangle(12-Lead configuration),Blood Pressure measurement, Blood Flow Measurement, Electrodes for ECG.

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UNIT-IV

Pacemaker, Defibrillators, Short wave Diathermy, Hemo-Dialysis, EEG-Anatomy, Recorders, Electrodes for EEG, Electrode-placement, EMG introduction ,Recorder, Electrodes for EMG

UNIT-V

Respiration, Spirometry, Pneumotachograph, Ventilators

TEXT BOOKS

Bio medical instrumentation&Measurements-2nd edition by leslie chromwell,fred j.weibell, erich a.Pfeiffer phi, Publishers

REFERENCES

1. Bio medical instrumentation-Armugam
2. Medical instrumentation application &design-3rd edition by jhon g.webster, editor jhon wiley.

Pre-requisite:

Course Educational Objectives(CEOs):

In this course student will learn about

1. Medical instrumentation system and problems with components of medical instrumentation system.
2. Different types of electrodes used in bio-potential recording.
3. Physiology , bio electric potentials generated by Cardiovascular system and measurement of blood pressure, blood flow.
4. Therapeutic, Prosthetic devices and bio electric potentials generated by nervous system.
5. Physiology and Instrumentation concerned with respiratory system.

Course Outcomes(COs):

At the end of the course student will be able to

CO1: Understand Medical instrumentation system (1)

CO2: Understand Physiology and instrumentation concerned with respiratory system.(2)

CO3: Know the importance of Therapeutic, Prosthetic devices and measure bio electric potentials generated by nervous system.(3)

CO4: Classify electrodes used in bio-potential recording.(4)

CO5: Measure bio electric potentials generated by Cardiovascular systems, blood pressure and blood flow(5)

Mapping Course Outcomes with Programme Outcomes:

Course Code	CO'S	PO'S									
		a	b	c	d	e	f	g	h	i	j	k
T128	CO1	3								3		
	CO2					1				3		
	CO3					3						
	CO4									3		
	CO5	3								3		

S.No	Teaching Learning Process (TLP)	Delivery Methods (DM)	Assessment Methods (AM)
1	Solving Real world problem	Chalk & Talk	Assignments
2	Explaining application before theory	ICT tools	Quiz
3	Solving problems	Group discussions	Tutorials
4	Designing of experiments	Industrial visit	Surprise Tests
5	Problems on environmental, economics, health & safety	Field work	Mid Exams
6	Problems on professional & ethics	Case studies	Model Exam
7	Seminar	Mini Projects	QAs
8	Problems using software	Numerical treatment	
9	Self study	Design / Exercises	

Detailed Lesson Plan

S.NO	TOPIC TO BE COVERED	Date		TLP	DM	AM
		Tentative	Actual			
1	Introduction to Bio Medical Instrumentation	15-12-2016		2	1	
UNIT –I:						
2	Components of Man-instrumentation System	15-12-2016		2	1	1,3,5,7
3	Bio Signals	16-12-2016		2	1	

4	Types of Bio Signals	19-12-2016		2	1	
5	Static Characteristics	20-12-2016		2	1	
6	Dynamic Characteristics	20-12-2016		2	1	
7	Bio-Amplifier	21-12-2016		2	1,	
8	Bio Amplifier Requirements.	21-12-2016		2	1,	
9	**Tutorial class-1**	22-12-2016		2	1,	
10	Problems with components of Medical System	22-12-2016		2	1	
11	Problems-Artifacts,Energy Limitations	23-12-2016		2	1	
12	**Cell Structure**	26-12-2016		2	1	
13	Action Potential	27-12-2016		2	1	
14	Resting Potential	27-12-2016		2	1	
15	Nernest Equation	28-12-2016		2	1	
UNIT –II						
16	**Introduction**	28-12-2016		2	1	1,3,5,7
17	Electrode Theory	29-12-2016		2	1	
18	Bio potential Electrodes-Micro Electrodes	29-12-2016		2	1	
19	Bio potential Electrodes-Skin surface Electrodes	30-12-2016		2	1	
20	Bio potential Electrodes-Needle Electrodes	02-01-2017		2	1	
21	Bio chemical Electrodes-Reference Electrodes	03-01-2017		2	1	
22	Bio chemical Electrodes-pHElectrode	03-01-2017		2	1	
23	Bio chemical Electrodes-Blood gas electrodes.	04-01-2017		2	1	
24	Bio chemical Electrodes-Specific ion Electrodes	04-01-2017		2	1	
25	Internal Electrodes	05-01-2017		2	1,	
UNIT –III						

26	Introduction to cardiovascular circulation	05-01-2017		2	1	
27	Cardiovascular circulation	06-01-2017		2	1	
28	Mechanical activities of heart	09-01-2017		2	1	
29	**I-MID Exams**	10-01-2017		2	1	
30	**I-MID Exams**	11-01-2017		2	1	
31	**I-MID Exams**	11-01-2017		2	1	
32	**I-MID Exams**	12-01-2017		2	1	
33	**I-MID Exams**	12-01-2017		2	1	
34	Electrical Activities of heart	17-01-2017		2	1	
35	Heart cardiac cycle	17-01-2017		2	1	
36	Electrocardiography(ECG)	18-01-2017		2	1	
37	Electrodes for ECG	18-01-2017		2	1	
38	ECG-12 lead configuration	19-01-2017		2	1	1,3,5,7
39	Einthoven Triangle	19-01-2017		2	1	
40	B.P Measurement-Indirect Methods	20-01-2017		2	1	
41	B.P Measurement-Automated Indirect Methods	23-01-2017		2	1	
42	B.P Measurement-Direct Methods	24-01-2017		2	1	
43	B.P Measurement-implantation of transducers	24-01-2017		2	1	
44	Blood Flow measurement-Electromagnetic, ultrasonic methods	25-01-2017		2	1	1,3,5,7
45	Blood Flow measurement-Thermal convection	25-01-2017		2	1	
46	Blood Flow measurement- Indicator dilution methods	27-01-2017		2	1	
UNIT –IV						
47	Introduction to Pacemakers	30-01-2017		2	1	

48	Types of Pacemakers	31-01-2017		2	1	
49	Defibrillators	31-01-2017		2	1	
50	DC Defibrillator Circuit	31-01-2017		2	1	
51	GATE PREPARATION	01-02-2017		2	1	
52	GATE PREPARATION	01-02-2017		2	1	
53	GATE PREPARATION	02-02-2017		2	1	
54	GATE PREPARATION	02-02-2017		2	1	
55	GATE PREPARATION	03-02-2017		2	1	
56	GATE PREPARATION	06-02-2017		2	1	
57	GATE PREPARATION	07-02-2017		2	1	
58	GATE PREPARATION	07-02-2017		2	1	1,3,5,7
59	GATE PREPARATION	08-02-2017		2	1	
60	GATE PREPARATION	08-02-2017		2	1	
61	GATE PREPARATION	09-02-2017		3	1	
62	GATE PREPARATION	09-02-2017		2	1	
63	GATE PREPARATION	10-02-2017		2	1	
64	Short wave diathermy	13-02-2017		2	1	
65	Tutorial class-II	14-02-2017		2	1	
66	EEG Anatomy	14-02-2017		2	1	1,3,5,7
67	Electrodes for EEG	15-02-2017		2	1	
68	EMG-Introduction	15-02-2017		2	1	
69	EMG-Recorder	16-02-2017		2	1	
70	EMG- Electrodes for EMG	16-02-2017		2	1	
71	Hemo-dialysis	17-02-2017		2	1	
72	Description of Hemo-dialysis	20-02-2017		2	1	
73	**Tutorial class-3**	21-02-2017		2	1	

UNIT-V						
74	Introduction to respiration	21-02-2017		2	1	
75	Mechanism of respiration	22-02-2017		2	1	
76	Lung Volumes	22-02-2017		2	1	
77	Lung Capacities	23-02-2017		2	1	
78	**Tutorial class-4**	23-02-2017		2	1	
79	Instrumentation for measuring breathing	27-02-2017		2	1	
80	Spirometers	28-02-2017		2	1	
81	Spirogram	28-02-2017		2	1	
82	Pneumotachograph	01-03-2017		2	1	
83	**Tutorial class-5**	01-03-2017		2	1	
84	Repetition class	02-03-2017		2	1	
85	Repetition class	02-03-2017		2	1	
86	Repetition class	03-03-2017		2	1	
87	Repetition class	06-03-2017		2	1	
88	Repetition class	07-03-2017		2	1	
89	Repetition class	07-03-2017		2	1	1,3,5,7
90	Repetition class	08-03-2017		2	1	
91	Repetition class	10-03-2017		2	1	
92	Repetition class	10-03-2017		2	1	
93	Repetition class	13-03-2017		2	1	
94	Repetition class	14-03-2017		2	1	
95	Repetition class	14-03-2017		2	1	
96	Main project Preparation	15-03-2017		2	1	
97	Main project Preparation	15-03-2017		2	1	
98	Main project Preparation	16-03-2017		2	1	

99	Main project Preparation	16-03-2017		2	1	
100	Main project Preparation	17-03-2017		2	1	
101	Main project Preparation	20-03-2017		2	1	
102	Main project Preparation	21-03-2017		2	1	
103	Main project Preparation	21-03-2017		2	1	
104	Main project Preparation	22-03-2017		2	1	
105	Main project Preparation	22-03-2017		2	1	
106	Main project Preparation	23-03-2017		2	1	
107	Main project Preparation	23-03-2017		2	1	
108	Main project Preparation	24-03-2017		2	1	
109	Main project Preparation	27-03-2017		2	1	
110	Main project Preparation	28-03-2017		2	1	
111	Main project Preparation	28-03-2017		2	1	
112	Main project Preparation	30-03-2017		2	1	
113	Main project Preparation	30-03-2017		2	1	
114	Main project Preparation	31-03-2017		2	1	
115	Main project Preparation	03-04-2017		2	1	
116	Main project Preparation	04-04-2017		2	1	
117	Main project Preparation	04-04-2017		2	1	
118	Main project Preparation	06-04-2017		2	1	
119	Main project Preparation	06-04-2017		2	1	
120	Main project Preparation	07-04-2017		2	1	
121	Main project Preparation	10-04-2017		2	1	
122	Main project Preparation	11-04-2017		2	1	1,3,5,7
123	Main project Preparation	11-04-2017		2	1	
124	Main project Preparation	12-04-2017		2	1	

125	Main project Preparation	12-04-2017		2	1	
126	Main project Preparation	13-04-2017		2	1	
127	Main project Preparation	13-04-2017		2	1	
128	**II-MID EXAMS**	17-04-2017		2	1	
129	**II-MID EXAMS**	18-04-2017		2	1	
130	**II-MID EXAMS**	18-04-2017		2	1	
131	**II-MID EXAMS**	19-04-2017		2	1	
132	**II-MID EXAMS**	19-04-2017		2	1	

Assessment Summary:

Assessment Task	Weightage (Marks)	**Course Outcomes**				
		CO1	CO2	CO3	CO4	CO5
Mid Exams	20					
End Exam	75					
Attendance	5					
Total	100					

	Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Name	G.MahammedRafi	Dr.T.Satyanarayana	M.Vasu Babu	Mr.R. Anjaneyulu Naik
Sign with Date				

	Lakireddy Balireddy College of Engineering College L.B.Reddy Nagar, Mylavaram , Krishna District, A.P **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**			
	LESSON PLAN			
	Subject **:**	**INDUSTRIAL ELECTRONICS(AS) - T218**		
	Academic Year :	**2016-17**	Semester :	**VIII**	**Date: 03.12.2016**
	Year :	**IV(2012-16)**	Section :	**--**	**To 09.04.2017**

T218 – INDUSTRIAL ELECTRONICS

Lecture	**: 7 Periods/week**	**Internal Marks**	**: 25**
Tutorial	**:**	**External Marks**	**: 75**
Credits	**: 4**	**External Examination**	**: 3 Hrs**

UNIT - I

DC AMPLIFIERS: Need for DC amplifiers, DC amplifiers—Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers—Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers.

UNIT - II

REGULATED POWER SUPPLIES: Block diagram, Principle of voltage regulation, Series and Shunt type Linear Voltage Regulators, Protection Techniques— Short Circuit, Over voltage and Thermal Protection.

UNIT - III

SCR AND THYRISTOR: Principle of operation and characteristics of SCR, Methods of Turn on and turn off mechanism, Gate characteristics , Ratings of SCR -Triggering of SCR, Diac and Triac Phase controlled half and full wave rectification.

UNIT - IV

INDUSTRIAL APPLICATIONS – I : Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding – Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control.

UNIT - V

INDUSTRIAL APPLICATIONS – II : High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications.Ultrasonics – Generation and Applications.

TEXT BOOK

GK Mithal & Dr Maneesha Gupta, Industrial & Power Electronics, 19th Edn., Kanna Publications, 2003

REFERENCES

1. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972.
2. Electronic Devices and circuits – Theodore.H.Bogart, Pearson Education,6th Edn., 2003.
3. Thyristors and applications – M. Rammurthy, East-West Press, 1977.

Pre-requisite:

- Students should have a good knowledge in EDC,II,SSC.

INDUSTRIAL ELECTRONICS

Course Educational Objectives(CEOs):

To make students familiar with :

1. The industrial used amplifying circuits and their characteristics.
2. Stabilization in DC Amplifiers.
3. Regulation of Power supplies and the protection techniques.
4. Thyristor families and characteristics of SCR.
5. SCR ratings and SCR and transistor applications.

6. Basic circuits containing power diodes and Thyristors.
7. Industrial applications related to Timers, Electric welding, HF Heating.

INDUSTRIAL ELECTRONICS

Course Outcomes(COs):

By the completion of the course, the students are able to:

CO1: Analyze the different types of amplifying circuits and their characteristics.

CO2: Select and Design, which type of regulation is required for different applications.

CO3: Understand operating principles, characteristics and advantages of SCRs.

CO4: Understand the utilization industrial timers in industrial applications like welding.

CO5: Obtain an overall view of the industrial applications

S.No	Teaching Learning Process (TLP)	Delivery Methods (DM)	Assessment Methods (AM)
1	Solving Real world problem	Chalk & Talk	Assignments
2	Explaining application before theory	ICT tools	Quiz
3	Solving problems	Group discussions	Tutorials
4	Designing of experiments	Industrial visit	Surprise Tests
5	Problems on environmental, economics, health & safety	Field work	Mid Exams
6	Problems on professional & ethics	Case studies	Model Exam
7	Seminar	Mini Projects	QAs
8	Problems using software	Numerical treatment	
9	Self study	Design / Exercises	

Detailed Lesson Plan

S.NO	TOPIC TO BE COVERED	Date		TLP	DM	AM
		Tentative	Actual			
UNIT –I:						
1	Introduction to electronic devices &	15-12-2016		2	1	
2	Characteristics of transistors	15-12-2016		2	1	
3	Transistor as a amplifier.	16-12-2016		2	1	
4	Need for DC amplifiers	19-12-2016		2	1	
5	Working of DC amplifiers	19-12-2016		2	1	
6	**Tutorial -1**	20-12-2016				
7	Causes of Drift in DC amplifiers	20-12-2016		2	1	
8	RC Coupling amplifiers	21-12-2016		2	1	
9	Darlington emitter follower	22-12-2016		2	1	
10	CE-CB Cascode amplifiers & Characteristics	22-12-2016		2	1	1,3, 5,7
11	Hybrid modal of cascade amplifiers	23-12-2016				
12	**Tutorial -2**	26-12-2016		2	1	
13	Introduction to Differential amplifiers	26-12-2016		2	1	
14	Chopper stabilization DC amplifiers	27-12-2016		2	1	
15	Ring Bridge Modulator	27-12-2016		2	1	
16	Transistor chopper circuits	28-12-2016		2	1	
17	Operational Amplifier & Ideal	29-12-2016		2	1	
18	**Tutorial -3**	29-12-2016		2	1	
19	AC,DC Characteristics of Operational Amplifiers	30-12-2016		2	1	

20	Introduction to Instrumentation amplifiers	02-01-2017				
21	**Assignment**	02-01-2017		2	1	
UNIT –II:						
22	Block diagram of Regulated power supplies	03-01-2017		2	1	
23	Principle of Regulated power supplies	03-01-2017		2	1	
24	Classification of regulated power supplies	04-01-2017		2	1	
25	Difference between regulator & stabilizer	05-01-2017		2	1	1,3, 5,7
26	**Tutorial -4**	05-01-2017				
27	Introduction to Protection techniques	06-01-2017		2	1	
28	Short circuit protection technique	06-01-2017		2	1	
29	Over voltage, Thermal protection techniques	07-01-2017		2	1	
30	**Assignment**	07-01-2017		2	1	
	I-MID Exams	09-01-17 To 11-01-17				
UNIT –III:						
31	Introduction to Thyristors & Types of Thyristors	17-01-17		2	1	
32	Introduction to SCR	17-01-17		2	1	
33	Characteristics of SCR	18-01-17		2	1	
34	Methods of Turn on	19-01-17		2	1	1,3, 5,7
35	Turn off mechanism of SCR	19-01-17				

36	Gate characteristics of SCR	20-01-17		2	1	
37	Gate characteristics of SCR	20-01-17		2	1	
38	Ratings of SCR	23-01-17		2	1	
39	**Tutorial-5**	23-01-17		2	1	
40	Triggering of SCR	24-01-17				
41	Introduction to DIAC,TRIAC	24-01-17		2	1	
42	Introduction to DIAC,TRIAC	25-01-17		2	1	
43	phase controllered half wave rectifier	13-02-17		2	1	
44	Phase controlled full wave rectifier	13-02-17		2	1	
45	**Assignment**	14-02-17				
UNIT –IV:						
46	Introduction to Industrial Timers	14-02-17		2	1	
47	Classfication of Industrial Timers	15-02-17		2	1	
48	Thermal timers	16-02-17		2	1	
49	Thermal timers	16-02-17				
50	**Tutorial-6**	17-02-17				
51	Electro-mechanical Timers	20-02-17		2	1	
52	Electro-mechanical Timers	20-02-17		2	1	
53	Classification of Electronic Timers	21-02-17		2	1	
54	R.C Timing elements	21-02-17		2	1	
55	Digital Timing elements	22-02-17		2	1	1,3, 5,7
56	**Tutorial -7**	23-02-17		2	1	
57	Time base generators	23-02-17				
58	Classification of Electric Welding	27-02-17		2	1	

59	Resistance welding	27-02-17				
60	Arc welding	28-02-17				
61	**Tutorial -8**	28-02-17				
62	**Assignment**	01-03-17				
		Unit V				
63	Principle of High frequency heating	02-03-17		2	1	
64	Merits and Applications of High frequency heating	02-03-17		2	1	
65	High frequency source for Induction heating	03-03-17		2	1	
66	Principle of Dielectric heating	06-03-17		2	1	
67	**Tutorial -9**	06-03-17				
68	Dielectric material properties	07-03-17		2	1	
69	Electrodes used in Dielectric heating	07-03-17		2	1	
70	Electrodes to the R.F.Generator	08-03-17		2	1	
71	Thermal losses and applications of Dielectric heating	10-03-17		2	1	
72	**Tutorial -10**	13-03-17		2	1	1,3, 5,7
73	Generation of Ultrasonic waves	13-03-17				
74	Applications of Ultrasonic waves	14-03-17		2	1	
75	Applications of Ultrasonic waves	14-03-17		2	1	
76	**Tutorial -11**	15-03-17		2	1	
77	**Assignment**	16-03-17		2	1	
	II-MID EXAMS	**17-04-2017 TO 19-04-2017**				

Assessment Summary:

Assessment Task	Weight age (Marks)	**Course Outcomes**				
		CO1	CO2	CO3	CO4	CO5
Assignments	--					
Quizzes	--					
Tutorials	--					
Surprise Tests	--					
Mid Exams	20					
Model Exams	--					
End Exam	75					
Attendance	05					
Total	100					

Mapping Course Outcomes with Programme Outcomes:

Course Code	**Unit**	**Programme Outcomes**															
		1	2	3	4	5	a	b	c	d	e	f	g	h	i	j	k
T-106	I									2	3				2		
	II									3					2		
	III													2			
	IV								2								
	V									2					2		

	Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Name	Mr.B.Sandeep	Prof.G.M.Rao	Prof.G.M.Rao	Mr.R.A.Naik
Sign with Date				