

**MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE
GWALIOR**

DEPARTMENT OF ELECTRONICS

BOARD OF STUDIES

SCHEME AND SYLLABUS FOR BE ELECTRONICS

2017

③ No. $\frac{165}{19-07-17}$ O/K

HOD
Dept. of Electronics,
Madhav Institute of Technology & Science
GWALIOR-474 005

Madhav Institute of Technology & Science, Gwalior-474005

Department of Electronics

Minutes of Board of Studies of Electronics held on 07 July 2017

Meeting of the Board of Studies of Electronics held on 07 July 2017 at 11:00 am in the Electronics Department. Following members are present

1.	DR. S. S. BHADAURIA	CHAIRMAN
2.	DR. P.L.ZADE	MEMBER
3.	SHRI ASHUTOSH CHINCHOLIKAR	MEMBER
4.	DR. P.K.SINGHAL	MEMBER
5.	DR.REKHA GUPTA	MEMBER
6.	DR. BIMAL GARG	MEMBER
7.	DR. VANDANA VIKAS THAKRE	MEMBER
8.	DR. LAXMI SHRIVASTA	MEMBER
9.	DR. R.P. NARWARIA	MEMBER
10	DR. KARUNA MARKAM	MEMBER
11	PROF. MADHAV SINGH	MEMBER
12	PROF.POOJA SAHOO	MEMBER
13	PROF. DEEP K. PARSEDIYA	MEMBER

The following points were discussed:

1-Minutes of the previous meeting of the Board of Studies of Electronics held on 23 July 2016 were confirmed.

2- Scheme and syllabus of the following programs were discussed and recommended for the approval of Academic Council:

B.E. Electronic Engineering

B.E. Electronics & Telecommunication Engineering

3- Need of two new subjects namely Sensors & Its Applications in IOTs and Cloud Computing in the curriculum.

Vandana
SR *Peta*
Deep *SR* *SR* *SR* *SR*
SR

4-Three existing subjects viz .Industrial Electronics, Power Electronics & Electronics System Design may be taught as an Elective subjects and Microcontroller & Embedded system must be the compulsory subject.

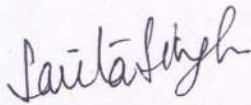
5- Experts from industry and academia may be called to teach the Elective subject in place of self study.

6-Final year students may be given very less load so that they can prepare for their competitive exam and the reduce load may be distributed in pre final year curriculum.

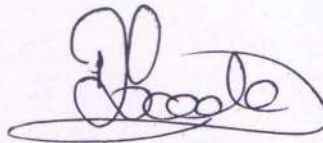
7-It is suggested to combine two subjects i.e. Radar and Satellite Communication and remove the subject TV & Radar Engineering which is obsolete.

8- It is suggested to introduce subject like Wireless Sensors Network and System integration to bridge the gap.

The meeting ended with vote of thanks to chair



DR. S. S. BHADAURIA

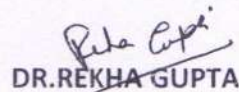


DR. P.L. ZADE

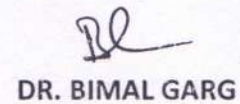


SHRI ASHUTOSH CHINCHOLIKAR

DR. P.K.SINGHAL



DR.REKHA GUPTA



DR. BIMAL GARG

DR. VANDANA VIKAS THAKRE



DR. LAXMI SHRIVASTA



DR. R.P. NARWARIA



DR. KARUNA MARKAM



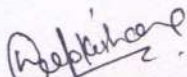
PROF. MADHAV SINGH



PROF.POOJA SAHOO



PROF. DEEP K. PARSEDIYA



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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B.E. III Semester (ELECTRONICS) GROUP B *For batches admitted in July, 15 & July, 16 (to be implemented in July, 2017)*

Subject wise distribution of marks and corresponding credits

S.NO.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End Sem.	Mid Sem. Test	Quiz/ Assignment	End Sem.	Term work					
							Lab Work & Sessional					
1.	BELL301	Material Science	70	20	10	-	-	100	3	1	-	4
2.	BELL302	Electronics I	70	20	10	30	20	150	2	1	2	4
3.	BELL303	Digital Circuits and systems	70	20	10	30	20	150	2	1	2	4
4.	BELL304	Network theory	70	20	10	30	20	150	2	1	2	4
5.	BELL305	Electronics measurement and instrumentation	70	20	10	-	-	100	3	1	-	4
6.	BELP306	Computer Lab	-	-	-	30	20	50	-	-	4	2
7.	BELS307	Idea Generation	-	-	-	-	50-	50	-	-	4	2
8.	BELS308	Communication Skills	-	-	-	-	50	50	-	-	4	2
9.		NSS/NCC	-	-	-	-	-	-	-	-	-	Qualifier
Total			350	100	50	120	180	800	12	5	18	26

GROUP A: (Civil, Mechanical, Computer Science, Information Technology, Biotech)

GROUP B: (Electrical, Electronics, Chemical, Automobile, Electronics & Telecommunication)

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B.E. IV Semester (ELECTRONICS)

GROUP B

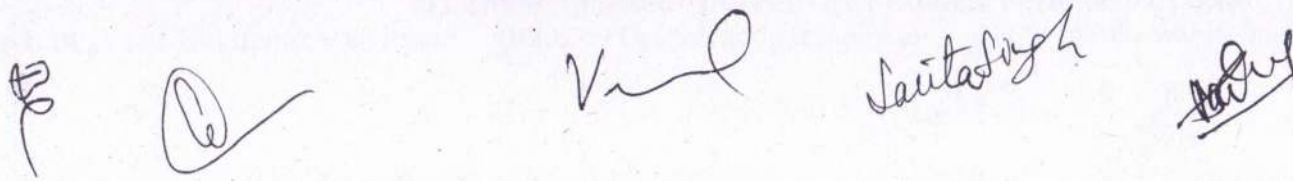
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Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End Sem.	Mid Sem. Test	Quiz/ Assignment	End Sem.	Term work Lab Work & Sessional					
1.	BELL401	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2.	BELL402	Electronics II	70	20	10	30	20	150	2	1	2	4
3.	BELL403	Analog communication	70	20	10	30	20	150	2	1	2	4
4.	BELL404	Network Synthesis and Filter Design	70	20	10	30	20	150	2	1	2	4
5.	BELL405	Signal and systems	70	20	10	-	-	100	3	1	-	4
6.	BELP406	Simulation Lab		-	-	30	20	50	-	-	4	2
7.	BELS407	Seminar/ Presentation/ GD		-	-	-	50	50	-	-	4	2
8.	BELS408	Integrated Ethics and Attitude		-	-	-	50	50	-	-	4	2
9.		NSS/NCC	-	-	-	-	-	-	-	-	-	Qualifier
Total			350	100	50	120	180	800	12	5	18	26

GROUP A: (Civil, Mechanical, Computer Science, Information Technology, Biotech)

GROUP B: (Electrical, Electronics, Chemical, Automobile, Electronics & Telecommunication)



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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B.E. V Semester (Electronics) (GROUP A)

For batches admitted in July, 15 & July, 16 (to be implemented in July, 2017)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	BELL501	Principles of Management & Economics	70	20	10	-	-	100	3	1	-	4
2.	BELL502	Microprocessors & Interfacing	70	20	10	30	20	150	3	1	2	5
3.	*	Elective -1	70	20	10	-	-	100	3	1	-	4
4.	BELL504	Linear Control Theory	70	20	10	30	20	150	3	1	2	5
5.	BELL505	Digital Communication	70	20	10	30	20	150	3	1	2	5
6.	BELP506	Electronics Workshop	-	-	-	30	20	50	-	-	2	1
7.	BELS507	Self Study (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
8.	BELS508	Seminar & Group Discussion (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
		Total	350	100	50	120	180	800	15	5	12	26

GROUP A: (Electrical, Electronics, Computer Science, Information Technology, Electronics & Telecommunication)

GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)

01 Theory period:01 Credit; 02 Practical Periods: 01 Credit

*Elective-I: BELL503 Electromagnetic Fields BELL509 Optimization techniques BELL510 Renewable energy resources BELL511 Mechatronics

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B.E. VI Semester (Electronics) (GROUP A)

For batches admitted in July, 15 & July, 16 (to be implemented in July, 2017)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	BELL601	Antenna & Wave Propagation	70	20	10	-	-	100	3	1	-	4
2.	BELL602	Digital Signal Processing	70	20	10	30	20	150	3	1	2	5
3.	BELL603	Data Communication	70	20	10	30	20	150	3	1	2	5
4.	*	Elective-II	70	20	10	-	-	100	3	1	-	4
5.	BELL605	Industrial Electronics	70	20	10	30	20	150	3	1	2	5
6.	BELP606	Minor Project - I	-	-	-	30	20	50	-	-	2	1
7.	BELS607	Self Study (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
8.	BELS608	Seminar & Group Discussion (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
Total			350	100	50	120	180	800	15	5	12	26

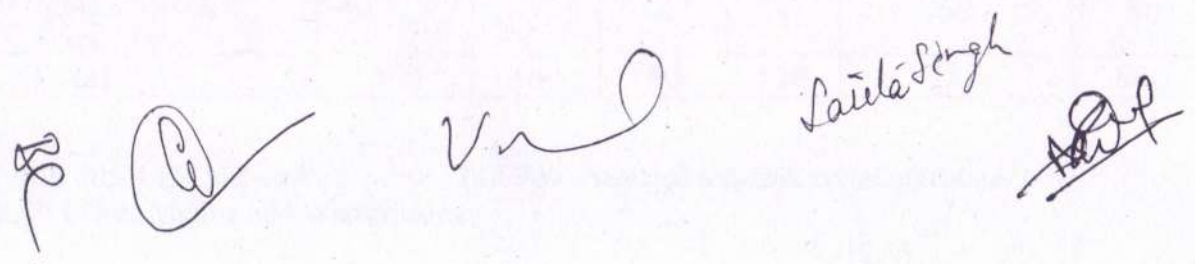
01 Theory period:01 Credit; 02 Practical Periods: 01 Credit

*Elective-II: BELL604 Electronic System Design Embedded Systems

BELL609 Data Structure

BELL610 Integrated circuits

BELL611 Microcontroller and



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B.E. VII Semester
Electronics Engineering

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	ELL701/7441	Advanced Control System	70	20	10	30	20	150	3	1	2	6
2.	ELL702/7442	Microwave Engg.	70	20	10	30	20	150	3	1	2	6
3.	ELL703/7443	Cellular & Mobile Communication	70	20	10	30	20	150	3	1	2	6
4.	ELL704/7444	VLSI Design	70	20	10	-	-	100	3	1	-	4
5.	*	Elective - III	70	20	10	-	-	100	3	1	-	4
6.	ELP706/7446	Major Project - I	-	-	-	30	20	50	-	-	2	2
7.	ELS707/7406	Self Study	-	-	-	-	50	50	-	-	2	2
8.	ELS708/7407	Seminar/Group Discussion	-	-	-	-	50	50	-	-	2	2
		Total	350	100	50	120	180	800	15	5	12	32

* **Elective-III:** ELL 705 ATM Networks
ELL 711 Data Mining and Warehousing

ELL709 Selected topics in communication

ELL 710 CMOS Technology

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B.E. VIII Semester
Electronics Engineering

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	ELL801/8441	Fiber Optics and Optical Communication	70	20	10	30	20	150	3	1	2	6
2.	ELL802/8442	Satellite communication	70	20	10	30	20	150	3	1	2	6
3.	ELL803/8443	TV and Radar Engg	70	20	10	30	20	150	3	1	2	6
4.	*	Elective – IV	70	20	10	-	-	100	3	1	-	4
5.	ELL805/8445	Major Project – II				100	50	150	-	-	8	8
6.	ELP806/8446	Self Study	-	-	-	-	50	50	-	-	2	2
7.	ELS807/8406	Seminar/Group Discussion	-	-	-	-	50	50	-	-	2	2
		Total	280	80	40	190	210	800	12	4	18	34

Minimum Passing Marks: (A) Theory (End Sem) 35% (B) Theory Block Aggregate 35% (C) Duration of Theory Paper (End Sem) 3hrs
Practical (End Sem) 50% Practical Block Aggregate 50%

Elective-IV ELL804 Neural Network and Fuzzy Systems
ELL810 Biomedical Instrumentation

ELL808 Image Processing and Pattern Recognition

ELL809 Nanotechnology



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B.E. III Semester (ELECTRONICS) GROUP B *For batches admitted in July, 15 & July, 16 (to be implemented in July, 2017)*

Subject wise distribution of marks and corresponding credits

S.NO.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End Sem.	Mid Sem. Test	Quiz/ Assignment	End Sem.	Term work					
							Lab Work & Sessional					
1.	BELL301	Material Science	70	20	10	-	-	100	3	1	-	4
2.	BELL302	Electronics I	70	20	10	30	20	150	2	1	2	4
3.	BELL303	Digital Circuits and systems	70	20	10	30	20	150	2	1	2	4
4.	BELL304	Network theory	70	20	10	30	20	150	2	1	2	4
5.	BELL305	Electronics measurement and instrumentation	70	20	10	-	-	100	3	1	-	4
6.	BELP306	Computer Lab	-	-	-	30	20	50	-	-	4	2
7.	BELS307	Idea Generation	-	-	-	-	50-	50	-	-	4	2
8.	BELS308	Communication Skills	-	-	-	-	50	50	-	-	4	2
9.		NSS/NCC	-	-	-	-	-	-	-	-	-	Qualifier
Total			350	100	50	120	180	800	12	5	18	26

GROUP A: (Civil, Mechanical, Computer Science, Information Technology, Biotech)

GROUP B: (Electrical, Electronics, Chemical, Automobile, Electronics & Telecommunication)

Santa Singh

Arora

Sharma

Verma

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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B.E. IV Semester (ELECTRONICS)

GROUP B

For batches admitted in July, 15 & July, 16 (to be implemented in July, 2017)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End Sem.	Mid Sem. Test	Quiz/ Assignment	End Sem.	Term work Lab Work & Sessional					
1.	BELL401	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2.	BELL402	Electronics II	70	20	10	30	20	150	2	1	2	4
3.	BELL403	Analog communication	70	20	10	30	20	150	2	1	2	4
4.	BELL404	Network Synthesis and Filter Design	70	20	10	30	20	150	2	1	2	4
5.	BELL405	Signal and systems	70	20	10	-	-	100	3	1	-	4
6.	BELP406	Simulation Lab		-	-	30	20	50	-	-	4	2
7.	BELS407	Seminar/ Presentation/ GD		-	-	-	50	50	-	-	4	2
8.	BELS408	Integrated Ethics and Attitude		-	-	-	50	50	-	-	4	2
9.		NSS/NCC	-	-	-	-	-	-	-	-	-	Qualifier
Total			350	100	50	120	180	800	12	5	18	26

GROUP A: (Civil, Mechanical, Computer Science, Information Technology, Biotech)

GROUP B: (Electrical, Electronics, Chemical, Automobile, Electronics & Telecommunication)

Santosh Singh

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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B.E. V Semester (Electronics) (GROUP A)

For batches admitted in July, 15 & July, 16 (to be implemented in July, 2017)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	BELL501	Principles of Management & Economics	70	20	10	-	-	100	3	1	-	4
2.	BELL502	Microprocessors & Interfacing	70	20	10	30	20	150	3	1	2	5
3.	BELL503(i)	Elective -1 (Electromagnetic Fields)	70	20	10	-	-	100	3	1	-	4
4.	BELL504	Linear Control Theory	70	20	10	30	20	150	3	1	2	5
5.	BELL505	Digital Communication	70	20	10	30	20	150	3	1	2	5
6.	BELP506	Electronics Workshop	-	-	-	30	20	50	-	-	2	1
7.	BELS507	Self Study (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
8.	BELS508	Seminar & Group Discussion (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
Total			350	100	50	120	180	800	15	5	12	26

GROUP A: (Electrical, Electronics, Computer Science, Information Technology, Electronics & Telecommunication)

GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)

01 Theory period:01 Credit; 02 Practical Periods: 01 Credit

Elective-I: (i) Electromagnetic Fields (ii) Optimization techniques (iii) Renewable energy resources (iv) Mechatronics

Savitadga *503* *509* *509* *509* *509* *509* *509*

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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B.E. VI Semester (Electronics) (GROUP A)

For batches admitted in July, 15 & July, 16 (to be implemented in July, 2017)

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	BELL601	Antenna & Wave Propagation	70	20	10	-	-	100	3	1	-	4
2.	BELL602	Digital Signal Processing	70	20	10	30	20	150	3	1	2	5
3.	BELL603	Data Communication	70	20	10	30	20	150	3	1	2	5
4.	BELL604(i)	Elective-II (Electronic System Design)	70	20	10	-	-	100	3	1	-	4
5.	BELL605	Industrial Electronics	70	20	10	30	20	150	3	1	2	5
6.	BELP606	Minor Project - I	-	-	-	30	20	50	-	-	2	1
7.	BELS607	Self Study (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
8.	BELS608	Seminar & Group Discussion (Internal Assessment)	-	-	-	-	50	50	-	-	2	1
Total			350	100	50	120	180	800	15	5	12	26

01 Theory period:01 Credit; 02 Practical Periods: 01 Credit

Elective-II: (i) Electronic System Design (ii) Data Structure (iii) Integrated circuits (iv) Microcontroller and Embedded Systems

Santosh *Boole* *610* *611* *Val* *ang* *Q*

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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B.E. VII Semester
Electronics Engineering

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	ELL701/ 7441	Advanced Control System	70	20	10	30	20	150	3	1	2	6
2.	ELL702/ 7442	Microwave Engg.	70	20	10	30	20	150	3	1	2	6
3.	ELL703/ 7443	Cellular & Mobile Communication	70	20	10	30	20	150	3	1	2	6
4.	ELL704/ 7444	VLSI Design	70	20	10	-	-	100	3	1	-	4
5.	ELL705/ 7445(ii)	Elective – III (ATM Networks)	70	20	10	-	-	100	3	1	-	4
6.	ELP706/7 446	Major Project – I	-	-	-	30	20	50	-	-	2	2
7.	ELS707/7 406	Self Study	-	-	-	-	50	50	-	-	2	2
8.	ELS708/7 407	Seminar/Group Discussion	-	-	-	-	50	50	-	-	2	2
		Total	350	100	50	120	180	800	15	5	12	32

Elective-III: (i) Selected topics in communication ⁷⁰⁹ (ii) ATM Networks ⁷⁰⁵ (iii) CMOS Technology ⁷¹⁰ (iv) Data Mining and Warehousing ⁷¹¹

Santosh
Bhoola

JS *V-L*

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A UGC-Autonomous Institute affiliated to RGPV, Bhopal)

B.E. VIII Semester

Electronics Engineering

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			L	T	P	
			End sem	Mid Sem	Quiz/	End Sem	Lab work & Sessional					
1.	ELL801/ 8441	Fiber Optics and Optical Communication	70	20	10	30	20	150	3	1	2	6
2.	ELL802/ 8442	Satellite communication	70	20	10	30	20	150	3	1	2	6
3.	ELL803/ 8443	TV and Radar Engg	70	20	10	30	20	150	3	1	2	6
4.	ELL804/ 8444(ii)	Elective – IV (Neural Network and Fuzzy Systems)	70	20	10	-	-	100	3	1	-	4
5.	ELL805/ 8445	Major Project – II				100	50	150	-	-	8	8
6.	ELP806/8 446	Self Study	-	-	-	-	50	50	-	-	2	2
7.	ELS807/8 406	Seminar/Group Discussion	-	-	-	-	50	50	-	-	2	2
		Total	280	80	40	190	210	800	12	4	18	34

Minimum Passing Marks: (A) Theory (End Sem) 35% (B) Theory Block Aggregate 35% (C) Duration of Theory Paper (End Sem) 3hrs

Practical (End Sem) 50% Practical Block Aggregate 50%

Elective-IV (i) Image Processing and Pattern Recognition (ii) Neural Network and Fuzzy Systems (iii) Nanotechnology (iv) Biomedical Instrumentation

Pratishk *808* *809* *810*

Department of Electronics Engineering

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2	1	2

ELECTRONICS – I (BELL/BETL - 302)

Course objective: To understand different semiconductor devices and circuits and inculcate the capability to design and construct circuits, take measurements of circuit parameters.

Unit I

Clippers and Clampers, Power supply parameters, SMPS, Zener voltage regulator, transistor series pass regulator (with feedback) and shunt voltage regulators, Short circuit protection.

Unit II

Transistors, characteristics of bipolar junction transistors(BJT)– CB, CE, CC configurations ,Low frequency transistor amplifiers, Equivalent circuit of BJT using h parameter for CB, CE, CC configuration, calculation of transistor parameter for CB, CE, CC using h parameters,

Unit-III

Transistor Amplifier: comparison of transistor amplifier configuration (gain, input impedance, output impedance, current gain, voltage gain) cascading of BJT amplifier. Transistor biasing and bias stabilization, the operating point, stability factor ,analysis of fixed base bias , collector to base bias , Emitter resistance bias circuit, Bias compensation techniques.

Unit IV

Field effect transistors, construction and characteristics of JFET, JFET biasing circuit MOSFET construction and characteristics, small signal model. MOSFET enhancement and depletion mode, Common source amplifier. Application of FET as a voltage variable resistor (VVR).

Unit V

Multistage Amplifiers: classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, the RC coupled amplifier, low frequency response of an RC coupled stages, effect of an emitter bypass capacitor on low frequency response.

Reference Books:

1. Micro Electronics – Miliman Gabel, McGraw-Hill
2. Microelectronic Circuits – Adel S. Sedra & Kenneth C Smith, Oxford University Press
3. Electronics Devices and Circuits – Boylested Nashelsky, Prentice Hall
4. Integrated Electronics- Millman Halkias, McGraw Hill Education

Course Outcomes

After the completion of this course students will be able to:

1. Design power supplies and DC regulator circuit using Zener diode.
2. Analyse basic circuits like biasing circuits, small-signal ac circuits with emphasis on single-stage amplifier.
3. Design amplifier using field effect transistors and applied application as a VVR.
4. Conduct experiments involving electronic devices and circuits.
5. Use feedback concept in amplification and analyze different feedback circuits.
6. Explain the basic principle, operation, Characteristics and applications of analog devices like Zener diode, Tunnel diodes, BJT and FET.

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Department of Electronics Engineering

List of Experiments
Electronics-I
(BELL/BETL - 302)

1. To study the half wave Rectifier
2. To study the Full wave Rectifier
3. To study the clipper and clamper circuits.
4. To study V-I characteristics of Zener diode.
5. To study the characteristics of Bipolar Junction Transistor.
6. To study CB, CE and CC Configuration of Bipolar Junction Transistor.
7. To study the characteristics of Junction Field Effect Transistor.
8. To study the characteristics of Enhancement mode MOSFET.
9. To study the characteristics of Depletion mode MOSFET.
10. To study the RC coupled amplifier.

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Digital Circuits and Systems
(BELL/BETL - 303)

Course objective : To understand the concept of digital systems and design and analyze combinational and sequential logic circuits.

Unit I-

Digital systems and Number system: Introduction to Digital system, number system & their conversion, Compliments of numbers, Binary codes.

Boolean algebra and switching functions: minimization of Boolean functions, Canonical & standard form, concept of prime implicant etc. Karnaugh's map method, Quine& Mc Cluskey's method, Introduction to logic gates NAND/NOR realization of switching functions.

Unit II-Combinational Logic circuits: half adder, half subtractor, full adder, full subtractor circuits. Series and parallel adder and BCD adders, look-ahead carry generator, Decoders, Encoders, multiplexers & demultiplexers.

Unit III-Sequential Circuits: Different type of flip-flops such as R-S, J-K, D, T Master slave J-K, edge triggered flip-flops. Applications of these flip-flops in shift registers, various types of counters.

Unit IV- Logic Families: RTL, DTL, all types of TTL circuits, ECL, HTL and PMOS, NMOS & CMOS logic etc. Comparison of various logic families

Unit V- Introduction to converters: Various types of analog to digital & digital to analog converters sample & hold circuits, Finite state machine, Moore and Mealey machines., Introduction to various semiconductor memories & designing with ROM and PLA.

Reference Books:

1. Digital Electronics- W.H. Gothman- PHI
2. Digital System principles & Applications- R.J. Tocci, Pearson
3. Pulse, Digital & Switching Waveforms- Millman & Taub- Mc Graw Hill
4. Digital Design- M. Mano, Prentice Hall
5. Logic & Computer Design- M.Mano- PHE
6. Digital Circuits and design- S. Salivahanan, Vikas Publishing House

Course Outcomes

After the completion of this course students will be able to:

1. Identify different logic gates, their realizations and truth tables.
2. Apply properties of Boolean algebra for minimizing logic expression.
3. Design various synchronous and asynchronous sequential circuits.
4. Discriminate between combinational and sequential circuits.
5. Describe the operation of different types of semiconductor memories.
6. Compare the Logic families and converters.

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Department of Electronics Engineering

List of Experiments
Digital Circuits and Systems
(BELL/BETL - 303)

1. To study basic Logic Gates- NAND, AND, NOR, NOT, OR, EX-OR, EX-NOR.
2. To construct the basic Gates using universal Gates.
3. To study and verify the truth table of Half Adder and Full Adder.
4. To study and verify the truth table of Half Subtractor and Full Subtractor.
5. To study and verify Demorgan's Theorem.
6. To study D latch flip flop.
7. To study R. S. flip flop.
8. To study J. K. flip flop.
9. To study parity generator/ checker circuit.
10. To study Analog to Digital and Digital to Analog converters.

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Department of Electronics Engineering

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Network Theory
(BELL/BETL - 304)

Course objective: To analyze phasor diagrams of three phase circuits, DC and AC transients, to impart knowledge on graph theory of networks, design and analyze two port networks.

Unit-I Introduction to Circuit Elements, Characterization of Resistors, Capacitors & Inductors in Terms of their linearity & time dependence features, Characteristics of Independent & Dependent Sources, KCL & KVL for circuits with dependent & independent sources, Dot convention for coupled inductor and their characteristics, co-efficient of coupling.

Unit-II Network theorems - superposition, Thevenin, Norton, Milliman, reciprocity and maximum power transfer theorems, problem with controlled sources, Network topology, concept of network graph, Tree, Tree branch and link, Incident matrix, cut set and tie set matrices.

Unit-III Transient analysis, Transients in RL, RC and RLC circuits, initial conditions, time constants, Steady state analysis – concept of phasor and vector, impedance and admittance. Node and mesh analysis of RL, RC and RLC networks with sinusoidal and driving sources.

Unit-IV Transform Domain Analysis of Networks: The Laplace transform, use of Laplace transform for the solution of integro differential equation. Initial and final value theorem. Transforms of wave forms synthesized with step, Ramp gate and sinusoidal functions.

Unit-V The concept of complex frequency, Concept of Ports, Network functions of one port & two ports, Calculation of network functions for one port and two port, Pole & zeros of network of different kinds. Two port parameters – Z, Y, hybrid and chain Parameters. Relationship between Parameters.

Reference Book:-

1. Network Synthesis – M.E. Van Valkenberg, , Prentice Hall of India
2. Network Analysis – M.E. Van Valkenberg (PHI)
3. Network systems – D. Roy Chaudhary, New Academic Science Ltd

Course Outcomes

After the completion of this course students will be able to:

1. Recognize passive and active elements.
2. Recognize voltage dependent and current dependent sources.
3. Solve the complicated network using theorems.
4. Compute the initial and final condition of RLC circuits.
5. Analyze the networks through transformation (Laplace transform).
6. Compute impedance, admittance and gain of the two port networks.

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Department of Electronics Engineering

List of Experiments

Network Theory

(BELL/BETL - 304)

1. To study and verify the Kirchoff's Current Low (KCL).
2. To study and verify the Kirchoff's Voltage Low (KVL).
3. To study and verify the Superposition Theorem.
4. To study and verify the Thevenin Theorem.
5. To study and verify the Norton's Theorem.
6. To study and verify the Milliman's Theorem.
7. To study and verify the Reciprocity Theorem.
8. To study and verify the Maximum Power Transfer Theorem.
9. To study and verify the condition for Series RLC circuit.
10. To study and verify the condition for Parallel RLC circuit.

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Department of Electronics Engineering

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Electronics Measurement and Instrumentation
(BELL/BETL - 305)

Course objective : To introduce students the use of various electrical/electronic instruments, their construction, applications, principles of operation, standards and units of measurements and provide students with opportunities to develop basic skills in the design of electronic equipments.

UNIT- I

A.C. Bridges: Measurement of self inductance, measurement of incremental inductance, Measurement of capacitance, measurement of mutual inductance using different types of bridges.

UNIT - II

Transducers: Classification of transducers, Strain gauge, thermistor, thermocouple, LVDT, Synchros, Capacitive transducers, Piezoelectric transducers

UNIT-III

Signal generation: Sine wave generation, frequency synthesized signal generator, frequency divider generator, signal generator modulation, sweep frequency generator, pulse and square wave generators, Function generator, Audio frequency signal generation.

UNIT-IV

Digital Instruments: Digital volt meters.-Ramp techniques, dual slope, integrating type, resolution and sensitivity of digital meters, digital multi-meters, digital frequency meter, universal counter.

UNIT-V

CRO : Introduction to CRO, dual beam CRO, dual trace CRO, measurement of frequencies by Lissajous method, measurement of capacitance and inductance, digital storage oscilloscope.

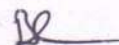
Reference Books:

1. Electronic Instrumentation and measurement techniques- By W.D. Cooper and A.D. Helfrick, Prentice Hall
2. Electronics Instrumentation – By H.S. Kalsi, Tata McGraw-Hill
3. Electrical & Electronics Measurement and Instrumentation – By A.K. Sawhney, Dhanpat Rai & Co

Course Outcomes

After the completion of this course students will be able to:

1. Identify different types of bridges.
2. Solve different types of bridges for mutual inductance.
3. Analyze the operation of transducers.
4. Compare different transducer.
5. Compare signal generators.
6. Understand the operation of CRO, digital multi-meters.





Department of Electronics Engineering

**List of Practical
BELS/BETS306 CP-III (Visual Basics)**

1. Write a program to perform addition, Subtraction, Multiplication and Division of two numbers.
2. Write a program to design a Login Form.
3. Write a program to print the series of odd or even numbers using input by user.
4. Write a program to determine length of a number.
5. Write a program to length of a word.
6. Write a program to design a registration Form.
7. Write a program to change the back color of form.
8. Write a program to operate Traffic Signal Light.
9. Write a program to calculate the Factorial, Square and Cube of a Number.
10. Write a program to design a Restaurant Bill.

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Electronics –II
(BELL/BETL - 402)

Course objective: Students will be able to learn Multistage amplifiers, Negative feedback: advantages, Tuned amplifiers and analysis of Oscillators.

Unit I

Oscillators: Barkhausen criterion, Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, resonant oscillator, Wien Bridge and crystal oscillators, Clapp oscillator.

Unit II

Tuned amplifier, general behavior of tuned amplifier, Single tuned and doubled tuned amplifier, Advantages and disadvantages of tuned amplifiers, Q factor of a circuit and coil, series and parallel resonant circuit, variation of impedance with frequency, Bandwidth of series and parallel resonant circuit.

Unit III

Power Amplifiers: Introduction, Amplifier Types, Analysis and design of Class A, Class B, Class AB, class C amplifiers, Amplifier Distortion, Power Transistor Heat Sinking, Class C, harmonic distortion, push pull amplifiers,

Unit IV

Multivibrators: Monostable, Astable, Bistable (transistorized), 555 timer and its applications.

Unit V

Introduction of Operational Amplifier: Introduction, characteristics of Ideal OP-Amp, operational amplifier stages, equivalent circuit of OP-Amp, Transfer characteristics of OP-Amp, Inverting and Non inverting OP-Amp, OP-Amp parameters

Reference Books:

1. Electronics Devices and Circuits – Boylested Nashelsky, Prentice Hall
2. Integrated Electronics- Millman Halkias, McGraw Hill Education
3. Micro Electronics – Miliman Grabel, McGraw-Hill
4. Microelectronic Circuits – Adel S. Sedra & Kenneth C Smith, Oxford University Press
5. Electronics Devices and Circuits – Sanjeev Gupta, Dhanpat Rai Publications

Course Outcomes

After the completion of this course students will be able to:

1. Classify and distinguish different types of oscillators.
2. Sketch the operation and characteristics of tuned amplifier.
3. Analyze different types of power amplifier like Class A, Class B, Class AB and Class C.
4. Design of Multivibrators using BJT.
5. Reconstruct and analyzed Multivibrators using 555 timers.
6. Apply the application of Operation Amplifier as adder, subtractor, logarithm, exponential etc.

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Department of Electronics Engineering

List of Experiments

Electronics-II

(BELL/BETL - 402)

1. To study of IC 555 and its application.
2. To study Hartley Oscillator.
3. To study Wien Bridge Oscillator.
4. To study Clapp Oscillator.
5. To study Colpitt Oscillator.
6. To study Crystal Oscillator.
7. To study Transistor Switching Characteristics.
8. To study IC 741 OP-AMP for Inverting and non-inverting mode.
9. To study IC 741 OP-AMP as summer, subtractor, integrator and differentiator.
10. To study IC 741 OP-AMP as current and voltage follower

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Analog Communication
(BELL/BETL - 403)

Course objective: Review of Fourier theory, linear system theory, probability and random processes, Modulation and detection and Noise in modulation systems.

Unit I

Fourier series and Fourier transforms: Single side and double side spectral representation, Normalized power Parsevals theorem, convolution, Auto-correlation and cross-correlation.

Unit II

Amplitude modulation, need of modulation, single side band and double side band suppressed carrier and vestigial side band, modulation techniques their generation and detection, square law modulators, switching modulator, envelope and square law detector, balanced modulator.

Unit III

Angle Modulation, Relationship between Frequency and phase modulation, frequency and phase deviation, Carson's rule, spectrum of F.M. signal, Constant bandwidth of F.M. ,comparison of narrow band F.M. and A.M., generation of F.M. signal.

Unit IV

Probability, random variables, cumulative distribution function, Probability density function, average and variance of random variables, Gaussian and Rayleigh probability density function, Error function and complementary error functions.

Unit V

Various sources of noise, Mathematical representation of noise figure, Noise bandwidth, Noise temperature and noise figure of amplifiers in cascades. Figure of merit of modulation techniques, comparison of modulation scheme on the basis of noise.



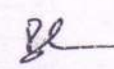
Reference Books:

1. Communication System – Kennedy, Tata McGraw-Hill
2. Principles of communication Engg.- Haykins, Tata McGraw-Hill
3. Communication Systems - B.P.Lathi, Oxford Univ
4. Modern Digital & Analog Communication System – B.P. Lathi , Oxford;
5. Principles of communication- Taub and Schilling, McGraw-Hill Education

Course Outcomes

After the completion of this course students will be able to:

1. Represent the periodic non-sinusoidal signals into sine and cosine terms using Fourier series.
2. Analyse the periodic and aperiodic non-sinusoidal signals using Fourier Transform.
3. Know the need of modulation.
4. Describe amplitude, frequency and phase modulation.
5. Classify the noise and its effect on different modulation techniques.
6. Describe the random variables and various distribution functions.

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Department of Electronics Engineering

List of Experiments
Analog Communication
(BELL/BETL - 403)

1. Study and analysis of Balance modulator.
2. Analysis of Amplitude Modulation and calculation for modulation index.
3. Study and analysis of Amplitude Demodulation.
4. Study and analysis of Frequency Modulation and calculation for modulation index.
5. Study and analysis of Frequency Demodulation.
6. Study of time division multiplexing.
7. Study of frequency division multiplexing.
8. Study and analysis of Switching modulator.
9. Study and analysis of SSB modulation.
10. Study and analysis of DSB modulation.

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Network Synthesis and Filter Design
(BELL/BETL - 404)

Course objective : To make the students capable of analyzing electrical network and how to synthesize an electrical network from a given impedance/admittance function.

Unit I Characteristic impedance, iterative impedance, Propagation constant, analysis of symmetrical T, π , Lattice and Bridged-T networks, image impedance, attenuators and their design.

Unit II-Network Synthesis: Positive real function, LC, RL, RC and RLC network synthesis, Foster and Cauer network.

Unit III- Realization of minimum positive real function: Minimum positive real function, Brune's method, Bott-Duffin method, Insertion Loss Synthesis-Coefficient matching technique.

Unit IV- Passive Filters: Constant K prototype Filters: Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, frequency transformation.

Unit V- Active filters: Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, relation of the above filters. Filter design using Sallen and Key approach.

Reference Books:

1. Principles of Active Network Synthesis and Design – G. Daryanani, John Wiley & Sons
2. Network Analysis and Synthesis - F.F. Kuo, John Wiley & Sons
3. Network fields –J.D. Ryder, Prentice- Hall.
4. Network Synthesis – Van Valkenberg, Wiley; 1 edition

Course Outcomes

After the completion of this course students will be able to:

1. Compute image and impedance parameters of the different types of networks.
2. Synthesize the network using impedance and admittance functions.
3. Distinguish the PR & Minimum PR function and also synthesize the systems (using Brunes & Bott Duffin method).
4. Construct the passive filters using characteristics impedance and cutoff frequency.
5. Understand filter specifications
6. Determine the poles and zeros of networks for stabilization using Butterworth and Chebyshev approximation.

Department of Electronics Engineering

List of Experiments
Network Synthesis and Filter Design
(BELL/BETL - 404)

1. Study first order and second order Low pass filter.
2. Study first order and second high pass filter.
3. Study first order and second band pass filter.
4. Study and analysis of Lattice filter.
5. Study and analysis of attenuators.
6. To study the lead and lag active network.
7. To study the lead and lag passive network.
8. Study and analysis of Butterworth approximation.
9. Study and analysis of Chebyshev approximation.
10. Study and analysis of cascade two port network.
11. Study and realization of minimum positive real function.

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**Signals and Systems
(BELL/BETL -405)**

Course objective: Coverage of continuous and discrete-time signals and systems, their properties and representations and methods that are necessary for the analysis of continuous and discrete-time signals and systems.

Unit-1 Introduction & Mathematical Description of Continuous – Time Signals

Definition & Classification of signals, Functions and functional notation, Signal Function; Continuous-Time Function, Complex Exponential and Sinusoidal Function with Discontinuities, Singularity Function and Related Functions; Unit Step, Signum, Unit Ramp, Unit Impulse, Periodic Impulse or Impulse Train, A Coordinated Notation for Singularity Functions, Unit Rectangle, Unit Triangle, Unit Sinc Function, Gaussian Function, Dirichlet Function, Even and Odd Functions, Periodic and non periodic Functions, Signal Energy and Power, Scaling and Shifting; Amplitude Scaling, Time Shifting, Differential and Integration,

Unit-2 Mathematical Description of Discrete – Time Signals

Signal Functions, Sampling and Discrete Time, Exponential and Sinusoidal, Singularity Functions, Kroneker Delta function, Unit –Sequence Function, Signum Function, Unit –Ramp Function, Unit –Rectangle Function, Periodic Impulse or Impulse Train, Scaling and Shifting; Amplitude Scaling, Time Shifting, Differencing and Accumulation, Even and Odd discrete Functions, Periodic and non-periodic discrete Functions, Signal Energy and Power of discrete signals,

Unit-3 Properties of Continuous and Discrete Time Systems

System Modelling, System Properties, Homogeneity, Time Invariance, Additivity, Linearity & Superposition, Stability, Incremental Linearity, Causality, Memory, Static Nonlinearity, Inevitability, Eigen functions of LTI Systems, continuous & discrete LTI system, transmission of signals through a LTI system

Unit-4 Time Domain Analysis of Continuous Time Systems

The Convolution Integral, Impulse Response, Convolution & Properties, System Interconnections, Stability and Impulse Response, Response of Systems to Standard Systems, Realization of Differential Equations,

Unit-5 Time Domain Analysis of Discrete Time Systems

The Convolution Sum, Impulse Response, Convolution & Properties, Numeric Convolution, System Interconnections, Stability and Impulse Response, Response of Systems to Standard Systems, Realization of Differential Equations,

Reference Books:

1. Proakis JP, Manolaxis; Digital Signal Processing Principles: Pearson
2. Michael J Roberts; Fundamentals of Signals & Systems, McGraw Hill
3. Oppenheim AV, Willisky AS and Nawab SH; Signal and systems; Pearson
4. Hwei. P. Hsu; Signals and systems, Schaum's outlines, TME

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Department of Electronics Engineering

Course Outcomes

After the completion of this course students will be able to:

1. Represent the continuous and discrete signals in time and frequency domain.
2. Discriminate the continuous and discrete signals.
3. Recognize the standard signal functions like step, Ramp and Parabolic.
4. Analyze mathematical description of Continuous & Discrete time signals.
5. Describe the LTI system and its properties.
6. Analyze the properties of Continuous and Discrete time systems.
7. Examine the time domain analysis of Continuous & Discrete time systems.

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Department of Electronics Engineering

BELS/BETS-406 [CP-IV (UNIX)]
LIST OF PRACTICALS

1. List all the subdirectories and files in your current directory.
2. Create a directory class13 and also create subdirectories (EC1)and (EC2) inside the directory class D.
3. List subdirectories of class D.
4. Create files EC1studentlist and EC2studentlist and insert 20-20 students name into each of them.
5. Display content of file EC1studentlist and EC2studentlist.
6. Display all files and subdirectories start with and end with r in your current directory.
7. Search name subhas in EC1studentlist and EC2studentlist.
8. Display the count of all the entries in files EC1studentlist and EC2studentlist.
9. Create a file EC1newlab and copy all the entries of EC2studentlist into it.
10. Move the file EC1studentlist into a new file EC11.
11. Now display all the contents of files EC11,EC2 student list and EC1newlab in sorted order.
12. Display names of all users using UNIX at this time in sorted order.
13. Now change permission of file EC11 by taking away write permission from other and group.
14. Compare the file EC2 student list and EC11.
15. Display history of all the command.
16. Write a C program to check whether a number is prime or not

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PRINCIPLES OF MANAGEMENT & MANAGERIAL ECONOMICS
(BELL/BETL /ELL-501/5ZH1/5Y11/5222)

Course objectives: The purpose of managerial economics is to supply a series of basic economic principles to the decision making process within the firm.

Unit I -Management Concepts: Meaning, Characteristics, Importance, process, function, levels of management, organizing process and structure, Administration, Difference and relationship between management, administration and organization, Scientific Management.

Unit II Decision Making: Meaning of a project, Characteristics, Project planning, project organization, Tools and Techniques uses of PERT and CPM.

Unit III Managerial Economics: Introduction, Meaning, Characteristics, Principles of Economics, Factors influencing manager, Micro & Macro economics, Theory of firm.

Unit IV Theory of Cost and Break-even Analysis, Theory of Production:

Production systems, Input-output Analysis, Productivity – Factors affecting, Measuring Productivity, Reasons for low productivity, Increasing Productivity of resources.

Reference Books:

1. Management Principles processor and practices-Anil Bhatt and Arya Kumar
2. Serial of Management -Harold Koontz
3. Industrial Engineering and Management - O.P. Khanna.
4. Serial Economics - D.N. Dwivedi.

Course Outcomes:

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

1. Understand the roles of managers in firms
2. Understand the internal and external decisions to be made by managers
3. Analyze the demand and supply conditions and assess the position of a company
4. Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.
5. Analyze real-world business problems with a systematic theoretical framework.
6. Make optimal business decisions by integrating the concepts of economics, mathematics and statistics.

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MICROPROCESSOR AND INTERFACING (BELL/BETL /ELL-502/5441EL)

Course objectives: To learn architecture of microprocessor. The course covers input/output interfacing circuits and peripheral devices.

UNIT I Salient features of advanced microprocessors. RISC & CISC processors. Review and evolution of advanced microprocessors:8086,8088, 80186/286/386/486/Pentium, introduction to 8086 processor: Register organization of 8086,Architecture,signal description of 8086,minimum mode 8086 systems and timings and maximum mode 8086 systems and timings

UNIT II Intel 8086 microprocessor programming: 8086 Instruction Set, Addressing modes, Assembly Language Programming with Intel 8086 microprocessor

UNIT III Introduction to the various interfacing chips like 8155, 8255, Interfacing key boards, LEDs , ADC, DAC and memory Interfacing.

UNIT IV General purposes programmable peripheral devices (8253), 8254 programmable interval timer, 8259A programmable interrupt controller & 8257 DMA controller, USART, serial I/O & data Communication .

UNIT V Introduction to microcontrollers (8051) and embedded systems: 8051 architecture, pin description , I/O configuration , interrupts, addressing modes, an overview of 8051 instruction set, embedded system, use of microcontrollers in embedded systems

Reference Books:

1. Advance microprocessor and peripheral –A.K. Ray and K. M. Bhurchandi, Tata McGraw Hill
2. Microprocessor and Interfaing – D.V.Hall, McGraw Hill.
3. The Intel microprocessor - Barry B. Brey, Pearson
4. The 8086 & 8088 Microprocessor- LIU and Gibson, Tata McGraw Hill
5. The 8051 microcontroller and embedded systems-M.A. Mazidi,Janice GillispieMazidi, Pearson Prentice Hall

Course Outcomes

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

1. Understand the architecture of 8086 and higher processors and 8051.
2. Impart the knowledge about the instruction set and interfacing..
3. Understand the basic idea about the data transfer schemes and its applications.
4. Develop skill in program writing for 8086 & 8051 and applications.
5. Distinguish between RISC and CISC processors.
6. Learn serial I/O & data Communication

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Department of Electronics Engineering

List of Experiments

MICROPROCESSOR AND INTERFACING (BELL/BETL /ELL-502/5441EL)

Experiments:-

1. System introduction.
2. Hardware, Keyboard & Command Description.

Programs:-

1. To find Hexadecimal addition of two numbers.
2. To find the addition of two sixteen bit numbers.
3. To find addition of a 8 bit number series neglecting the carry generated.
4. To find combination of two hex nibbles to form one byte number.
5. To find Hex number stored in location for odd or even parity.
6. To find multiplication by two, employing bit rotation.
7. To display flashing 'ABCDEF'.
8. To find the smallest number in data array.
9. To find the smallest number from a series of numbers.
10. To arrange a data array in ascending order.
11. To find Square root of a number.

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ELECTROMAGNETIC FIELDS (BELL/BETL /ELL-503 (/5442EL)
(Elective-I)

Course objectives: Develop an understanding of the fundamental concepts of electromagnetic fields, with an emphasis on wave propagation, relate basic electromagnetic concepts to the performance of devices, circuits, and systems.

Unit I Steady Electric Field: Coulomb's Law, units, Electric field intensity, Electric flux and flux density, Gauss law, Boundary relations, concept of divergence, Curl, scalar and vector potential. electric field in dielectric and conductor, continuity equation, methods of images.

Unit II Magnetic field due to steady currents, force between current carrying wires; Stokes theorem, vector magnetic potential, magnetization vector and its relation to magnetic field.

Unit III Maxwell's Equation: Time varying field and displacement current, faraday's law.

Unit IV Wave Equation: Pointing vector, Plane electromagnetic waves in free space, dielectric medium and conducting medium, Skin depth, slepian vector.

Unit V Waves propagation in lossy dielectrics, plane waves in lossless dielectrics, reflection of a plane wave at normal incidence , reflection of a plane wave at oblique incidence .

Reference Books:

1. Elements of Engineering Electromagnetic Third Edition- N.N. Rao- Prentice Hall, India.
2. Elements of Electromagnetic, Second Edition- Matthew N.O. Sadiku- Saunders coll Publishing.
3. Fields & Waves in Communication Electronics- S.Ramo, J.R. Whinnery & T. Van Duzer- John Wiley & Sons.
4. Electromagnetic- J.D. Kraus-McGraw Hill
5. Electromagnetic Waves & Radiating Systems- E.C. Jordan & K.G. Balmain- Prentice Hall.

Course Outcomes

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

1. Solve the problems in different EM fields.
2. Design a programming to generate EM waves subjected to the conditions.
3. Applications of EM Waves in different domains and to find the time average power density.
4. Solve Electromagnetic Relation using Maxwell Formulae.
5. Solve Electro Static and Magnetic to Static circuits using Basic relations.
6. Analyze moving charges on Magnetic fields.
7. Design circuits using Conductors and Dielectrics.

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Department of Electronics Engineering

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OPTIMIZATION TECHNIQUES
(BELL/BETL /ELL-509 /5442EL)
(Elective-I)

Course Objective: The general objectives of the course is to introduce the fundamental concepts of Optimization Techniques; make the learners aware of the importance of optimizations in real scenarios and provide the concepts of various classical and modern methods of for constrained and unconstrained problems in both single and multivariable.

Unit I Introduction to Classical Methods: Terminology, Design Variables, Constraints, Objective Function, and Problem Formulation. Calculus method, Kuhn Tucker conditions, Method of Multipliers.

Unit II Linear Programming: Standard form of linear programming (LP) problem; Canonical form of LP problem; Assumptions in LP Models; Elementary operations, Simplex method, Concept of Duality.

Unit III Single Variable Optimization Problems: Optimality Criterion, Bracketing Methods, Region Elimination Methods, Interval Halving Method, Fibonacci Search Method, Golden Section Method. Gradient Based Methods: Newton-Raphson Method, Bisection Method, Secant Method. Application to Root finding.

Unit IV Multivariable Optimization Algorithms: Optimality Criteria, Unidirectional Search. Direct Search Methods: Hooke-Jeeves pattern search method, Powell's Conjugate Direction Method. Gradient Based Methods: Cauchy's Steepest Descent Method, Newton's method, Marquardt's Method.

Unit V Further Topics in Optimization Techniques: Quadratics Programming, sequential quadratic programming, Integer Programming, Penalty Function Method, Branch and Bound Method, Geometric Programming, Dynamic programming; Genetic algorithm

Reference Books:

1. S. S. Rao: Engineering Optimization, New Age International.
2. E. J. Haug and J.S. Arora, Applied Optimal Design, Wiley, New York.
3. Kalyanmoy Deb, Optimization for Engineering Design, Prentice Hall of India.
4. A. Ravindran and K.M. Ragsdeth, Optimization G.V. Reklaites, Wiley, New York.

Course Outcomes: Upon successful completion of this course, students will be able to

1. Understand the basic concepts of classical methods
2. Formulate optimization problems;
3. Understand and apply the concept of optimality criteria for various type of optimization problems;
4. Solve various constrained and unconstrained problems in single variable as well as multivariable;
5. Apply the methods of optimization in real life situation.

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Department of Electronics Engineering

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RENEWABLE ENERGY SOURCES
(BELL/BETL /ELL-5) /5442EL)
(Elective-I)

Course objective: To understand and analyze the present and future energy demand of world and nation and techniques to exploit the available renewable energy e-sources such as, solar, bio-fuels, wind power, tidal and geothermal effectively.

UNIT-I

Statistics on Conventional Energy Sources and Supply in Developing Countries: Definition, Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES, Classification of NCES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of these energy sources.

UNIT-II

Solar Energy: Definition, Energy available from Sun, Solar radiation data, solar energy conversion into heat, Flat plate and Concentrating collectors, Principle of natural and forced convection, Solar Engines: Stirling, Brayton engines, Photo voltaics: p-n junctions. Solar cells, PV systems, Standalone, Grid connected solar power satellite, Calculation of energy through photovoltaic power generation.

UNIT-III

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics.

Bio-Mass: Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation, and economic aspects.

UNIT-IV

Nature of Geothermal Sources: Definition and classification of resources, Utilization for electricity generation and direct heating, Wellhead power generating units. Basic features: Atmospheric exhaust and condensing, Exhaust types of conventional steam turbines. Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Constructional details of gasifier, Usage of biogas for chullas, various types of chullas for rural energy needs.

UNIT-V

Wave, Tidal and OTEC energy, Difference between tidal and wave power generation. Principles of tidal and wave power generation, OTEC power plants, Operation of small open-cycle experimental facility, Design of 5 MW OTEC pro-commercial plant. Economics of OTEC, Environmental impacts of OTEC, Status of multiple product OTEC systems.

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Department of Electronics Engineering

Reference Books

- Renewable Energy Sources I Twidell & Weir / Taylor and Francis / 2nd Special Indian Edition.
- Non- conventional Energy Sources / G.D. Rai / Dhanpat Rai and Sons.
- Energy Resources Utilization and Technologies /Anjaneyulu & Francis/ BS Publications/2012.
- Principles of Solar Energy / Frank Krieth & John F Kreider / Hemisphere Publications.
- Non-Conventional Energy / Ashok V Desai I Wiley Eastern.
- Non-Conventional Energy Systems / K Mittal / Wheeler.
- Renewable Energy Technologies I Ramesh & Kumar / Narosa.

Course outcomes:

Learner should be able to.

1. To analyze the need of energy demand of world and nation and techniques
2. To understand the Concepts of NCES and Limitations of RES
3. Create awareness among students about Non-Conventional sources of energy technologies
4. Enable students to understand various renewable energy technologies and systems.
5. To impart the knowledge of Storage technologies form the autonomous renewable energy sources
6. Equip the students with knowledge and understanding of various possible mechanisms about renewable energy projects.

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Department of Electronics Engineering

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MECHATRONICS (BELL/BETL /ELL-5() /5442EL) (Elective-I)

Course Objectives: To understand basic architecture of the mechatronics system; design and study the characteristics of the mechanical and electrical actuators and their selection for mechatronic systems and development of process plan and templates for design of mechatronic systems

UNIT-I

Introduction to mechatronics systems: Basic building blocks of mechatronic systems. Mechatronics key elements, Mechatronics in home, office and industry automation, Scope of Mechatronics, advantages of Mechatronics, pre-requisites for Mechatronics.

UNIT-II

Performance characteristics of sensors and transducers, position and speed measurement; proximity sensor, potentiometer, LVDT, digital optical encoder, stress and strain measurement; strain gages, force measurement with load cells, temperature measurement; thermometer, thermocouple, vibration and acceleration measurement, pressure and flow measurement.

UNIT-III

Introduction of actuators, electromagnetic principles, solenoids and relays, electric motors, DC motors, stepper motors, Hydraulic and pneumatic actuators, microactuators. Piezoelectric actuators.

UNIT-IV

Selection criteria for sensors and actuators, interfacing of sensors and actuators, Control unit; Microcontroller, PLC.

UNIT-V

Various example of mechatronics system; manipulator/ Robotic arm, quadcopter, mobile robots, Hexapod Robots, Humanoid and Biped Robots.

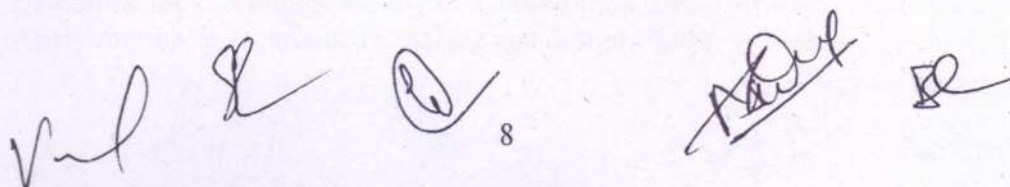
Reference Books

1. Mechatronics, Kenji Uchino and Jayne R. Giniewicz, publication: Marcel Dekker, Inc.
2. Applied Mechatronics- A. Smaili and F. Mrad, OXFORD university press.
3. Mechatronics System Design ,Shetty and Kolk CENGAGE Learning, India Edition
4. Introduction to Mechatronics and Measurement Systems, Alciatore and Histan Tata McGraw-Hill
5. Mechatronics, Neacsulescu, Pearson education.

Course Outcome:

Learner should be able to.

1. Understand the basic concepts of mechatronics system
2. Analyze the performance characteristics of sensors and transducers
3. Understand the Selection criteria for sensors and actuators
4. Interface sensor and actuator for a mechatronic system.
5. Indigenously design and develop a mechatronic system.

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LINEAR CONTROL THEORY (BELL/BETL /ELL-504/5443EL)

Course Objectives: The aim is to learn the classical and modern control system theory and how it is implemented in practical systems using electronic devices.

UNIT I Introduction to the control systems, Basic Control System Terminology, open loop , closed loop system, feedback control, Different modeling of physical systems, Linear approximation of physical systems. Transfer function of linear systems, Block diagram algebra and signal flow graphs. Effects of negative feedbacks.

UNIT II Proportional, Integral, derivative controllers, PID etc. Time domain analysis, Test input signals, first order systems, Second order systems, and higher order systems, Effects of addition of poles and zeros to open and closed loop transfer functions. Error analysis steady state error , constant and coefficients, dynamic error coefficients for type 0,1 and 2 systems.

UNIT III Concept of stability of linear systems, bounded input bounded output stability range for a parameter, co relation between the closed loop poles and stability , relative stability , Absolute stability, condition of stability characteristics equation, Routh Hurwitz Criteria and its applications.

UNIT IV Frequency Domain analysis , Performance specification in frequency domain, Co -relation between frequency domain and time domain, polar plots and Bode plots of transfer function s, Nichols Chart. Development of Nyquist stability criterion, assessment of relative stability closed loop frequency response , concept of root locus , guidelines for sketching root locus, control system design by root locus.

Unit V State variable techniques: state space representation of system , state diagram, transition matrix their properties, solution of LTI state equations, relationship between state equation and transfer function, different canonical forms, Eigen values and Eigen vectors.

Reference Books:

1. Automatic control system—B. C. Kuo, Wiley
2. Control system engineering—Nagrath & Gopal, New Age International
3. Modern control engineering —K. Ogata, Prentice Hall
4. Control system engineering- Norman Nise, John Wiley & Sons

Course Outcomes:

Students who successfully complete the course will be able to:

1. Demonstrate an understanding of the fundamentals of (feedback) control systems.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
3. Express and solve system equations in state-variable form (state variable models).
4. Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
5. Determine the (absolute) stability of a closed-loop control system
6. Apply root-locus technique to analyze and design control systems.

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Department of Electronics Engineering

List of Experiments:

LINEAR CONTROL THEORY (BELL/BETL /ELL-504/5443EL)

1. To study the performance characteristics of D.C. motor speed control system.
 - a. Subsystem performance.
 - b. Close loop performance.
 - i. Steady state error
 - ii. Transient performance
 - iii. Disturbance rejection.
2. To study the operating characteristics of stepper motor.
 - a. Basic step angle measurement.
 - b. Speed and direction control.
 - c. Low frequency resonance
3. To study the magnetic amplifier.
 - a. Series connected magnetic amplifier.
 - b. Parallel connected magnetic amplifier.
 - c. Self saturated magnetic amplifier.
4. Study of Synchro Transmitter and receiver.
5. Study of Linear System Simulator.
 - a. Open loop
 - i. Error detector cum variable gain
 - ii. Integrator
 - iii. Uncommitted amplifier
 - b. Closed loop amplifier
6. To study the performance characteristics of an angular position error detector using two Potentiometer.
 - a. Linearity and rang of potentiometer
 - b. Error detector coefficient
 - c. AC Excitation

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DIGITAL COMMUNICATION (BELL/BETL / ELL-505/5444EL)

Course Objectives: The main objectives of this course is to understand the basics of digital modulation concepts , understand the basics of signal-space analysis and the concepts of digital transmission

Unit I

Sampling theorem for low pass and band pass signals, Ideal sampling, Natural sampling, Flat top sampling, crosstalk, aliasing, time division multiplexing, PAM, PWM and PPM their generation and detection.

Unit II

Pulse code modulation, Quantization, quantization noise, companding, Inter symbol interference, Eye pattern, Delta and adaptive modulation, Encoding techniques: On-Off signaling, Polar signaling, RZ signaling, Bipolar signaling, AMI, Manchester code, Differential encoding their advantage and disadvantages.

Unit III

Band pass data transmission: ASK, Binary phase shift keying (BPSK), QPSK, DPSK, coherent and non coherent BFSK, minimum shift keying, QAM, Concept of M-ary PSK and M-ary FSK. Spectral properties of QPSK and MSK.

UNIT IV

Matched filter and correlator detector. Gram Schmidt orthogonalization procedure and concept of signal space for the computation of probability of error, calculation of error probability for BPSK, QPSK, QAM and coherent BFSK, comparison of different modulation techniques.

Unit V

Concept of information theory, entropy, information rate, channel capacity, Shannon's theorem, Shannon Hartley theorem , BW and signal to noise ratio trade off, sources encoding, extension of zero memory source, Error correcting codes: linear block codes and cyclic codes: encoder and decoder circuits, burst error correcting codes, concept of convolution codes.

Reference Books:

1. Communication Systems –Simon Haykins, Wiley
2. Principle of Communication Systems-Taub and Schilling, Tata McGraw-Hill
3. Communication Systems-Singh and Sapre, Tata McGraw-Hill

Course Outcomes:

After successfully completing the course students will be able to

1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Perform the time and frequency domain analysis of the signals in a digital communication system.
3. Learn and design concepts of Digital Communication System.
4. ~~Analyze performance of spread spectrum communication system.~~
4. Learn and design the concepts of Matched filter and Correlator detector
5. Understand the Concept of Source Coding and Channel Coding

Department of Electronics Engineering

List of Experiments:

DIGITAL COMMUNICATION (BELL/BETL / ELL-505/5444EL)

1. To study Sampling and Reconstruction.
2. To study Data formatting and reformatting.
3. To study Delta Modulation and Demodulation.
4. To study Adaptive and signal Delta Modulation and Demodulation.
5. To study Amplitude Shift Keying.
6. To study frequency Shift Keying.
7. To study Phase Shift Keying.
8. To study Pulse Code Modulation.
9. To study Pulse Amplitude Modulation.
10. To study Pulse Width Modulation.
11. To study Pulse Position Modulation.

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Department of Electronics Engineering

List of Experiments:

ELECTRONICS WORKSHOP (BELP/BETP/ELP506/5446)

1. Study of Basic Electronic components:-
 - (i) Active and
 - (ii) Passive components.
2. Study & selection of resistances.
3. Testing to get familiar with components.
4. Solder and soldering techniques.
5. Power supply of various output voltages.
6. To fabricate basic circuits on Bread board and observe its response i.e. half wave rectifier, Full wave rectifier and Bridge rectifier.

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Department of Electronics Engineering

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ANTENNA AND WAVE PROPAGATION (BELL/BETL /ELL-601/6441EL)

Course objectives: To develop the students' basic understanding of antenna operation through the application of Maxwell's equations, develop the students' ability to calculate and interpret basic antenna performance parameters.

Unit I Radiation retarded potential: Radiation field from current element radiation resistance of short dipole and half wave dipole antenna Directivity and gain calculation of short dipole and half wave antenna.

Unit II Introduction to antenna: the antenna as an aperture effective lengths resonant and travelling antenna for different wave lengths, antenna arrays of point sources, two element array, end fire and broad side arrays, uniform linear arrays of N-elements, linear arrays with non-uniform amplitude distribution (Binomial distribution and Chebyshev optimum distribution).

Unit III Effect of earth on vertical pattern: image antenna, network theorems applied to antenna, self and mutual impedance of antenna feature of antenna impedance, principle of pattern multiplication, Arrays of two-driven half wave length elements (Broad side and end fire case).

Unit IV Babinet's principles and complimentary antennas: horn antennas, parabolic reflector, slot antenna, log periodic antenna.

Unit V Propagation of radio wave: Duct propagation, Influence of earth's magnetic field, Sky wave, Skip distance and MUF, single hop and multiple hop transmission.

Reference Books:

1. Antenna theory- J.D. Kraus, 4th edition, Tata Mc-Graw Hill
2. Electromagnetic Fields & Radiating System - Jordan & Balmain, 2nd edition, PHI
3. Antennas(for all applications)- Kraus, Marshka, Khan, Tata Mc-Graw Hill
4. Antenna Wave Propagation-K D Prashad, New Delhi : Satya Prakashan

Course Outcome:

After the completion of this course students will be able to:

1. Apply principles of electromagnetic to analyze antenna Radiation and antenna parameters.
2. To Establish mathematical equations for various parameters of antenna.
3. Understand loop, slot, patch and horn antennas and derive expressions for the parameters of loop and slot antennas.
4. Illustrate applications of satellite, Ultra Wideband (UBW) antennas.
5. Understand Babinet's principles and complimentary antennas.
6. Analyze effects of atmosphere on radio wave propagation.

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Department of Electronics Engineering

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DIGITAL SIGNAL PROCESSING (BELL/BETL /ELL-602/6442EL)

Course Objectives: Understand the DSP techniques relevant to Electronic automation systems.

Unit I Discrete time signals and systems: Introduction (signals, systems and signal processing, classification of signals). Discrete time signal sequences, linear time invariant system, stability and causality. Linear constant co-efficient difference equations. Fourier transform of discrete time signals. Properties of Fourier transform. Sampling of continuous time signals. Linear convolution.

Unit II Z-transform, properties of z-transform, rational z-transform, inverse z-transform, one sided z-transform, analysis of LTI systems in the z-domain, Inverse systems, minimum phase system and invertibility of LTI system.

Unit III Linear time invariant systems as frequency-selective filters: Ideal filter characteristics, highpass, lowpass and bandpass filter.

Signal flow representation of IIR system, basic network structure of FIR systems, transposed forms, basic effects, Tellegens theorem for digital filter and its application.

Unit IV Discrete Fourier Transform (DFT): Introduction of DFT and properties of DFT, representation of periodic sequences, properties of discrete Fourier series, representation of periodic sequences. circular convolution, Decimation in time FFT algorithm, decimation of frequency FFT algorithm with radix-2

Unit V Design of Digital filters: Design of linear phase FIR filter using window and frequency sampling method, IIR filter design by Impulse invariance and bilinear transformation, Butterworth filter and Chebyshev filter.

Reference Books:

1. Digital Signal Processing- Oppenheim and Schafer, Prentice Hall
2. Digital Signal Processing-Rabiner and Gold, Prentice Hall
3. Digital Signal Processing- Proakias, Pearson publication
4. Digital Signal Processing – Sanjit K. Mitra, Tata Mc-Graw Hill

Course Outcome:

After the completion of this course students will be able to:

1. Understand the basic concepts of discrete-time signal.
2. Apply the idea of DFT and FFT.
3. Analyze digital filters both FIR and IIR using different techniques
- ~~4. Understand the concept of linear prediction and estimation.~~
- ~~5. Understand the concept of Multi-rate signal processing and sample rate conversion.~~
6. Design of digital filters.

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Department of Electronics Engineering

List of Experiments:

DIGITAL SIGNAL PROCESSING (BELL/BETL /ELL-602/6442EL)

- Problem..1.** Write a Program to generate & plot saw tooth waveform sequence of duty cycle 60% for first 100 samples, peak value of the wave form is 7 & period is 10 samples, Sampling rate is 20 KHz.
- Problem..2.** Write a Program to generate & plot square wave form sequence of duty cycle 60% for first 100 samples, peak value of the waveform is 7 & period is 10 samples, Sampling rate is 20 KHz.
- Problem.. 3.** Plot an exponential sequence given as :

$$y[n] = 0.5e^{\frac{(-0.4 + j\pi)N}{5}} \quad \text{for } 100 \text{ samples.}$$

- Problem..4.** You are given uncorrupted signal $s[n] = 2[n(0.9)^n]$, $d[n]$ is random noise sequence which is generated as 'rand' -0.5, 'rand' is uniformly distributed random variable. Input sequence is giving -

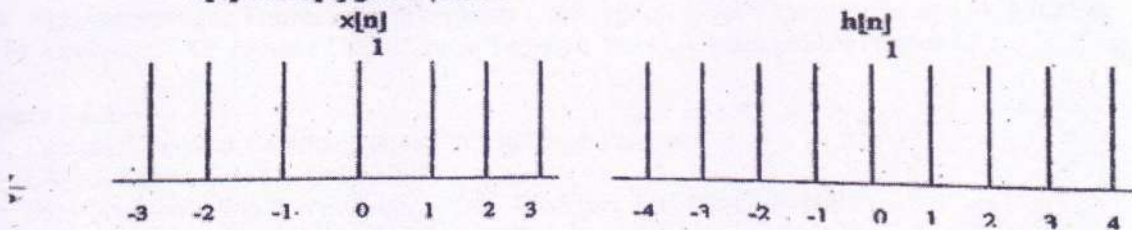
$$x[n] = s[n] + d[n].$$

sequence $x[n]$ goes into a moving average system whose O/P is given as

$$y[n] = \frac{1}{m} \sum_{k=0}^{m-1} x[n-k] \quad \text{where } m=3,5,7,9$$

plot the sequences $s[n]$, $d[n]$, $x[n]$, and $y[n]$.

- Problem..5.** Write a program to perform convolution between two sequences $x[n]$ and $h[n]$ given below :



i.e find out $y[n] = x[n] * h[n]$

$$\text{where } x[n] = \begin{cases} 1, & -N \leq n \leq N \\ 0, & \text{elsewhere} \end{cases} \quad \text{and} \quad h[n] = \begin{cases} 1, & -N-1 \leq n \leq N+1 \\ 0, & \text{elsewhere} \end{cases}$$

- Problem.6.** Determine 16 point DFT of the following 8-point sequence,

$$u[n] = \begin{cases} 1, & 0 \leq n \leq 7 \\ 0, & \text{otherwise} \end{cases}$$

- Problem.7.** Compute 13 point IDFT of the 8-point DFT sequence given by,

$$V[k] = \begin{cases} k/8, & 0 \leq k \leq 7 \\ 0, & \text{otherwise} \end{cases}$$

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DATA COMMUNICATION (BELL/BETL /ELL-603/6443 EL)

Course objectives: To provide an introduction to fundamental network architecture concepts and their applications.

Unit I Introduction, Switching Techniques: Circuit Switching, Message Switching, Packet Switching, Protocols, Layered Network Architecture and Architecture OSI & TCP/IP Reference model, ATM Model, SNA, Physical Layer Transmission Medium, RS 232 C, Modem, Topologies.

Unit II Data Link Layer: Framing BSC, HDLC. ARQ: Stop and Wait, Sliding Window. Efficiency Error and Correction. Parity Checks – CRC, Checksum, MAC Sub layer – LAN Protocols, ALOHA, Slotted, ALOHA, CSMA, CSMA/CD, Token Bus, Ring.

Unit III Network Layer: Routing – Data gram and Virtual Ckt, Dijkstra's Bellman Ford, DV and Link state routing. Congestion Control and ATM Traffic Management – AAL, X.25, Internal Layer.

Unit IV Transport Layer: Connection Oriented transport Protocol Mechanism, TCP, TSAP, Transport Flow Regulation, UDP Fragmentation & Reassemble, Session and Transport Interaction, Synchronization Points, Session Protocols Data Unit.

Unit V Synchronization, Translation, Encryption / Decryption, Data Compression and Application Layer Protocols like: FTP, Remote Login. Virtual Terminal, Network Management Protocols.

Reference Books:

1. Data and Computer Communication – W. Stallings, Pearson
2. LANs – Keiser, Tata Mc-Graw Hill
3. Data Communication & Networking – B.A. Forouzan, Tata Mc-Graw Hill
4. Internetworking with TCP/IP – VOL-I – D.E. Comer, PHI
5. ISDN and Broad band ISDN with Frame Relay & ATM – W. Stalling, Pearson

Course Outcome:

After completing this course the student must demonstrate the knowledge and ability to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of sub netting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

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Department of Electronics Engineering

List of Experiment

DATA COMMUNICATION (BELL/BETL /ELL-603/6443 EL)

1. Fabricate RS32 Interface cable as per following specification.
 - a) Using -25 pin connector for DTE-DTE.
 - b) Using -25 pin connector for DTE-DCE.
 - c) Using -9 pin connector for DTE-DTE.
 - d) Using -9 pin connector for DTE-DCE.
 - e) Using -25 pin connector at end one and 9 pin connector at other end.
2. Write a program for displaying waveform of three characters of your surname for following codes:
 - a) NRZ
 - b) Manchester
 - c) Differential Manchester.
3. Establish a network of 4 system using coaxial cable and UTP cable having windows 98 and XP.
4. Establish connection between two system using modems.

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ELECTRONIC SYSTEM DESIGN (BELL/BETL /ELL-604 /6444EL)
Elective-II

Course objectives: The course objective is to provide students with knowledge of analog circuit design.

Unit I Design of Power Supply System Unregulated DC power supply system with rectifier and filter. Consideration regarding ripple. Design of emitter follower regulator (series pass transistor regulator). Design of SMPS, Step up and step down.

IC voltage regulator, Positive & negative voltage regulator, Adjustable regulator, High current short circuit protection.

Unit II Design of Single Stage and Two stage amplifier (R-C Coupled) using BJT. Design and analysis of power amplifier: class A, class B, class AB, Design of transformer coupled class A power amplifier.

Unit III Design of Oscillators using BJT's: Frequency of oscillation and condition for sustained oscillation, Sine wave oscillators, Audio frequency and radio frequency oscillator .

Unit IV Operational Amplifier: Basics of an OP-Amp, OP-Amp parameters, their basic application, Inverting amplifier, Non-Inverting amplifier, Differential amplifier, Integrator Differentiator, Voltage follower, Adder, Subtractor, V to I and I to V converter. Design of Butterworth , chebyshev filters.

Unit V Design of Digital System: flip flops, registers, Counters, A to D Converter and D to A converter and Digital voltmeter.


Reference Books:

1. Introduction to system Design using Integrated Circuits- B.S. Sonde- New Age International (P) Ltd., New Delhi.
2. Electronics Integrated Circuits and System- F.C. Fitchen, Van Nostrand Reinhold
3. Regulated Power Supply Hand Book. Texas Instrument
4. Electronics: BJT's FETS and Microcircuits – Angelo, McGraw-Hill
5. Monograph on Electronic Circuit Design- Goyal & Khetan., Khanna Publishers
6. Electronic Devices and Circuits- Boylestad Reseat and Nashelsky Louis, prentice hall
7. Integrated Electronic -Millman and Halkias, Tata Mc. Graw Hill.

Course Outcome:

After completing this course the student must demonstrate the knowledge and ability to:

1. Design different power supply system.
2. Design and analyze power amplifier.
3. Design oscillators using BJT.
4. Basics of op-amp and design of filters.
5. Design of counters, registers and converter.
6. Study of converters and digital voltmeter.



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DATA STRUCTURE
(BELL/BETL /ELL-609 /6444EL)
Elective-II

Course Objectives:

The objective of the course is to teach students efficient storage mechanisms of data for an easy access, to design and implementation of various basic and advanced data structures, to introduce various techniques for representation of the data in the real world, to develop application using data structures, to teach the concept of protection and management of data.

UNIT I

Preliminaries of algorithm, Algorithm analysis and complexity, Data structure- Definition, types of data structures

Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi, Tail recursion.

UNIT II

Searching Techniques: List Searches using Linear Search, Binary Search, Fibonacci Search

Sorting Techniques: Basic concepts, Sorting by: insertion (Insertion sort), selection (heap sort), exchange (bubble sort, quick sort), distribution (radix sort) and merging (merge sort) Algorithms.

UNIT III

Stacks: Basic Stack Operations, Representation of a Stack using Arrays, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions.

Queues: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Circular Queues, Priority Queues.

Linked Lists: single linked list, Operations on a Single linked list, Reversing a single linked list, circular linked list, Double linked list

UNIT IV

Trees: Properties, Representation of Binary, Trees using arrays and linked lists, operations on a Binary Tree, Binary Tree Traversals (recursive), Creation of binary tree from in, pre and post order traversals.

UNIT V

Graphs: Basic concepts, Representations of Graphs: using Linked list and adjacency matrix, Graph algorithms. Graph Traversals (BFS & DFS), applications: Dijkstra's shortest path, Transitive closure, Minimum Spanning Tree using Prim's Algorithm, Warshall's Algorithm (Algorithmic Concepts Only, No Programs required).

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Reference books:

1. Data Structure with C, Seymour Lipschutz, TMH
2. Data Structures using C. Reema Tharej , Oxford
3. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage
4. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH
5. Classic Data Structures, 2/e, Debasis , Sarnanta, PHI, 2009
6. Fundamentals of Data Structure in C, 2e, Horowitz, Sahni, Anderson Freed, University Press

Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
4. Students will be able to use linear and non-linear data structures like stacks, queues , linked list etc.
5. Ability to analyze algorithms and algorithm correctness.
6. Ability to summarize searching and sorting techniques
7. Ability to have knowledge of tree and graphs concepts.

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Department of Electronics Engineering

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INTEGRATED CIRCUITS
(BELL/BETL /ELL-6(000)/6444EL)
Elective-II

Course objectives: To understand the basic building blocks of linear integrated circuits and the linear and non-linear applications of operational amplifiers .To understand the theory and applications of analog multipliers and PLL, ADC and DAC.

UNIT I -BASICS OF OPERATIONAL AMPLIFIERS: Current mirror and current sources,Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier -General operational amplifier stages-and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate open and closed loop configuration.

UNIT II-APPLICATIONS OF OPERATIONAL AMPLIFIERS: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector clipper and clamper low pass ,high pass and band pass butterworth filter.

UNIT III ANALOG MULTIPLIER AND PLL: Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis.Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and frequency synthesizing.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS: Analog and digital data conversion ,D/A converter –Specification- Weighted resistor type,R-2R Ladder types, voltage mode and current mode R-2R Ladder type switches for D/A converters, high speed sample-and-hold circuits, A/D Converters specifications Voltage Mode and Current-Mode R-2R– Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION IC: Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers.

REFERENCE BOOKS:

1. Analysis and Design of Analog Integrated Circuits, Gray and Meyer Wiley International, 1995.
2. Applications and Design with Analog Integrated Circuits, J. Michael Jacob Prentice Hall of India, 1996..
3. Integrated Circuits Khanna Publishers, K.R.Botkar, 1996.

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4. Digital Integrated Electronics, Taub and Schilling McGraw-Hill, 1997.

5. OP-AMP and Linear IC's . Ramakant A .Gayakwad Prentice Hall / Pearson Education, 1994

COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

1. To understand about Operational amplifier and its applications.
2. To understand the working of different integrated circuits, their pin configurations and about their applications.
3. Students will also able to understand the performance of ICs on practical basis.
4. To understand various waveform generators and amplifiers.
5. To understand different A/D and D/A converters.
6. To understand about analog multipliers.

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MICROCONTROLLER AND EMBEDDED SYSTEMS
(BELL/BETL /ELL-6(1) (1V) /6444EL)
Elective-II

Course Objectives: To conceptualize the basics of embedded systems; organizational and architectural issues of a microcontroller; learn programming techniques used in microcontroller; understand basic concept of ARM processor and real time operating system

Unit-1 The Microcontroller Architecture: Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Counter and Timers, Serial communication, interrupts.

Introduction to Embedded Systems: Overview of Embedded System Architecture, Application areas

Unit-2 Assembly Language Programming of 8051: Instruction set, Addressing modes, Development tools, Assembler Directives, Programming based on Arithmetic & Logical operations, I/O parallel and serial ports, Timers & Counters, and ISR.

Unit-3 ARM-7 architecture: Architectural inheritance, Detailed study of Programmer model, ARM Development tools, Instruction set: Data processing, Data transfer, Control flow, Addressing modes, writing simple assembly language programs. Pipelining, Brief introduction to exceptions and interrupts handling

Unit-4 Embedded System:-Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC. Design case studies: Digital clock, Battery Operated smart card reader, automated meter reading system, Digital camera

Unit-5 Embedded / Real Time Operating System: Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem. Off-the-Shelf Operating Systems Embedded Operating Systems, Real Time Operating System (RTOS) and Handheld Operating Systems.

Reference Books:

1. The 8051 microcontroller & embedded systems, M. A. Mazidi, J. G. Mazidi, R. D. McKinlay, Pearson
2. The 8051 microcontroller & embedded systems, Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learning
3. Embedded / real - time systems: concepts, design & programming, Black Book, Dr. K.V. K. K. Prasad, Dreamtech press, Reprint edition 2013
4. Introduction to embedded systems, Shibu K. V., McGraw Hill
5. ARM System on chip Architecture, Steve Furber, Pearson edition second

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Course Outcomes:

After going through this subject the student would be able to-

1. Ability to understand basic structure embedded systems
2. Ability to understand basic structure microcontroller
3. Ability to understand basic concepts used in embedded system
4. Ability to program microcontroller
5. Ability to design conceptual embedded system

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INDUSTRIAL ELECTRONICS (BELL/BETL /ELL-605/6445EL)

Course Objectives: The objective is to increase the understanding of power electronic fundamentals, applications and recent developments in the power electronics field.

Unit I Power semiconductor Devices- Classification of power semiconductor devices ,characteristics , construction , application and theory of operation of power diodes , power transistors , thyristors working of diac , triac , IGBT , GTO.turn on/turn off methods and their circuits

Unit II Rectifiers, controlled rectifiers, half wave and full wave configuration and their parameters, use of freewheel diode in controlled rectifier configuration, dual converters.

Unit III INVERTERS AND CHOPPERS, Classification of inverters ,voltage and current communicated inverters ,PWM inverters ,principle of choppers ,chopper and their classification.

Unit IV A.C. voltage controllers and cyclo converters classification and operation of AC voltage controllers and cyclo converters ,their circuit analysis for different type of loads .various types of heating and welding.

Unit V Acoustics- Microphones-carbon , moving coil ,ribbon, crystals ,condenser, their working principles and characteristics ,noise figure and sensitivity and shielding. Loudspeakers- moving coil, electrodynamics horn type. Multiway speaker system, crossover network and their frequency characteristics. various types of sound recording-magnetic recording, disk and crystal recording reverberations ,building and studio acoustics ,high fidelity.

Reference Books:

1. Power Electronics-P.S.Bhimbra, Khanna Publishers
2. Power Electronics – Rashid Publisher: Pearson
3. Power Electronics – P.C.Sen Tata McGraw-Hill
4. Audio and Video system-R. G. Gupta Tata McGraw-Hill Education

Course Outcome:

After completing this course the student must demonstrate the knowledge and ability to:

1. Study different power semiconductor devices.
2. Design and analyze controlled rectifier.
3. Troubleshoot AC & DC power control circuits employing thyristors
4. Troubleshoot inverter and chopper.
5. Study and troubleshoot cyclo-converters
6. Use concept of acoustics.

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Department of Electronics Engineering

List of Experiment

INDUSTRIAL ELECTRONICS (BELL/BETL /ELL-605/6445EL)

1. Study of V-I Characteristics of SCR.
2. Study of SCR using DC bias alone triggering.
3. Study of SCR triggering DC bias with super imposed AC trigger.
4. Study of SCR R triggering.
5. Study of SCR RC triggering.
6. Study of SCR UJT triggering.
7. Study of SCR R triggering as half wave rectifier.
8. Study of SCR R triggering as Full wave rectifier.
9. Study of SCR R triggering as Bridge rectifier.

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ADVANCED CONTROL SYSTEM (BETL/ELL701/7441EL)

Course objectives: To understand the basics of mathematical modeling of control systems , to study the stability analysis of linear and nonlinear systems.

Unit I Advantages and disadvantages of digital control system, Ideal sampler, sampled and hold circuit, zero order hold circuit, Z transform, Inverse Z transform by various method, mapping between s plane and Z plane, solution of the linear difference equation.

Unit II Pulse transfer function, general procedure for obtaining pulse transfer function, pulse transfer function of cascaded elements, pulse transfer function of closed loop systems. Transfer function of discrete data system, stability analysis of closed loop system in the z plane, Jury stability test.

Unit III Non Linear Systems: introduction , common physical non linearity's, phase plane method , basic concepts ,singular points, stability of non linear system , construction of phase trajectories, system analysis by phase plane method, Describing functions methods, basic concepts derivation of describing function, liapunov's stability criterion.

Unit IV Review of root locus, lead compensation, lag compensation, lag- lead compensation and their comparison, review of state space methods, observability and controllability of system , pole placement by state feedback.

Unit V Tuning rules of PID controller, modifications of PID controllers, Introduction to software package used in control systems- MATLAB SIMULINK.

Reference Books:

1. Automatic control system—B. C.Kuo, wiley
2. Control system engineering—Nagrath & gopal, Publishers: New Age International
3. Modern control engineering —K. Ogata, Pearson; 5 edition
4. Control system engineering—Norman Nise, Publisher: Wiley
5. Discrete time Control system— K. Ogata, Pearson; 2 edition

Course Outcomes

After the completion of this course students will be able to:

1. Understand the basics of digital control system
2. Design Lead-Lag compensators based on frequency data for an open-loop linear system.
3. Understand the importance of performance, robustness and stability in control design
4. Understand the decomposition of system into controllable and uncontrollable parts.
5. Perform stability analysis of closed loop system in the z plane, Jury stability test.
6. Understand Tuning rules of PID controller

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List of Experiments

ADVANCED CONTROL SYSTEM (BETL/ELL701/7441EL)

1. Study of compensation design-
 - (a) Bode plot
 - (b) Lag network design
 - (c) Lead network design
2. Study of temperature control system-
 - (a) Identification of oven parameters
 - (b) On-off controller
 - (c) Proportional controller
 - (d) Proportional integral controller
 - (e) Proportional integral derivative
3. Study of D.C position control system.
4. Study of relay control system.
5. Study of torque characteristics of a.c servo motor.
6. Study of PID controller.

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MICROWAVE ENGINEERING (BETL/ELL702/7442 EL)

Course objectives: The goal of this course is to introduce students to the concepts and principles of the advanced microwave engineering, theory and design of passive and active microwave components, and microwave circuits.

Unit I Review of Maxwell's equation, Rectangular waveguides, characteristics of TE and TM wave in rectangular wave guides, Dominant mode in rectangular waveguide, Cylindrical waveguides, waveguide excitation.

Unit II Microwave resonator, Microwave Network representations. Scattering matrix, S-Matrix for two, three & four port networks such as E-plane tee, H-plane tee, Magic tee, directional coupler, tuning screw, quarter wave transformer, matched load, isolator, circulator.

Unit III Transit time effect, Tubes for very high frequency limitation of conventional tubes, Reflex klystron, two cavity klystron, Magnetron, Travelling Wave Tube.

Unit IV Pin diode, Tunnel diode, GUNN effect devices, varactor diode, IMPATT diode, circuit application of above devices, MASERS AND LASERS.

Unit V Measurement of VSWR, impedance, frequency, dielectric constant power, attenuation and phase shift. Planar transmission lines Introduction to micro strip lines, slotlines, coplanar lines.

Reference Books:

1. Introduction to Microwaves -Wheeler G.J., Prentice-Hall
2. Microwave circuits & passive devices- Sisodia and Raghuvanshi, New International.
3. Microwave engineering/David M. Pozar.—4th ed. , John Wiley & Sons, Inc.
4. Microwave Devices and Circuits, SAMUEL Y. LIAO, PRENTICE HALL
5. Microwave and Radar Engineering. Kulkarni, McGraw Hill Education;

Course Outcomes

After the completion of this course students will be able to:

1. Apply electromagnetic theory to calculations regarding waveguides and transmission lines
2. Describe, analyze and design simple microwave circuits and devices e g matching circuits, couplers, antennas and amplifiers
3. Describe common devices such as microwave vacuum tubes, high-speed transistors
4. Design active circuits (amplifiers and oscillators) using microstrip technology.
5. Understand the characteristics of two-port networks.
6. To learn the VSWR, impedance, frequency, dielectric constant power, attenuation and phase shift. measurement

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Department of Electronics Engineering

List of Experiments

MICROWAVE ENGINEERING (BETL/ELL702/7442 EL)

1. Measurement of microwave frequency.
2. To study the properties of E-plane tee junction and to determine isolation coupling coefficient.
3. To measure the performance of directional coupler.
4. To study the properties of H-plane tee junction and to determine isolation coupling coefficient.
5. To study the three port circulator.
6. To study the isolation and coupling of magic tee.

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Department of Electronics Engineering

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CELLULAR AND MOBILE COMMUNICATIONS (BETL/ELL703/7443EL)

Course objectives: The main objective of the course is to provide a comprehensive and state of the art knowledge in the area of mobile communication. The course emphasis is on the structure and function of the complete communication system.

Unit I Introduction to wireless communication systems, different generations of wireless networks. Cellular system design fundamentals, frequency reuse, handoff strategies, Interference and system capacity, Trunking and grade of service.

Unit II Mobile radio propagation: free space propagation model, Ground reflection propagation model, Long term fading, Small scale multipath propagation, Time dispersion parameters, Coherence bandwidth, Doppler spread and coherence time, types of small scale fading, Clarke's model for flat fading, level crossing and fading statistics.

Unit III Capacity in cellular systems, cell splitting and sectoring, cell-site antennas and mobile antenna, cochannel interference reduction, Frequency management and channel assignment.

Unit IV Frequency division and time division multiple access. Global System for Mobile: System Architecture. GSM Radio subsystem, GSM, GSM Traffic Channel and Control Channel, Frame Structure.

Unit V Spread spectrum multiple access (Frequency Hopped Multiple Access and Code Division Multiple Access). Different spreading codes. CDMA Digital Cellular system: different standards with detailed description of forward and reverse channels. Capacity of cellular systems.

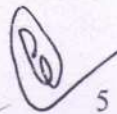

Reference Books:

1. Mobile cellular telecommunication- W. C. Lee, McGraw-Hill
2. Wireless communication -T. S. Rappaport, Prentice Hall
3. Wireless communication – Simon Haykins, Pearson

Course Outcomes

After the completion of this course students will be able to:

1. Understand the concept of cellular communication
2. Understand the basics of wireless communication
3. study GSM mobile communication standard, its architecture, logical channels, advantages and limitations.
4. Learn CDMA mobile communication standard, its architecture, logical channels, advantages and limitations.
5. Understand mobile standards and their comparison with other technologies.
6. Design a cellular link and estimate the power budget.

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Department of Electronics Engineering

List of Experiments

CELLULAR AND MOBILE COMMUNICATIONS (BETL/ELL703/7443EL)

1. Develop the program to compute the blocking probability.
2. Generation of BFSK,MSK and GMSK signals.
3. Write a computer program to generate a Rayleigh fading envelop.
4. Generate the Walsh-Hadamard codes of length 2
5. Write a computer program to generate a maximal length sequencecode of length 31 using the polynomial: $1+X+X^2+X^4+X^5$.
6. Generate the set of Gold codes using the following m-sequences:
(i) $1+X+X^2+X^4+X^5$ (ii) $1+X^2+X^5$

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A circled "6" below the initials.
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VLSI DESIGN (ELL704/7444EL)

Course Objectives: To develop the students' understanding of how rudimentary logic functions are designed and implemented at the transistor-level in complementary metal-oxide semiconductor (CMOS) technology..

Unit I Introduction, Trends & Projections in VLSI Circuits, Flow diagram of VLSI Circuit Design and VLSI Design issues. MOSFET fundamentals, Enhancement Mode MOSFETs, Depletion Mode MOSFETs, Weak & strong Inversion Conditions, Threshold Voltage Concept in MOSFETs, IV Characteristics of a MOSFET, Limitations in IV Model.

Unit II Basic VLSI Design Styles-NMOS, CMOS Process flow ; Noise Margin; Inverter Threshold Voltage; NMOS Inverter design and characteristics; CMOS Inverter Design and Properties; Inverter as an Amplifier and Differential Amplifier, Delay , Power Dissipation and scaling in CMOS circuits.

Unit III Parallel & Series Equivalent circuits; Static CMOS Circuit Design: case study; VLSI Interconnects.

Unit IV Stick Diagrams; Physical Design Rules; Layout Designing; Euler's Rule for VLSI Physical Design. High Speed Dynamic CMOS logic families; Precharge-Evaluate logic; Dynamic CMOS logic circuits, cascading ,

Unit V Memory / Regular Structure Design; ROM Design, SRAM Design SPICE models, introduction to Xilinx, overview of verilog ,VHDL,VHDL Operators, Basic concepts

Reference Books:

1. CMOS Digital Integrated Circuits-Analysis & Design - S.M. Kang & Y. Leblibici-TMH, Ed. 2003.
2. Solid State Electronic Devices-B.G. Streetman & S. Banerjee- PHI.
3. Introduction to VLSI- K. Eshraghian&Pucknell - PHI.
4. Digital Integrated Circuits-A Design Perspective -J.M. Rabaey -PHI.
5. Design of Analog CMOS Integrated Circuits- B. Razavi-TMH.
6. Principles of CMOS VLSI Design: A System Perspective - N.H.E. Weste & K. Eshraghian - McGraw Hill Pub.

Course Outcomes: After the completion of this course students will be able to:

1. Analyze CMOS digital electronics circuits, including logic components
2. Aware the trends in semiconductor technology, and how it impacts scaling and performance.
3. Able to learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters
4. Synthesis of digital VLSI systems from higher level descriptions in hardware design languages.
5. Design digital systems using MOS circuits.
6. Design of Memory / Regular Structure.

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SELECTED TOPICS IN COMMUNICATION (BETL/ELL709 /7445)
(Elective-III)

Course objectives: Objective of this course is to provide students with the knowledge and understanding of advanced digital telecommunications systems with special emphases on digital modulation techniques.

UNIT I Signal design for band-limited channels: Nyquist criterion for zero ISI, design of communication system using pulses with a raised cosine spectrum, partial response signaling, basic concept of equalizers for compensation of ISI.

UNIT II Error rate performance of BPSK, QPSK and BFSK over flat Rayleigh fading channel, diversity techniques, tapped delay line channel model and RAKE demodulator.

UNIT III Diversity using multiple antennas. Trellis coded modulation.

UNIT IV Multiuser detection: Detection of multiuser CDMA signals, single user detector and multiuser MMSE detector for synchronous CDMA transmission.

UNIT V OFDM: Principle, modulation by DFT, cyclic OFDM extension, reduction of inter carrier interference and peak-to-mean power ratio.



Reference Books:

1. Digital communication – John G Proakis, McGraw-Hill
2. Communication Systems – Simon Haykins, Wiley
3. Principle of Communication Systems-Taub and Schilling, Tata McGraw-Hill
4. Communication Systems-Singh and Sapre, Tata McGraw-Hill

Course Outcomes

After the completion of this course students will be able to-

1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Simulate MSK, DPSK, QPSK and BPSK schemes and estimate their BER
3. Generate digital modulation signals for ASK, PSK and FSK and perform their detection
4. Perform signal sampling by determining the sampling rates for baseband signals and reconstruct the signals
5. Understand OFDM principles and modulation techniques.
6. Understand CDMA concepts and modulation techniques

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ATM NETWORK (BETL/ELL705 / 7445)
(Elective-III)

Course objectives: To Understand the principle of ATM as transfer mode for the future broadband ISDN. Develop the students knowledge of the ATM protocol, network architecture and ATM applications in different networks.

Unit I Introduction to ISDN, B-ISDN, B-ISDN service, ATM basics, ATM Services, Architecture of B-ISDN, virtual channel, Virtual path, ATM performance Parameters, Signaling techniques.

Unit II ATM – performance Reference Model (PRM) layered architecture, relationship between ATM PRM and OSI reference model. Layer functions, User Network Interface (UNI), Physical layer of UNI, functions of transmission convergence sub layer, physical medium characteristic ATM layer cell headers of B-ISDN, UNI & MNI, ATM adaptation layer, operation and maintenance of B-ISDN UNI.

Unit III B-ISDN signaling, meta signaling, ATM adaptation layer for signaling, signaling protocols, switches & cross connects.

Unit IV ATM transmission network, Cell transfer function, transmission systems, network synchronization, B-ISDN local network Topology & Technology, Trunk, network structure, ATM network implementation and its equipments.

Unit V Evolutionary scenarios for B-ISDN fiber to the customer, integration of TV distribution, LAN's, Man's to B-ISDN, Voice delay & Eco problem, Tainting in B-ISDN, Telecommunication management networks, Gigabits LAN's, Optical switching, ATM standardization.

Reference Books:

1. ATM Network - Rainer Handel, Huber & Schooder- Addison Wesley
2. ATM Theory & Application- David E.M. Dysan -McGraw Hill
3. Computer Network –Tannanbaum
4. An Introduction to ISDN- William Stalling- McMillan Publishing Co. USA.

Course Outcomes

After the completion of this course students will be able to:

1. Understand basic Broadband Communication concepts.
2. Differentiate High speed networks supporting B-ISDN.
3. Understand broadband Network architecture, data transmission, network design.
4. Understand cell format and switching principle of broadband ATM networks.
5. Study the transport mechanism using different AALs
6. Learn Telecommunication management networks, Gigabits LAN's, Optical switching.

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CMOS TECHNOLOGY (BETL/ELL710 /7445)
(Elective-III)

Course objective: This course aims at understanding the manufacturing methods and their underlying scientific principles in the context of technologies used in VLSI chip fabrication.

Unit -I

Introduction

CMOS Logic: Inverter, NAND Gate, Combinational Logic, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tristates, Multiplexers, Latches and Flip-Flops, CMOS Fabrication and Layout: Inverter Crosssection, Fabrication Process, Layout Design rules, Gate Layout, Stick Diagrams. VLSI Design Flow.

Unit -II

MOS Transistor Theory: Ideal I-V Characteristics, C-V Characteristics: MOS Capacitance Models, MOS Gate Capacitance Model, MOS Diffusion Capacitance Model. Non ideal I-V Effects: Velocity Saturation and Mobility Degradation, Channel Length Modulation, Body Effect, Subthreshold Conduction, Junction Leakage, Tunneling, Temp. and Geometry Dependence. DC Transfer characteristics: Complementary CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin, Pass Transistor DC Characteristics.

Unit -III

CMOS Processing Technology

CMOS Technologies: Background, Wafer Formation, Photolithography, Well and Channel Formation, Silicon Dioxide (SiO₂), Isolation, Gate Oxide, Gate and Source/Drain Formation, Contacts and Metallization, Passivation, Metrology. Layout Design Rules: Design Rules Background.

Circuit Unit -IV

Characterization and Performance Estimation

Delay Estimation: RC Delay Models, Linear Delay Model, Logical Effort, Parasitic Delay. Logical Effort and Transistor Sizing: Delay in a Logic Gate, Power Dissipation: Static Dissipation, Dynamic Dissipation, Low-Power Design. Interconnect: Resistance, Capacitance, Delay, Crosstalk. Design Margin: Supply Voltage, Temperature, Process Variation.

Unit V.

Array Subsystem: Introduction, SRAM, DRAM, Read-Only Memory, Serial Access Memories, Content-Addressable Memory. Programmable Logic Arrays.

References:

1. Neil H.E. Weste, David Harris, Ayan Banerjee: CMOS VLSI Design, Third Edition, Pearson Education.
2. Neil H.E. Weste, Kamran Eshraghian: Principle of CMOS VLSI Design, Pearson Education.
3. B. Razavi: Design of Analog CMOS Integrated Circuits, TMH Publication.
4. J. M. Rabaey, Digital Integrated Circuits, PHI Learning.
5. J. P. Uyemura: Chip Design for Submicron VLSI, Cengage Learning.

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Course Outcomes

After the completion of this course students will be able to-

1. Study the basics of MOS device.
2. Understand the CMOS process technology.
3. Ability to design layout of CMOS circuits.
4. Understand the characteristics of CMOS circuits.
5. Ability to understand the basic difference between static and dynamic CMOS logic circuits.
6. Understand CMOS transmission gates, latches and registers.

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DATA WAREHOUSE AND MINING (BETL/ELL-711/7445)
(Elective-III)

Course objective: To introduce the basic concepts of Data Warehouse and Data Mining techniques, examine the types of the data to be mined and apply preprocessing methods on raw data and Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Unit-I

Introduction: Motivation, important, Data type for mining: relational databases, Data warehouses. Transactional databases, advanced Databases system and its Applications, Data mining Functionalities Concept/Class description, Association Analysis classification & prediction, cluster analysis, Outer liner Analysis classification of data Mining Systems, Major issues in data mining.

Unit -II

Data warehouse and OLTP Technology for Data Mining: Differences between operational Database systems & Data warehouse, A multidimensional Data Model, Data warehouse Architecture, Data warehouse Implementation Data cube technology.

Unit -III

Data pre-processing: Data cleaning, Data Integration and Transformation Data reduction Discretization and concept Hierarchy Generation. Data Mining Primitives Languages and system Architectures, Concept Description, Characterization and comparison Analytical characterization.

Unit -IV

Mining Association rules in large databases : Association rule mining : Market Basket Analysis , Basic concepts, Mining single Dimensional Boolean Association rules from Transactional databases : The Apriori algorithm, Generating Association rules from frequent items, Improving the efficiency of Apriori, other algorithms & their comparison, Mining multilevel Association Rules, Multidimensional Association rules constrained based Association rule Mining.

Unit -V

Classification & Prediction and cluster Analysis: Issues regarding classification & prediction Different classification methods, Prediction, cluster Analysis, Major clustering methods Application & Trends in data mining: Data mining Applications, Currently available tools, case study , current status.

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Reference Books:-

1. Data Mining concepts and techniques - Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers,
2. Data mining and Techniques – Arun Kumar and Pujari, Pearson Education
3. Data mining Introductory and Advanced Topics – Margaret H. Dunhan, Pearson Education

Course Outcomes: After the completion of this course students will be able to

1. Process raw data to make it suitable for various data mining algorithms.
2. Discover and measure interesting patterns from different kinds of databases.
3. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.
4. Design various algorithms based on data mining tools.
5. To understand various tools of Data Mining and their techniques to solve the real time problems
6. Predict cluster Analysis

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FIBER OPTICS & OPTICAL COMMUNICATION

(BETL/ELL801 /8441 EL)

Course objectives: This course gives an introduction of the principles and technologies of optical fiber communications and optical networks. It covers optical fiber waveguide theory, the structure and performance of active and passive optical devices, optical fiber communication systems, the structures and key technologies of optical fiber information networks.

Unit I Introduction to optical communication, principles of light transmission, Optical fiber modes and configurations, Mode theory for circular wave-guides, Single-mode fibers, Multimode fibers, Numerical aperture, Mode field diameter, V-number, fiber materials, Fiber fabrication techniques.

Unit II Optical sources, LED'S, LASER diodes, Model reflection noise, Power launching and coupling, Population inversion, fiber splicing, optical connectors, Photo-detectors, PIN, Avalanche detector, Response time, Avalanche multiplication noise.

Unit III Signal degradation in optical fibers, Attenuation losses, Signal distortion I optical wave guides, Material dispersion, Wave guide dispersion, Chromatic dispersion, Inter-modal distortion, Pulse broadening in Graded index fibers, Mode coupling, Advance fiber designs: dispersion shifted, Dispersion flattened, Dispersion compensating fibers, Design optimization of single mode fibers.

Unit IV Coherent optical fiber communication, Modulation techniques for Homodyne and Heterodyne systems, Optical filter link design, Rise time budget and link power budget, Long haul systems bit error rate, line coding, NRZ, RZ, Block Codes, eye pattern.

Unit V Advance system and techniques, wavelength division multiplexing, optical amplifiers, semiconductor amplifier, EDFA, Comparison between semiconductor and optical amplifier, Gain band width, Photonic switching, Optical Networks, Optical fiber bus, Ring topology, Star architectures, FDDI, SONET.

Reference Books:

1. Optical Communication Systems – By J. H. Franz, V. K. Jain, Narosa Publishing House
2. Optical Fiber Communication – By G. Keiser , Tata McGraw-Hill Education
3. Optical Fiber Communication- By John M. Senior, Prentice Hall

Course Outcomes

After the completion of this course students will be able to:

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Department of Electronics Engineering

1. Learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. Understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
3. Study the various optical source materials, LED structures, quantum efficiency, Laser diodes.
4. Analyse the fiber optical receivers such as PIN APD diodes,
5. Study noise performance in photo detector, receiver operation and configuration.
6. Study the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM.

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Department of Electronics Engineering

List of Experiments

FIBER OPTICS & OPTICAL COMMUNICATION

(BETL/ELL801 /8441 EL)

1. Study of elements of fiber optic communication.
2. Setting up fiber optic analog link.
3. Setting up fiber optic digital link.
4. The AM system using an analog input signal.
5. The AM system using an digital input signal.
6. Study of propagation loss in optical fiber.

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Department of Electronics Engineering

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SATELLITE COMMUNICATION
(BETL/ELL802/8442EL)

Course objectives: The course provides the basic concepts and principles of satellite communication and learns how the satellite provides communication services.

UNIT I Introduction:- Origin of satellite communication current state of satellite communication. Orbital aspect of satellite communication: - Orbital mechanism, equation of orbit, locating Satellite in orbit. Orbital elements, orbital perturbation. Space craft subsystem:- Altitude and orbit control system, Telemetry tracking and command power system, communication Subsystem.

UNIT II Satellite link design :- system noise temperature and G/T ratio , down link design, domestic satellite system, uplink design, design of satellite link for specified.

Unit III Multiple access techniques:- FDMA, FDM/FM/FDMA, Effects of intermodulation, Companded FDM/FM/FDMA, TDMA, TDMA FRAME Structure and design, TDMA Synchronization and timing code division multiple access on board processing, SCPS system, digital speech interpolation system DAMA.

UNIT IV Propagation on satellite:- Earth's path- propagation effects, atmospheric absorption Scintillation effects land and sea multipath ,rain and ice effects, rain drop distribution Calculation of attenuation rain effects on Antenna noise temperature. Eliminating propagation effects:- Attenuation, site diversity, De polarization.

UNIT V Encoding and forward error correction; Error detection and correction, channel capacity, Error detecting code, linear block codes, error correction with linear block codes, performance of block error correction codes, convolution codes, cyclic code, BCH and codes ,error detection on satellite links. Earth station technology - earth station design, antennas tracking, LAN, HPA, RF, Multiplexing factors affecting orbit utilization, tracking, equipment for earth station.

Reference books

1. Satellite communication by D.C.Agrawal, Khanna Publisher
2. Satellite communication by T.Pratt. , Wiley Publisher
3. Advance electronic communication systems –WAYNE –Tomasi , Prentice Hall
4. Satellite communication-Robert M Gagliardi , CBS Publisher
5. Satellite communication-Dennis –Roddy, McGraw-Hill

Course Outcomes

After the completion of this course students will be able to :

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Department of Electronics Engineering

1. Understand the basic concept in the field of Satellite Communication and to know how to place a satellite in an orbit.
2. Calculate the link power budget.
3. Get a complete knowledge about the earth and space subsystems
4. Gain knowledge about the Satellite Access schemes
5. Analyze Satellite system and mobile services provided
6. Study digital speech interpolation system DAMA

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Department of Electronics Engineering

List of Experiments

**SATELLITE COMMUNICATION
(BETL/ELL802/8442EL)**

1. To set up direct satellite link.
2. To set up active satellite link.
3. Study audio video transmission through satellite link.
4. Study baseband analog signal (voice) in satellite link.
5. To transmit and receive function generator waveforms through satellite link.
6. To transmit tone through satellite link.
7. To measure up linking and down linking frequencies.

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TV AND RADAR ENGINEERING

(BETL/ELL803/8443EL)

Course objectives: The objective of this course is to introduce to the students the basics of TV picture transmission and reception and different radar systems with their applications.

Unit I Scanning number of scanning lines, Flicker, Interlaced scanning, vertical resolution, horizontal resolution, Video signal bandwidth diagram, blanking pulses, synchronizing pulses, bandwidth requirement, vestigial side band transmission.

Unit II Monochrome Color Picture tube, Television camera tube, image orthicon vidicon, plumbicon, television transmitter, television application.

Unit III Television receiver D.C. restoration, inter carrier sound system, compatibility of colour television, colour theory, colour television camera, colour television picture tube, antenna, HDTV.

Unit IV Principles of RADAR, Radar frequencies, pulse RADAR, RADAR range equation, RADAR application, RADAR cross section of targets RADAR indicator, Noise figure of receiver, Mixer duplexer, Line pulsar.

Unit V MTI RADAR, Delay line canceller, digital signal processing, limitation of MTI RADAR, CW RADAR, FM CW RADAR.

Reference Books:

1. TV Engineering- Dhake, Tata McGraw-Hill Education
2. Monochrome and colour Television -R.R. Gulati, Wiely Eastern
3. RADAR System –Skolnik, McGraw-Hill

Course Outcome

After the completion of this course students will be able to:

1. Study TV Picture tubes, Composite Video Signal.
2. Study Receiver Picture tubes and Television Camera Tubes.
3. Analyse TV picture transmission and reception
4. Understand the advanced topics in digital television and High definition television.
5. Understand and analyse radar Systems,
6. Study Target detection and tracking using radar systems

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Department of Electronics Engineering

List of Experiments

TV AND RADAR ENGINEERING

(BETL/ELL803/8443EL)

1. To study RF tuner, IF amplifier, Sound IF amplifier.
2. To study picture tube and power amplifier.
3. To study video output.
4. To study vertical and horizontal output.
5. To study sound output and EHT output.
6. To study fault finding in different section of TV.

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Image Processing and Pattern Recognition

(BETL (ELL808) /8444 EL)

(Elective IV)

Course objectives: The course is designed to introduce students to theoretical concepts and issues associated with Image Processing and pattern recognition.

Unit I Digital Image Processing Problems and Application Two dimensional system, Matrix theory result, Block Matrix and Conical Products. Two Dimensional four and Z Transform

Unit II Image Perception, Introduction to Monochrome Vision Model, Color Representation, Color Vision Model, Image Sampling and Quantization. Image Quantization, Optimum Mean Square Quantizer, Compentor Design. Analytical Models for Practical Quantizer, Visual Quantization.

Unit III Image Transform, Two Dimensional Orthogonal and unitary Transform, Properties of Unitary Transform, Properties of Two Dimensional DFT, Cosine Transform, Hadamard Transform, R Transform, Slant Transform, KL Transform.

Unit IV Image Enhancement, Method of Image Enhancement: Point Operation Histogram Modeling, Spatial Transform Operation, Color Image Enhancement.

Unit V Image Feathers Extraction – Hash Reduction, Boundary Extraction, Introduction to Image Data Comparison, Image Restoration.

Reference Books:

1. Fundamental of Digital Image Processing - A. K. Jain PHI New Delhi
2. Digital Image Processing – Gonzalez, Pearson
3. Image Processing Analysis and Machine Vision – Milan Sonka, CL Engineering
4. Image Processing Theory –Dr. M.A. Sid- Ahmed , McGraw-Hill

Course Outcomes

After the completion of this course students will be able to:

1. Understand image formation and the role human visual system plays in perception of gray and color image data.
2. Get broad exposure to various applications of image processing in industry, medicine, and defense.
3. Learn the signal processing algorithms and techniques in image enhancement and image restoration.

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Department of Electronics Engineering

4. Acquire an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems.
5. Be able to conduct independent study and analysis of image processing problems and techniques.
6. Understand Image Feathers Extraction.

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NEURAL NETWORKS AND FUZZY SYSTEMS
(BETL/ELL804 /8444 EL)
(Elective IV)

Course objectives: The aim of this course is to provide students with an understanding of the fundamental theory of neural networks and fuzzy systems and to model and solve complicated practical problems such as recognition and classification .

Unit I Introduction, Human Brain and Biological Neurons, Properties of Artificial Neural system, ANN, Training of Neural Networks, Perceptron and linear separability.

Unit II Multilayer feedback networks, Back Propagation, Training, Recurrent networks, Hopfield nets and energy function, statistical training methods and Boltzman machine, Counter propagation network architecture, operation, training of kohonen layer, training of grossberg layer, Cauchy training.

Unit III Competitive learning, Architecture of ART, Working of ART, Implementation and training of ART.

Unit IV Fuzziness Probability: Fuzzy sets and systems, fuzzy entropy theorem, subtheed theorem, entropy-hobsethood theorem, Fuzzy associative memory, Fuzzy and neural Function estimators, fuzzy Hebb FAMS, Adaptive FAMS.

Unit V Fuzzy and Neural control systems, Comparison of Fuzzy and Neural systems, Fuzzy image transform coding, Fuzzy controller, Kalman Filter Controller.

Reference Books:

1. Neural Computing theory and Practice- P.D. Wosotman, Coriolis Group
2. Neural networks and Fuzzy systems - Bert Keske, Prentice-Hall
3. Neural Network- Simon Haykins, Prentice Hall
4. Fuzzy logic with engineering application- Timothy, John Wiley & Sons

Course Outcomes

After the completion of this course students will be able to: Comprehend the basic concepts of neural networks

1. Analyze the various feedforward networks.
2. Understand the concept of fuzziness involved in various systems and fuzzy set theory.
3. Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
4. Analyze the application of fuzzy logic control to real time systems.
5. Implement Fuzzy controller

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Department of Electronics Engineering

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NANOTECHNOLOGY
(BETL/ELL809 / 8444 EL)
(Elective IV)

Course objectives: The objectives of this course are to provide the students with knowledge and the basic understanding of nanotechnology.

UNIT-I NANOTECHNOLOGY: Background, what is nanotechnology, types of nanotechnology and nano-machines, top down and bottom up techniques, Molecular nanotechnology, atomic manipulation-nanodots, self-assembly, Dip pen nanolithography,

UNIT-II NANOMATERIALS :What are nanomaterials? Preparation of nanomaterials-Plasma arcing, Chemical Vapor Deposition, Sol-gels techniques, Electro deposition, Ball Milling, Natural nanomaterials, Applications of nanomaterials-Insulation materials, Machine tools, Phosphors, Batteries, High power magnets Medical implants.

UNIT-III CARBONTUBES: New forms of carbon, Carbon tubes-types of nanotubes, formation of nanotubes, Assemblies, purification of Carbon nanotubes, Properties of nanotubes, applications of nano tubes.

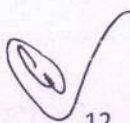

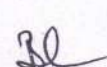
UNIT-IV OPTICS, PHOTONICS AND SOLAR ENERGY: Light and nanotechnology, Interaction of light and nanotechnology, Nano holes and photons, Solar cells, nano particles and nanostructures; Optically useful nanostructured polymers, Photonic Crystals.

UNIT-V NANO ELECTRONICS: Introduction, Tools of Micro- and Nanofabrication-optical and electron beam lithography, Molecular beam lithography, Quantum electronic devices, Molecular electronics, Simple ideas about quantum computers.

APPLICATIONS: MEMs, robots, Nanomachines, Nanodevices, New Computing System, Optic-electronic devices, Environmental applications, Nanomedicine, Biological nanotechnological future.

Reference Books:

1. Nanotechnology-A Gentle Introduction to the Next Big Idea Mark Ratner and Daniel Ratner, Prentice Hall.
2. Nanotechnology-Basic Science and Emerging Technologies Mick Wilson, Kamali Kannangra
3. Geoff Smith, Michelle Simons and Burkhard Raguse, Overseas Press
4. Nanotechnology: Rebecca L Johnson, Lerner Publications.
5. Introduction to Nanotechnology: Charles P. Poole Jr., Chapman and Hall/CR

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Madhav Institute of Technology and Science, Gwalior – 05
(Department of Electronics Engineering)

Ref.No.Elex/SSB/

Date 18/07/17

Ref.No.

S.No.	UG			
	Name of External Examiner	Designation	Postal Address	Phone Number
01	Dr. S.N. Sharma	Associate Professor	Department of Electronics & Communication Engineering, SATI, Vidisha, NetajiSubhashMarg, Civil Lines, Vidisha – 464001	07592250356
02	Dr. Mahendra Kumar	Associate Professor	, BIET, Kanpur Road, NH-25, Jhansi – 284128 (U.P.)	9450079696
03	Dr. PoonamSinha	Associate Professor	Barkatullah University, Hoshangabad Road, Bhopal - 462026	9826871398
04	Dr. Alok Jain	Professor & Head	Department of Instrumentation, SATI, Vidisha, NetajiSubhashMarg, Civil Lines, Vidisha – 464001 (M.P.)	9425463116
05	Prof Sourabh Kumar	Assistant Professor	Anand Engineering College Agra (U.P.)	
06	Dr. Sumant Katiyal	Assistant Professor	School of Studies in Electronics Engineering, Devi AhilyaVishwavidyalya, Khandwa Road, Indore – 452001 (M.P.)	
07	Dr. Shailendra Singh,	Professor & Head	NITTTT, Shamla Hills, Bhopal - 462002	9425011658
08	Dr. Anand Swaroop Saxena,	Professor	Department of Electronics Engineering, MPCT, Gwalior - 474006	9926219797
09	Dr. M.S. Parihar	Assistant Professor	IITDM, Jablpur, Dumna Airport Road, Khamaria Jabalpur – 482005 (M.P)	
10	Dr. K.V. Arya	Associate	ABV-IIITM, Morena Link	9406967661

Santa Singh

		Professor	Road, Gwalior - 474015	
11	Dr. Neeraj Shrivastava	Associate Professor	Department of Electronics & Communication, RJIT, BSF, Tekanpur - 475005 Gwalior	8989563787 9425754197
12	Dr. Vivek Kushwah	Professor	Department of Electronics & Communication, AMITY University, Gwalior - 474001 (M.P.)	8989563787
13	Dr. Bhavna Jharia	Associate Professor	SGSITS, 23 Park Road, Indore - 452003	
14	Dr. Jyoti Singhai	Professor	MANIT, BHOPAL - 462003	
15	Dr. Manoj Shukla	Professor	(HBTU) Harcourt Butler Technical University, HBIT East Campus, Nawabganj, Kanpur - 208002 (U.P.)	9721456021
16	Prof. Sunil Kumar Singh	Associate Professor	Jabalpur Engineering College Gokalpur, Jabalpur - 482011 (M.P.)	
17	Dr. Mata Deen Bansal	Assistant Professor	Department of Electronics & Communication Engineering, PDPM - IIITDM, Jabalpur, Dumna Airport Road, Khamaria Jabalpur - 482005 (M.P.)	
18	Dr. R.S. Tomar	Professor	LNMIIT Rupa Ki Mangal Post- Sumel, Via Jamdoti, Jaipur - 302031 (Rajasthan)	
19	Dr. Vimallesh Singh	Assistant Professor	ManavRachna University, Delhi Surajkund Road, Sector - 43 Aravalli Hills, Faridabad, Haryana - 121004	
20	Prof. P.L. Zade	Professor	Chavan College of Engineering, Hingna Road Wanadongri, Nagpur - 441110 (M.S.)	9673321177
21	Prof. Dheeraj Singh Rajput	Assistant Professor	GEC, SAGAR	9584120261
22	Prof. Rachit Jain	Assistant Professor	IITM, GWALIOR	8602332396
23	Prof. Devendra Kumar	Assistant Professor	RJIT TEKANPUR	9926882527

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24	Prof. Saurabh Kumar	Assistant Professor	AEC AGRA	
25	Prof. Rashmi Tikar	Assistant Professor	ITM,GWALIOR	9425702086
26	Prof. Anurag Shrivastav	Assistant Professor	SGSITS,INDORE	9685697175
27	Prof. Atul Bhargav	Assistant Professor	GITS Gwalior	9165032056
28	Prof. Mahendra Pandey	Assistant Professor	RJIT,TEKANPUR	9425122359
29	Prof. Amit Rajput	Assistant Professor	ITM,GWALIOR	
30	Prof. Amit Shrivastav	Assistant Professor	NRIITM,GWALIOR	9329556862
31	Prof. Anuj Kanchan,	Assistant Professor	ITM,GWALIOR	8878014537
32	Prof.Ashish Dubey,	Assistant Professor	SRCEM,BANMORE	
33	Prof. Gajendra Kulshreshtha,	Assistant Professor	SRITT, BANMORE	7898135109
34	Prof. Abhishek Lahariya,	Assistant Professor	MPCT,GWALIOR	
35	Prof. Ranjeet S. Bhadauria	Assistant Professor	IPS Gwalior	9926257872
36	Prof. Vineet	Assistant Professor	ITM,GWALIOR	7898806424
37	Prof. Ashish Garg	Assistant Professor	ITM,GWALIOR	
38	Prof. Kapil Jain	Assistant Professor	ITM,GWALIOR	
39	Prof Raghvendra Sharma	Professor	Amity, GWALIOR	8077886859
40	Prof Devendra Chack	Assistant Professor	IIT Dhanbad	
41	Prof. Ashish Bansal	Assistant Professor	Symbiosis Indore	
42	Prof. Sanjay Kushwah	Assistant Professor	GEC Gwalior	
43	Prof. Unmukt Datta	Assistant Professor	MPCT Gwalior	
44	Prof. Pankaj Shrivastav	Assistant Professor	MPCT Gwalior	

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45	Prof. Pankaj Tomar	Assistant Professor	MPCT Gwalior	
46	Dr Anjana Goen	Associate Professor	RJIT TEKANPUR	9425755052
47	Dr Manish Shrivastav	Associate Professor	LNCT Bhopal	9827296290
48	Prof Gaurav Bhardwaj	Assistant Professor	RJIT TEKANPUR	
49	Prof Sandeep Agarwal	Assistant Professor	RJIT TEKANPUR	

Savitri Singh

Dr. S.S Bhaduria
BOS Chairman
Head, Department of Electronics

Dr. Manjaree Pandit
Dean Academic

Dr. R.K. Pandit
Director

Department of Electronics Engineering

Course Outcomes

After the completion of this course students will be able to:

1. Learn the basic concept of nanotechnology
2. Understand the preparation of Nanomaterials
3. Study carbon tubes ,its preparation and properties
4. Know the processing of Nan particles and Nanomaterials
5. Know the application of Nanotechnology and nanomaterials
6. Understand Environmental applications

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BIO-MEDICAL INSTRUMENTATION
(BETL/ELL810 /8444 EL)
(Elective IV)

Course objectives: this course gives knowledge of the principle of operation and design of biomedical instruments and gives the introductory idea about human physiology system which is very important with respect to design consideration.

Unit I Introduction: Specifications of bio-medical instrumentation system, Man-Instrumentation system Components, Problems encountered in measuring a living system. Basics of Anatomy and Physiology of the body.

Bioelectric potentials: Resting and action potentials, propagation of action potential, The Physiological potentials – ECG, EEG, EMG, ERG, EOG and Evoked responses.

Electrodes and Transducers: Electrode theory, Bio potential Electrodes – Surface electrodes, Needle electrodes, Microelectrodes, Biomedical Transducer.

Unit II Cardiovascular Measurements: Electrocardiography – ECG amplifiers, Electrodes and Leads, ECG –Single channel, Three channel, Vector Cardiographs, ECG System for Stresses testing, Holter recording, Blood pressure measurement, Heart sound measurement. Pacemakers and Defibrillators..

Patient Care & Monitoring: Elements of intensive care monitoring, displays, diagnosis, Calibration & Reparability of patient monitoring equipment.

Unit III Respiratory system Measurements: Physiology of Respiratory system. Measurement of breathing mechanism – Spirometer. Respiratory Therapy equipment: Inhalators, Ventilators & Respirators, Humidifiers, and Nebulizers & Aspirators.

Nervous System Measurements: Physiology of nervous system, Neuronal communication, Neuronal firing measurements.

Unit IV Ophthalmology Instruments: Electroretinogram, Electro-oculogram, Ophthalmoscope, Tonometer for eye pressure measurement.

Diagnostic techniques: Ultrasonic diagnosis, Eco-cardiography ,Eco-encephalography, Ophthalmic scans, X-ray & Radio-isotope diagnosis and therapy, CAT -Scan, Emission computerized tomography, MRI.

Unit V Bio-telemetry: The components of a Bio-telemetry system, Implantable units , Telemetry for EC G measurements during exercise, for Emergency patient monitoring.

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Prosthetic Devices and Therapies: Hearing Aides, Myoelectric Arm, Diathermy, Laser applications in medicine.

Reference Books:

1. Cromwell, "Biomedical Instrumentation and Measurements" PHI
2. R. S. Khandpur, "Biomedical Instrumentation", TMH
3. J. G. Webster (editor), "Medical Instrumentation Application & Design", 3rd Ed WILEY, India
4. S. Ananthi, "A Text Book of Medical Instruments", New Age International
5. Pandey & Kumar, "Biomedical Electronics and Instrumentation", Kataria

Course Outcomes

After the completion of this course students will be able to:

1. familiarize with various medical equipments and their technical aspects
2. Understand the measurements involved in some medical equipments
3. Interpret technical aspects of medicine
4. Solve Engineering Problems related to medical field
5. Understand medical diagnosis and therapy.
6. Understand Bio-telemetry principles.

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