FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Fr. Agnel Ashram, Bandstand, Bandra (W), Mumbai – 400050.

Department of Electronics Engineering

Branch & Semester	S.E. (Electronics Engineering) – Semester IV
Academic Year	2018 – 2019
Subject Name	Electronic Devices & Circuits – II (EDC – II) – ELX 402
Subject I/C	Jayen Modi – Assistant Professor, Department of Electronics Engineering

SYLLABUS

Module No.	Topics	Hours
1	**Frequency response of amplifiers.**	8
1.1	High frequency equivalent circuit of BJT and MOSFET, Miller's theorem, effect of Miller's capacitance, unity gain bandwidth	
1.2	Effect of coupling, bypass and load capacitors on single stage BJT and MOSFET amplifiers.	
2	**Frequency Response of Multistage Amplifiers.**	6
2.1	Effect of parasitic capacitances on BJT and MOSFET amplifiers. Low, mid and high frequency response of multistage amplifiers (CE-CE, CE-CB, CS-CS, CS-CG)	
3	**Feedback Amplifiers and Oscillators**	8
3.1	Types of Negative Feedback block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, feedback topologies (Introduction only).	
3.2	Positive feedback and principle of oscillations, RC oscillators: Phase shift oscillators, Wien bridge oscillators, LC Oscillators: Hartley, Colpitts and clapp, Tunned Oscillator, Twin T Oscillator, Crystal Oscillator (BJT circuit analysis).	
4	**Differential Amplifiers**	10
4.1	MOSFET current sources, Cascode current mirror, advanced MOSFET active load, small signal analysis: MOSFET active load	
4.2	Basic MOSFET differential amplifier, DC characteristics, transfer characteristics, differential and common mode input impedances.	
4.3	MOSFET differential amplifier with active load, MOSFET differential amplifier with cascode active load.	
5	**Power Amplifiers**	8
	Power BJTs, Heat sinks, Power BJTs, Power MOSFETs, Heat Sinks, Class A, Class B, Class C and Class AB operation, Power efficiency, Class AB output stage with diode biasing, VBE multiplier biasing, input buffer transistors, Darlington configuration.	
6	**Special Semiconductor Devices - II**	8
	PNPN diode, SCR, DIAC, TRIAC, UJT, IGBT, HEMT, Gunn diode, IMPATT diode, HBT	
	Total Hours	48

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ELXL401	Electronic Devices and Circuits II Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme						
		Theory Marks						
		Internal assessment			End Sem. Exam	Term Work	Oral &Practical	Total
		Test1	Test 2	Avg.				
ELXL401	Electronic Devices and Circuits II Laboratory	--	--	--	--	25	25	50

Term Work:

At least 6 experiments covering entire syllabus of ELX 402 (Electronic Devices and Circuits II) should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiment must be graded from time to time. Also each student (in group of 3/4) has to perform a ***Mini Project*** as a part of the laboratory and report of mini project should present in laboratory journal. The grades should be converted into marks as per the Credit and Grading System manual and should be added and averaged. The grading and term work assessment should be done based on this scheme. The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work. Practical and Oral exam will be based on the entire syllabus. Equal weightage should be given to laboratory experiments and project while assigning term work marks.

Suggested List of Experiments, however Instructor is free to design own experiments as per the guidelines

Laboratory Experiments

1. To perform frequency response of single stage CE amplifier.
2. To perform frequency response of single stage CS MOSFET amplifier..
3. To perform frequency response of Cascode amplifier.
4. To perform frequency response of two stage RC coupled CE amplifier
5. To perform RC phase shift oscillator
6. To perform Wein Bridge oscillator.
7. To perform Hartley oscillator.
8. To perform Colpitts oscillator
9. To perform Crystal oscilator.
10. To perform Class B push pull amplifier
11. To perform Class AB amplifier

Guidelines for Simulation Experiments:

1. SPICE simulation ofs of frequency response of single stage CE amplifier

COURSE OUTCOMES (CO) & ASSESSMENT PLAN OF EDC – II (ELX 402) FOR 2018 – 2019

Jayen Modi
Assistant Professor & Subject I/C
Electronics Engineering Department

Course Code :- ELX 402 **Subject Name :-** Electronic Devices & Circuits – II (EDC – II)

Course Objectives :-

- To enhance comprehension capabilities of students through understanding of electronic devices & circuits
- To perform DC & AC analysis of single stage & multi-stage amplifiers
- To introduce & motivate students to the use of advanced microelectronic devices
- To design electronic circuits using semiconductor devices

Course Outcomes :-

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

- **ELX 402.1 :-** Evaluate frequency response of single stage & multi-stage amplifiers
- **ELX 402.2 :-** Design practical electronic circuits as per the given specifications
- **ELX 402.3 :-** Analyze oscillators, differential amplifiers, feedback amplifiers & power amplifiers
- **ELX 402.4 :-** Describe special semiconductor devices & their use for various practical applications
- **ELX 402.5 :-** Use software computer simulation tools to test & troubleshoot practically designed circuits

Mapping of CO with PO :-

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
ELX 402.1	2	3			1							
ELX 402.2		3	3	1	2						1	
ELX 402.3	3	2		2	1							
ELX 402.4									2	3		
ELX 402.5		1		2	3							

Mapping of CO with PO with Justification :-

ELX 402.1	PO-1	Acquire knowledge of frequency response characteristics of small signal amplifiers
	PO-2	Analyze small signal amplifiers to evaluate low & high cut-off frequencies
	PO-5	Simulate the small signal amplifier to verify frequency response characteristics
ELX 402.2	PO-2	Analyze the given amplifier design problem in order to propose solutions
	PO-3	Design a small signal amplifier / oscillator for a given set of specifications
	PO-4	Investigate whether the design specifications are satisfied or not
	PO-5	Use software simulation tools to verify the designed circuit
	PO-11	Manage the designed project & perform cost evaluation of the entire circuit
ELX 402.3	PO-1	Gain understanding of small signal / AC analysis
	PO-2	Analyze effects of all coupling & bypass capacitors for small signal amplifiers
	PO-4	Investigate effects of device / component parameters on the circuit performance
	PO-5	Use software simulation tools to verify the small signal / AC analysis
ELX 402.4	PO-9	Work together as a group / team for poster making on the given topic
	PO-10	Effectively communicate your presentation & submit report on the same

ELX 402.5	**PO-2**	Analyze to calculate differential & common mode gain, CMRR & frequency response
	PO-4	Investigate circuit performance under different current sources (BJT/JFET/MOSFET)
	PO-5	Use computer simulation software tools for designing & analysis

Mapping of CO with PSO :-

	ELX 402.1	**ELX 402.2**	**ELX 402.3**	**ELX 402.4**	**ELX 402.5**
PSO-1	**2**	**1**	**3**		
PSO-2		**2**	**2**	**1**	**2**

Mapping of CO with PSO with Justification :-

ELX 402.1	**PSO-1**	Fundamental knowledge of circuit DC & AC analysis
ELX 402.2	**PSO-1**	Designing a circuit for a given application
	PSO-2	Knowledge of various designing techniques for further applications
ELX 402.3	**PSO-1**	Ability to perform various AC analysis of a given amplifier circuit
	PSO-2	Knowledge of different mathematical tool for AC analysis
ELX 402.4	**PSO-2**	Knowledge of feedback for other advanced applications
ELX 402.5	**PSO-2**	Ability to use various software tools for advanced simulation

Modes of Content Delivery :-

Modes of Delivery	**Brief Description of Content Delivered**	**Attained COs**	**Attained POs**
Class Room Lectures	Lectures conducted as per the overall theory lesson plan covering 48 contact hours in total	**ALL**	**PO-1 to PO-5**
Experiment (Practical)	A total of 06 practical experiments based on syllabus that reinforce theoretical concepts into practice	**ALL**	
NPTEL Videos	Audio-visual (AV) aid in form of an NPTEL video that shows an advanced topic of related syllabus topics	**ELX 402.4 & ELX 402.5**	
Guest Lecture	Guest lecture by resource person from academics or industry to enlighten students on certain topics	**ELX 402.4**	**PO-12**
Industrial Visit	Practical & industry-approach learning by visiting any core electronics company to understand & learn	**ELX 402.2 & ELX 402.4**	**PO-9 to PO-12**

Course Outcomes (CO) Assessment Tools :-

Course Outcomes (CO)	**Assessment Methods**						
	Direct Methods (80 %)						**Indirect Method (20 %)**
	Unit Tests (UT-1 & 2)	**Assignments (Self Study)**	**Laboratory Experiments**	**Multiple Choice Quiz**	**Student Activity**	**University Examination**	**Course Exit Survey (CES)**
ELX 402.1	10 %	20 %	20 %	---	---	50 %	100 %
ELX 402.2	---	25 %	50 %	---	25 %	---	100 %
ELX 402.3	10 %	---	20 %	20 %	---	50 %	100 %
ELX 402.4	---	20 %	20 %	10 %	---	50 %	100 %
ELX 402.5	---	50 %	50 %	---	---	---	100 %

Calculation of Individual Course Outcomes (CO) is performed as shown below :-

ELX 402.1 (CO-1) :- 0.8 [0.1 (UT) + 0.2 (A) + 0.2 (LE) + 0.5 (ESE)] + 0.2 (CES)

ELX 402.2 (CO-2) :- 0.8 [0.25 (A) + 0.5 (LE) + 0.25 (SA)] + 0.2 (CES)

ELX 402.3 (CO-3) :- 0.8 [0.1 (UT) + 0.2 (A) + 0.2 (MCQ) + 0.5 (ESE)] + 0.2 (CES)

ELX 402.4 (CO-4) :- 0.8 [0.2 (A) + 0.2 (LE) + 0.1 (MCQ) + 0.5 (ESE)] + 0.2 (CES)

ELX 402.5 (CO-5) :- 0.8 [0.5 (A) + 0.5 (LE)] + 0.2 (CES)

Rubrics for Assignment Grading :-

Indicators & Marks Awarded	Timeline, Involvement, Participation & Skills	Structure, Approach, Organization & Presentation	Contents, Understanding, Procedure & Methodology
01 Mark	After the due date & late submission next week	Very shabby & haphazard work with casual approach	No understanding shown & seemingly copied contents
02 Marks	On or before due date, during the college hours	Major topics covered & are delivered with proper structure	Little understanding but has improper procedure followed
03 Marks	---	Addressed all major points & delivered what was expected	Slight improvement in the methodology & understanding
04 Marks	---	---	Proper contents, procedure followed & well understood
05 Marks	---	---	Original work – precise, concise & systematic details

Rubrics for Experiment (Journal) Grading :-

Indicators & Rubrics Parameters	Method / Basis of Assessment	Grading Scale (Marks)	
		Minimum	Maximum
Attendance & Timelines	Punctuality & Regularity (Timely Completion)	0 Marks	2 Marks
Experiment Set-up & Performance	Practical Skills & Applied Knowledge	1 Marks	3 Marks
Involvement & Participation	Team work, Ethics & Communication	1 Marks	2 Marks
Data Evaluation & Presentation Format	Theoretical Knowledge, Capability of Analysis	1 Marks	3 Marks
TOTAL	**Overall Individual Laboratory Assessment**	**3 Marks**	**10 Marks**

THEORY LESSON PLAN FOR EDC – II (ELX 402)			
Class & Division	S.E. (Electronics Engineering) – Semester IV		
Academic Term	1st January 2019 – 20th April 2019		
Subject	Electronic Devices & Circuits – II (EDC – II) – ELX 402		
Faculty I/C	Jayen Modi		
Periods (Hours) per week	**Lectures**	04 Hours / Week	
	Practicals	02 Hours / Week	
	Tutorials	---	
Evaluation System		**Hours**	**Marks**
	Theory examination	3	80
	Internal Assessment	1	20
	Practical Examination	--	25
	Oral Examination	--	--
	Term work	--	25
	Total	--	150
Time Table	**Days**	**Timings**	
	Tuesdays	08:45 am to 09:45 am	
	Wednesdays	09:45 am to 10:45 am	
	Thursdays	01:30 pm to 02:30 pm	
	Fridays	12 noon to 01:00 pm	

COURSE CONTENTS & LESSON PLAN

Week No.	Lecture No.	Dates		Topics Planned to be Covered	Course Outcome (CO)	Programme Outcome (PO)	Assignments / Experiments	Teaching Aids	Remarks
		Scheduled	Conducted						
1	1	01/01/2019	01/01/2019	Introduction to the course / subject EDC – II (ELX 402) with course objectives, course outcomes (CO) & the mapping with programme outcomes (PO) & academic administration				Handouts	NBA
1	2	02/01/2019	01/01/2019	Introduction to the concept of feedback – types of feedback viz. negative & positive feedback along with advantages & disadvantages & their real-life applications				Chalk, duster & black board	
1	3	03/01/2019	02/01/2019	Mathematical model of positive feedback, the Barkhausen's criterion for sustained oscillations, introduction to oscillators & classification of oscillators				Chalk, duster & black board	
1	4	04/01/2019	02/01/2019	RC oscillators – the 3 stage RC phase shift oscillator & the Wien Bridge oscillator with circuit diagram, operation & output frequency of oscillations, numerical examples	ELX 402.3	PO-3	Experiment No. 1	Chalk, duster & black board	Syllabus for UT – 1

2	5	08/01/2019	03/01/2019	LC oscillators – Hartley, Colpitts & Clapp oscillators with their circuit diagram, working, output frequency of oscillations & numerical examples based on above	ELX 402.3	PO-3		Chalk, duster & black board	Syllabus for UIT – 1
2	6	09/01/2019	03/01/2019	Other types of oscillators – Tuned Collector oscillator, Twin T oscillator & crystal oscillator with circuit diagrams, operation, advantages & disadvantages of each case				PPT	Syllabus for UIT – 1
2	7	10/01/2019	08/01/2019	Introduction to negative feedback & mathematical model, the advantages & disadvantages, different types of the negative feedback topologies – sampling & mixing networks				PPT	
2	8	11/01/2019	09/01/2019	Voltage series feedback topology – the block diagram, circuit diagram, derivation of both input & output resistances with feedback with advantages & disadvantages	ELX 402.3	PO-3		Chalk, duster & black board	Syllabus for UIT – 1
3	9	15/01/2019	10/01/2019	Current series feedback topology – the block diagram, circuit diagram, derivation of both input & output resistances with feedback with advantages & disadvantages	ELX 402.3	PO-3	Experiment No. 2	Chalk, duster & black board	Syllabus for UIT – 1
3	10	16/01/2019	10/01/2019	Voltage shunt feedback topology – the block diagram, circuit diagram, derivation of both input & output resistances with feedback with advantages & disadvantages	ELX 402.3	PO-3		Chalk, duster & black board	Syllabus for UIT – 1
3	11	17/01/2019	11/01/2019	Current shunt feedback topology – the block diagram, circuit diagram, derivation of both input & output resistances with feedback with advantages & disadvantages	ELX 402.3	PO-3		Chalk, duster & black board	Syllabus for UIT – 1
3	12	18/01/2019	15/01/2019	Introduction & concept of the power amplifiers, difference between voltage & power amplifier, classification of different types of power (large signal) amplifiers				PPT	
4	13	22/01/2019	16/01/2019	Class A – series fed / directly coupled power amplifier with circuit diagram, operation & working, analysis for overall & collector conversion efficiency	ELX 402.3	PO-2 & PO-3		Chalk, duster & black board	
4	14	23/01/2019	17/01/2019	Class A – the transformer coupled power amplifier with circuit diagram, operation & working, analysis for overall & collector conversion efficiency	ELX 402.3	PO-2 & PO-3		Chalk, duster & black board	

4	15	24/01/2019	18/01/2019	Class B – the transformer coupled power amplifier with circuit diagram, operation & working, analysis for overall & collector conversion efficiency	ELX 402.3	PO-2 & PO-3		Chalk, duster & black board	
4	16	25/01/2019	19/01/2019	Cross-over distortion in Class B power amplifiers, Class AB power amplifier to remove the cross-over distortion, circuit diagram & operation of various configurations	ELX 402.3	PO-2 & PO-3	Experiment No. 2	PPT	
5	17	29/01/2019	22/01/2019	Class C power amplifier – circuit diagram & working, design steps, advantages, disadvantages & comparison of different types of power amplifiers (Class A, Class B & Class C)		PO-4		Chalk, duster & black board	
5	18	30/01/2019	23/01/2019	Concept of heat sinks, numerical examples & calculations on heat sinks, introduction to power BJT & power MOSFET with their structure & operation / working	ELX402.3	PO-2 & PO-3	Assignment No. 1	PPT	
5	---	31/01/2019	---	**SPORTS DAY**					Academically Off
5	19	01/02/2019	24/01/2019	Introduction to multi-stage amplifiers, advantages over single stage amplifier configurations, types of multistage amplifier configurations & various types of couplings			MCQ No. 1	PPT	YouTube Video
6	---	05/02/2019	---	**FIRST UNIT TEST (UT – 1)**					Academically Off
6	---	06/02/2019	---	**FIRST UNIT TEST (UT – 1)**					Academically Off
6	20	07/02/2019	25/01/2019	Analysis of the BJT CE – CE & CE – CB configuration, circuit diagram & operation, advantages & disadvantages, cascode configuration & its advantages over CE – CE BJT amplifier				Chalk, duster & black board	
6	21	08/02/2019	29/01/2019	Analysis of the JFET/MOSFET CS – CS & CS – CG amplifier configuration, circuit diagram & operation, the advantages & disadvantages, cascade configuration & its analysis			Experiment No. 4	Chalk, duster & black board	

7	22	12/02/2019	30/01/2019	Designing steps for cascade BJT CE – CE & JFET CS – CS amplifier configurations as per specifications & simulation of designed circuit for verification	ELX 402.5		Assignment No. 2	MultiSim 10	
7	---	13/02/2019		**EUPHORIA**					Academically Off
7	---	14/02/2019		**EUPHORIA**					Academically Off
7	---	15/02/2019		**EUPHORIA**					Academically Off
8	---	19/02/2019		**SHIVAJI MAHARAJ JAYANTI**					Holiday
8	23	20/02/2019	01/02/2019	Introduction to frequency response in small signal amplifiers, description of the frequency response measurement process & definition of low & high cut-off frequencies, bandwidth (BW)	ELX 402.1			PPT	
8	24	21/02/2019	07/02/2019	Effect of input & output coupling capacitor, emitter & source bypass capacitor on the BJT & MOSFET amplifier frequency response with lower cut-off frequency equations (f_L)		PO-1		Chalk, duster & black board	
8	25	22/02/2019	08/02/2019	Mathematical analysis of low frequency response for CB-BJT & CG-JFET amplifiers with numerical example for calculation of |Av| & f_L	ELX 402.1	PO-2		Chalk, duster & black board	
9	26	26/02/2019	12/02/2019	Mathematical analysis of low frequency response for CE-BJT & CS-JFET amplifiers with numerical example for calculation of |Av| & f_L	ELX 402.1	PO-2	Experiment No. 4	Chalk, duster & black board	UT – 2 Syllabus
9	27	27/02/2019	20/02/2019	Mathematical analysis of low frequency response for CC-BJT & CD-JFET amplifiers with numerical example for calculation of |Av| & f_L	ELX 402.1	PO-2	Assignment No. 2	Chalk, duster & black board	

9	28	28/02/2019	21/02/2019	Mathematical analysis of low & high frequency response for CD-MOSFET amplifiers with numerical examples for the calculation of $\|Av\|$ & f_L with f_H	ELX 402.1	PO-2 & PO-3		Chalk, duster & black board	
9	29	01/03/2019	22/02/2019	Mathematical analysis of low & high frequency response for CS-MOSFET amplifiers with numerical examples for the calculation of $\|Av\|$ & f_L with f_H	ELX 402.1	PO-2 & PO-3		Chalk, duster & black board	UT – 2 Syllabus
10	30	05/03/2019	26/02/2019	Mathematical analysis of low & high frequency response for CG-MOSFET amplifiers with numerical examples for the calculation of $\|Av\|$ & f_L with f_H	ELX 402.1	PO-5		Chalk, duster & black board	
10	31	06/03/2019	27/02/2019	High frequency equivalent circuit of BJT & MOSFET, effect of Miller capacitance, Miller's theorem & unity gain bandwidth with wiring & stray / unwanted capacitance		PO-4		PPT	UT – 2 Syllabus
10	32	07/03/2019	28/02/2019	Small signal / AC analysis in multi-stage amplifiers for lower cut-off frequency (f_L) in various configurations in CE-CE & the CE-CB (cascode) configuration		PO-2		PPT	
10	33	08/03/2019	01/03/2019	Small signal / AC analysis in multi-stage amplifiers for lower cut-off frequency (f_L) in various configurations in CS-CS & the CS-CG (cascode) configuration		PO-2		PPT	YouTube Video
11	34	12/03/2019	05/03/2019	Introduction of the concept of differential amplifiers, concept of differential mode gain (A_d), common mode gain (A_c) & the common mode rejection ratio (CMRR)				Handouts & PPT	
11	35	13/03/2019	06/03/2019	Working / operation of the MOSFET differential amplifier with the differential & common mode configuration, configurations of differential amplifiers – DIBO, DIUO, SIBO, SIUO				PPTs & Handouts	NPTEL Video
11	36	14/03/2019	07/03/2019	DC analysis / Q – Point calculations of MOSFET differential amplifier with numerical examples, DC characteristics & the transfer characteristics	ELX 402.3	PO-1		Chalk, duster & Blackboard	
11	---	15/03/2019	---	**CRESCENDO**					Academically Off

12	37	19/03/2019	08/03/2019	Small signal / AC analysis of MOSFET differential amplifier in the differential mode of operation – calculation of differential mode gain (A_d) & differential mode input resistance (R_{id})	ELX 402.3	PO-2		Chalk & Blackboard	
12	38	20/03/2019	08/03/2019	Small signal / AC analysis of MOSFET differential amplifier in common mode of operation – calculations of common mode gain (A_c) & common mode input resistance (R_{ic})	ELX 402.3			Chalk & Blackboard	
12	---	21/03/2019	---	**HOLI (2ND DAY)**					Holiday
12	39	22/03/2019	12/03/2019	Calculation of common mode rejection ratio (CMRR) & how to improve CMRR using different techniques – using constant current source & active load	ELX 402.3	PO-4		Chalk & Blackboard	
13	40	26/03/2019	13/03/2019	MOSFET current sources to improve CMRR, cascode current mirror, small signal analysis, various type of MOSFET current sources & their description / analysis			Assignment No. 2	PPTs	
13	41	27/03/2019	14/03/2019	MOSFET active load, small signal / AC analysis of MOSFET active load with numerical examples		PO-1		Chalk & Blackboard	
13	42	28/03/2019	18/03/2019	Cascode current mirror & advanced MOSFET active load, the small signal / AC analysis of cascode current mirror & active load of advanced MOSFET				Chalk & Blackboard	
13	43	29/03/2019	19/03/2019	MOSFET differential amplifier with active load & MOSFET differential amplifier with cascode current mirror – the AC or small signal analysis		PO-2		Chalk & Blackboard	
14	44	02/04/2019	22/03/2019	Introduction to PNPN diode, structure & construction, working & operation, V-I characteristics, symbol & applications, how it is different from conventional PN junction diode	ELX 402.4	PO-1 & PO-2	Experiment No. 5	PPT	
14	45	03/04/2019	22/03/2019	Introduction to silicon controlled rectifier (SCR), structure & two transistor analogy, working & operation, characteristics & applications	ELX 402.4	PO-1 & PO-2		PPT	
14	46	04/04/2019	26/03/2019	DIAC construction & structure, operation & working, the V-I characteristics, applications, symbol & difference between the SCR & DIAC	ELX 402.4	PO-1 & PO-2		PPT	

14	47	05/04/2019	27/03/2019	TRIAC construction & structure, operation & working, the V-I characteristics, applications, symbol & difference between the TRIAC & DIAC	ELX 402.4	PO-1 & PO-2		PPT	
15	---	09/04/2019	---	**SECOND UNIT TEST (UT – 2)**					Academically Off
15	---	10/04/2019	---	**SECOND UNIT TEST (UT – 2)**					Academically Off
15	48	11/04/2019	28/03/2019	Uni-junction transistor (UJT) construction structure, operation & working, the V-I characteristics, applications, symbol & use as a relaxation oscillator	ELX 402.4	PO-1 & PO-2	Assignment No. 1	PPT	
15	49	12/04/2019	29/03/2019	Insulated gate bipolar junction transistor (IGBT) construction & structure, operation & working, V-I characteristics, symbol & applications, advantages over the SCR	ELX 402.4	PO-1 & PO-2	MCQ No. 2	PPT	

List of Reference & Text Books :-

1. Donald A. Neamen – Electronic Circuit Analysis & Design, 2nd edition by Tata McGraw Hill.
2. David A. Bell – Electronic Devices & Circuits, 5th edition by Oxford Publishing.
3. S. Salivahanan & N. Suresh Kumar – Electronic Devices & Circuits, 3rd edition by Tata McGraw Hill.
4. Muhammad Rashid – Microelectronics Circuits Analysis & Design, 2nd edition by Cengage Learning.
5. Jacob Millman & Arvin Grabel – Microelectronics, 2nd edition by Tata McGraw Hill.
6. Millman & Halkias – Electronic Devices & Circuits, 2nd edition by McGraw Hill.
7. Boylestad & Nashelsky – Electronic Devices & Circuit Theory, 3rd edition by Tata McGraw Hill.
8. R. S. Sedha – Textbook of Applied Electronics, 4th edition by S. Chand Publishing Co. Ltd.

Internal Assessment (IA) :-

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered as final IA marks.

End Semester Examination :-

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining questions will be selected from all the modules

Class, Division & Semester			S.E. (Electronics Engineering) – Semester IV	
Academic Term			14th January 2019 – 5th April 2019	
Subject Name			Electronic Devices & Circuits – II Laboratory (ELXL 401)	
Faculty I/C			Jayen Modi	
Evaluation System			**Hours**	**Marks**
		Practical Examination	--	25
		Oral Examination	--	--
		Term work	--	25
		Total	--	50
Time Table	**DAYS**	**BATCHES**	**TIMINGS**	
	Monday	A	01:30 pm to 03:30 pm	
	Tuesday	B	01:30 pm to 03:30 pm	
	Wednesday	C	02:30 pm to 03:30 pm	
	Thursday	D	02:30 pm to 03:30 pm	

TITLE OF EXPERIMENTS

No.	Title	Module No.	Attained POs
1.	Frequency Response CS-JFET Amplifier	1. Frequency Response	PO-1 & PO-2
2.	Class AB Power Amplifier (Push – Pull)	5. Power Amplifiers	PO-1 & PO-2
3.	Wien Bridge & Phase Shift Oscillators	3. Feedback Amplifier & Oscillators	PO-3 & PO-4
4.	Negative Feedback CS – JFET Amplifier	3. Feedback Amplifier & Oscillators	PO-3 & PO-4
5.	Multi-stage BJT / JFET Amplifier Design	2. Multi-stage Amplifiers	PO-5
6.	V-I Characteristics of SCR	6. Special Semiconductor Devices	PO-1 & PO-2

Overall Mapping with Programme Outcomes (POs)

LEVEL OF IMPORTANCE	Programme Outcomes (POs)
03 – High Importance (HI)	**PO-1 & PO-2**
02 – Moderate Importance (MI)	**PO-3 & PO-4**
01 – Low Importance (LI)	**PO-5**

BATCH	SCHEDULED DATES		Course Outcomes (COs)
	Planned Dates	Actual Dates	
Experiment No. 1 – 3 Stage RC Phase Shift & Wien Bridge Oscillator			
A	14/01/2019	14/01/2019	ELX 402.3 (CO-3) Hardware Performance
B	15/01/2019	15/01/2019	
C	16/01/2019	16/01/2019	
D	17/01/2019	17/01/2019	
Experiment No. 2 – Negative Feedback of CS – JFET Amplifier			
A	21/01/2019	21/01/2019	ELX 402.3 (CO-3) Hardware Performance
B	22/01/2019	22/01/2019	
C	23/01/2019	23/01/2019	
D	24/01/2019	24/01/2019	
Experiment No. 3 – Class AB Power Amplifier (Push – Pull)			
A	28/01/2019	28/01/2019	ELX 402.3 (CO-3) Hardware Performance
B	29/01/2019	29/01/2019	
C	30/01/2019	30/01/2019	
D	07/02/2019	07/02/2019	
Experiment No. 4 – Frequency Response of CS – JFET Amplifier			
A	11/02/2019	11/02/2019	ELX 402.1 (CO-1)
B	12/02/2019	12/02/2019	

C	20/02/2019	20/02/2019	Hardware Performance
D	21/02/2019	21/02/2019	
Experiment No. 5 – V-I Characteristics of Silicon Controlled Rectifier (SCR)			
A	18/02/2019	18/02/2019	ELX 402.4 (CO-4) Software Simulation
B	26/02/2019	26/02/2019	
C	27/02/2019	27/02/2019	
D	28/02/2019	28/02/2019	
Experiment No. 6 – Multistage Amplifier Design & Simulation			
A	25/02/2019	25/02/2019	EXL 402.5 (CO-5) Software Simulation
B	05/03/2019	05/03/2019	
C	06/03/2019	06/03/2019	
D	07/03/2019	07/03/2019	
Mini Project (MP)			
A	11/03/2019 18/03/2019 25/03/2019	11/03/2019 18/03/2019 25/03/2019	ELX 402.2 (CO-2) Design & Hardware Implementation
B	12/03/2019 19/03/2019 26/03/2019	12/03/2019 19/03/2019 26/03/2019	
C	13/03/2019 20/03/2019 27/03/2019	13/03/2019 20/03/2019 27/03/2019	
D	14/03/2019 28/03/2019 30/03/2019	14/03/2019 28/03/2019 30/03/2019	

Recommended Books :-

1. Donald A. Neamen – Electronic Circuit Analysis & Design, 2nd edition by Tata McGraw Hill.
2. David A. Bell – Electronic Devices & Circuits, 5th edition by Oxford Publishing.
3. S. Salivahanan & N. Suresh Kumar – Electronic Devices & Circuits, 3rd edition by Tata McGraw Hill.
4. Muhammad Rashid – Microelectronics Circuits Analysis & Design, 2nd edition by Cengage Learning.
5. Jacob Millman & Arvin Grabel – Microelectronics, 2nd edition by Tata McGraw Hill.
6. Millman & Halkias – Electronic Devices & Circuits, 2nd edition by McGraw Hill.
7. Boylestad & Nashelsky – Electronic Devices & Circuit Theory, 3rd edition by Tata McGraw Hill.
8. R. S. Sedha – Textbook of Applied Electronics, 4th edition by S. Chand Publishing Co. Ltd.

Experiments Mapping with Programme Outcomes (POs)

EXPERIMENTS MAPPING	PO-1	PO-2	PO-3	PO-4	PO-5
Experiment No. 1	02	03			
Experiment No. 2	02	03		01	
Experiment No. 3	02	03		02	
Experiment No. 4	02	03		01	
Experiment No. 5		01	03	02	03
Experiment No. 6			01	02	03

Term Work :-

At least 6 experiments covering entire syllabus of ELX 402 (Electronic Devices and Circuits II) should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiment must be graded from time to time. Also each student (in group of 3/4) has to perform a Mini Project as a part of the laboratory and report of mini project should present in laboratory journal. The grades should be converted into marks as per the Credit and Grading System manual and should be added and averaged. The grading and term work assessment should be done based on this scheme. The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work. Practical and Oral exam will be based on entire syllabus. Equal weightage should be given to laboratory experiments and project while assigning term work marks.