Minutes of

BoS meeting

held on 14-12-2022

Agenda of the BoS

(BoS Meeting Scheduled 14th December 2022)

Instructions for preparing BoS Proceedings

{All information is to be uploaded on the webpage under suitable heading (such as Board of Studies) and separate links to be provided for each category mentioned below}

1.

Minutes should have a summary/cover page mentioning all the significant changes made in the following given format

Courses where revision was carried out*

(Course/subject name)	Course Code	Year/Date of introduction	Year/Date of revision	Percentage of content added or replaced	Agenda Item No.	Page No.	Link of relevant documents/minutes
Digital Communication	140412	-	Dec 2022	10%	10	26	Item10
Electronic Circuits	140222	-	Dec 2022	8%	13	37	Item13
Communication System design and Application	600113	-	Dec 2022	10%	17	51	Item 17
Soft computing techniques for RF Engineering	600117	-	Dec 2022	10%	17	53	Item 17

Courses focusing on employability/entrepreneurship/ skill development*

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes
Python Programming	140224	Data Science	13	37	Item 13
Artificial Intelligence & Machine Learning	-	Machine Learning	5	15	Item5

New Courses added*

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes
Python Programming	140224	Data Science	13	37	Item 13
Artificial Intelligence & Machine Learning	-	Machine Learning	5	15	Item5

Feedback on curriculum received from stakeholders: Analysis& ATR*

Stakeholder	Student	Faculty	Alumni	Employer
No. of responses	II Year: 115 III Year: 79 IV Year: 171	16	24	19
Link of Analysis	https://drive.google.com/file/d/1IGIGa_aD3XrodSd7rGcZd8Y9GqRNnlIG/view?usp=share_link	https://docs.google.com/spreadsheets/d/12WXQ7y3NepNopoZTsquNiuppsANJUGHR/edit?usp=share_link&ouid=112748483881479644796&rtpof=true&sd=true	https://drive.google.com/file/d/13RW3sA8GsNygGJvTtV3ZuXq4cNy4aVTv/view?usp=share_link	https://drive.google.com/file/d/1y6OW69ul_iJjWBUBLN4p-phcyVKpASgU/view?usp=share_link

<table>
<tr><td></td><td>
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<tr><td>ATR Link</td><td>https://docs.google.com/document/d/1UPsk90h8e4oXhtMmejlP-5hId5o8SK4J/edit?usp=share_link&ouid=112748483881479644796&rtpof=true&sd=true</td><td>https://docs.google.com/document/d/1afVqvGStjkV0GLj6dLdWyqZRDt9pWdC2/edit?usp=share_link&ouid=112748483881479644796&rtpof=true&sd=true</td><td>https://drive.google.com/file/d/13RW3sA8GsNygGJvTtV3ZuXq4cNy4aVTv/view?usp=share_link</td><td>https://drive.google.com/file/d/1y6OW69ul_iJjWBUBLN4p-phcyVKpASgU/view?usp=share_link</td></tr>
<tr><td>Link showing Excel sheet of Google Form details of stakeholders</td><td>-</td><td>-</td><td>https://docs.google.com/spreadsheets/d/1JPkUwzLx0eG6p_MUjAhMXRF0_jrn4Q6E/edit#gid=415996994</td><td>https://docs.google.com/spreadsheets/d/1ym9R_T8ecS3hsOFwqvUOygVapHfXaYg4/edit?usp=share_link&ouid=112748483881479644796&rtpof=true&sd=true</td></tr>
</table>

* Separate page(s) for each of the above four points; Agenda point wise minutes to be appended with each point and a separate link to be given in the appropriate column for each point
</td></tr>
<tr><td>2.</td><td>The BoS minutes along with the cover/summary page (under point number 1, above) must be uploaded on the departmental web page and link for the same must be shared with the office of the Dean Academics.</td></tr>
<tr><td>3.</td><td>Stakeholder feedback analysis must also contain an action taken report (ATR).
The details/data of the stakeholder responded through GOOGLE form (such as Name, organization, mail id, phone no if available) must also be shared along with the feedback for the alumni/employer.</td></tr>
<tr><td>4.</td><td>The following must be uploaded on the departmental web page and link for the same must be shared withthe office of the Dean Academics.
(i) The Stakeholder feedback collected & analyzed to find the index out offive
(ii) Action takenreport
(iii) Google form showing responses from alumni, employer, student, facultyetc.</td></tr>
<tr><td>5.</td><td>Minutes should have a footer with department name and page number.</td></tr>
<tr><td>6.</td><td>Each page should be signed by all faculty, scanned and then submitted to the Dean Academics office.</td></tr>
</table>

BoS Agenda Items

Item 1

To confirm the minutes of previous BoS meeting held in the month of May 2022.

The minutes of last BoS held in June 2022 were confirmed and finalized.

Item 2

To propose the **scheme structure of VIII Semester** with the provision of **ONE DE & ONE OC** course **to be offered in online mode** with credit transfer for the **batch admitted in 2019-20.** (**The total credits from I-VIII semester should be 170 for this batch)**

The scheme structure of VIII Semester with the provision of ONE DE & ONE OC course to be offered in online mode with credit transfer for the batch admitted in 2019-20 were discussed and finalized. The same can be find out in Annexure-I.

Item 3

To propose the list of courses which the students can opt from SWAYAM/NPTEL/ other MOOC Platforms/ Institution (MITS) MOOC, to be offered in ***online mode under Departmental Elective (DE) category courses (DE-5) and open category (OC4)*** for credit transfer in the ***VIII Semester*** under the flexible curriculum **(*Batch admitted in* 2019-20*)***

The list of courses which the students can opt from SWAYAM/NPTEL/ other MOOC Platforms/ Institution (MITS) MOOC, to be offered in online mode under Departmental Elective (DE) category courses (DE-5) and open category (OC4) for credit transfer in the VIII Semester under the flexible curriculum (Batch admitted in 2019-20) has been discussed and finalized. The list is written in below table.

S.No	Category	Subject Code	Subject Name
1	DE-5	140853	Power Management Integrated Circuits
2	DE-5	140854	Fundamental of Power Electronics
3	DE-5	140855	Biomedical Signal Processing

S.No	Category	Subject Code	Subject Name
1	OC-4	900601	Linear Dynamical Systems
2	OC-4	900602	Sensors and Actuators

Item 4

To propose the list of "Additional Courses" which can be opted for getting an

(i) Honours (for students of the host department)
(ii) Minor Specialization (for students of other departments)

[These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the VI semester (for the batch admitted in 2020-21) and for VIII semester students for the batch admitted in* 2019-20*. The list should be additive; such that those MOOCs which were offered in previous semesters are also included provided they are being offered on the platform during Jan-June 2023 semester]

Category	Semester	Name of The course	Track wise Domain
Hons	VI	Electromagnetic Waves in Guided and Wireless Media	Communication and Signal Processing
	VI	Communication Networks	
	VI	Analog IC Design	VLSI Design
	VI	Op-Amp Practical Applications: Design, Simulation and Implementation	
Minors	VI	Communication Networks	Communication and Signal Processing
	VI	Fundamentals Of MIMO Wireless Communication	
	VI	Microprocessors and Microcontrollers	Control & Sensor Technology
	VI	Network Analysis	
Hons	VIII	Cloud Computing and Distributed Systems	-
	VIII	Architectural Design of Digital Integrated Circuits	
Minors	VIII	Microwave Integrated Circuits	-
	VIII	Signal Processing Techniques and its Applications	

	VIII	Computer Vision and Image Processing - Fundamentals and Applications	

Item 5

To review and finalize the syllabi for all Departmental Core (DC) Courses of VI Semester (for batches admitted in 2020-21) under the flexible curriculum along with their Cos.
The syllabi for all Departmental Core (DC) Courses of VI Semester (for batches admitted in 2020-21) under the flexible curriculum along with their Cos has been discussed and finalized. Details can be find out in Annexure-II.

S.No	Category	Subject Code	Subject Name
1	DC	140602	Digital Signal Processing
2	DC	140603	VLSI Design

Item 6

To review and finalize the courses & syllabi to be offered ***(for batches admitted in 2020-21)*** under ***Departmental Elective (DE) Course*** in the ***VI Semester***

The courses & syllabi to be offered (for batches admitted in 2020-21) under Departmental Elective (DE) Course in the VI Semester has been discussed and finalized.

S.No	Category	Course Code	Course Name
1	**DE-1**	140651	Spread Spectrum Communications and Jamming
2	**DE-1**	140652	Digital IC Design
3	**DE-1**	140653	**Fuzzy Sets, Logic and Systems & Application**

Item 7

To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered ***(for batches admitted in 2020-21)*** in online mode under ***Departmental Elective (DE) Course*** with credit transfer, in the ***VI Semester***

Mentioned in Item no. 6

Item 8

To review and finalize the courses & syllabi to be offered ***(for batches admitted in 2020-21)*** under the ***Open Category (OC) Courses*** (in traditional mode) for ***VI semester*** students of other departments along with their COs

The courses & syllabi to be offered (for batches admitted in 2020-21) under the Open Category (OC) Courses (in traditional mode) for VI semester students of other departments along with their COs has been discussed and finalized. The same can be find out in Annexure-III.

S.No	Category	Course Code	Course Name
1	**OC-1**	**900117**	**Intelligent Control**
2	**OC-1**	**900116**	**Embedded System**

Item 9

To review and finalize the Experiment list/ Lab Manual for Laboratory Courses to be offered in **VI semester *(for batches admitted in2020-21)***

The Experiment list/ Lab Manual for Laboratory Courses to be offered in VI semester (for batches admitted in2020-21) has been discussed and finalized. The same can be find out in Annexure-IV.

S.No	Category	Subject Code	Subject Name
1	**DC**	**140602**	Digital Signal Processing

	2	**DC**	**140603**	VLSI Design

Item 10

To review and finalize the scheme and syllabi of **B. Tech.** ***IV Semester (for batches admitted in 2021-22)*** under the flexible curriculum along with their COs

The scheme and syllabi of **B. Tech.** ***IV Semester (for batches admitted in 2021-22)*** under the flexible curriculum along with their Cos has been discussed and finalized with the recommendation of BoS experts. *The same can be find out in Annexure-V.*

Item 11

To review and finalize the Experiment list/ Lab Manual for Laboratory Courses to be offered in **IV** ***(for batch admitted in 2021-22)***

The Experiment list/ Lab Manual for Laboratory Courses to be offered in IV (for batch admitted in 2021-22) has been discussed and finalized. The same can be find out in Annexure-VI.

S.No	Category	Course Code	Course Name
1	DC	140411	Analog Integrated Circuits
2	DC	140412	Digital Communication
3	DLC	140414	Software Lab (Introduction to MATLAB)

Item 12

To review and finalize the suggestive list of projects under the 'Skill based mini-project' category in various laboratory courses to be offered in Jan - June 2023 semester during **IV Semester** ***(for the batch admitted in 2021-22)***.

The suggestive list of projects under the 'Skill based mini-project' category in various laboratory courses to be offered in Jan - June 2023 semester during IV Semester (for the batch admitted in 2021-22) has been discussed and finalized. The same can be find out in Annexure-VII.

S.No	Category	Course Code	Course Name
1	DC	140411	Analog Integrated Circuits
2	DC	140412	Digital Communication
3	DLC	140414	Software Lab (Introduction to MATLAB)

Item 13

To ratify the ***Scheme & Syllabi, list of experiments and skill based mini projects of First Semester & Second Semester*** **B. Tech. programmes [admitted batch 2022-23 Session]**

The *Scheme & Syllabi, list of experiments and skill based mini projects of First Semester & Second Semester* B. Tech. programmes [admitted batch 2022-23 Session] has been discussed and finalized. *The same can be find out in Annexure-VIII.*

Item 14

To review the CO attainments, to identify gaps and to suggest corrective measures for the improvement in the CO attainment levels for Jan-June 2022.

The CO attainments, to identify gaps and to suggest corrective measures for the improvement in the CO attainment levels for Jan-June 2022 has been displayed and discussed. Same can be find out in Annexure-IX.

Item 15

To review curricula feedback from various stakeholders, its analysis and impact

{**Stakeholder feedback analysis must also contain an action taken report (ATR) and the details/data of the stakeholder who have responded through GOOGLE form (such as Name, organization, mail id, phone no if available) must also be shared along with the feedback for the alumni/employer.}**

Curricula feedback from various stakeholders, its analysis and impact has been reviewed and discussed. Same can be find out in Annexure-X.

Item 16

To review Course Outcomes (COs) feedback of various courses, its analysis and impact

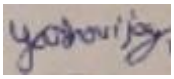
The Course Outcomes (COs) feedback of various courses, its analysis and impact has been reviewed and

	discussed. *The same can be find out in Annexure-XI.*
Item 17	Any other matter 1. To finalize M.E. (CCN) schemes of I and II Semester. 2. To revise syllabi of M.E. (CCN) I Semester. Detailed Scheme and Syllabus can be find out in Annexure-XII.

Dr. R.B Pachori
Professor, IIT Indore
(External member)

Dr. Jyoti Singhai
Professor,MANIT, Bhopal
(External member)

Er. Pankaj Agarwal
Assistant Engineer, UPPCL
(External member)



Mr. Yasho Vijay Singh Yadav
Scientist, CSIR
(Alumni Member)

Dr. P. K. Singhal

Dr. Laxmi Shrivastava

Dr. R. P. Narwaria

Dr. Karuna Markam

Prof Madhav Singh

Prof Pooja Sahoo

Prof D K Parsedia

Dr. Vikas Mahor

Dr. Rahul Dubey

Dr. Hemant Choubey

Dr. Deepak Batham

Dr. Varun Sharma

Dr. Shubhi Kansal

Dr. Pawan Dubey

Dr. Tej Singh

Dr. Vikram

Dr. Dinesh Rano

Dr. Sushmita Chaudhari

Dr. Sandeep Sharma

Mr. Manoj Kumar

Dr. Vandana Vikas Thakare
Head of the Department

Item 1

To confirm the minutes of previous BoS meeting held in the month of May 2022

The minutes of previous BOS meeting has been discussed and finalized.

Annexure-I

Item 2

To propose the **scheme structure of VIII Semester** with the provision of **ONE DE & ONE OC** course **to be offered in online mode** with credit transfer for the **batch admitted in 2019-20.**

Batch 2019-2023: Scheme for Electronics Engineering

Scheme of Examination B.Tech. VIII Semester Electronics Engineering

[For batches admitted in Academic Session 2019-20 onwards]

S.N.	Subject Code	Category	Subject Name & Title	Maximum Marks Allotted					MOOCS		Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot								
				End Sem.	Mid Sem. Exam	Quiz/ Assignment	End Sem.	Term Work / Lab Work & Sessional	Assignment	Exams		L	T	P	
1.	**1408XX**	**DE**	**Departmental Elective-5***	-	-	-	-	-	25	75	100	4	-	-	**4**
2.	**9006XX**	**OC**	**Open Course -4**	-	-	-	-	-	25	75	100	2	-	-	**2**
3.	**140804**	**DLC**	**Internship/Project (DLC-9)**	-	-	-	250	150	-	-	400	-	-	12	6
4.	**140805**		**Professional Development#**	-	-	-	-	50	-	-	50	-	-	2	1
			Total	**-**	**-**	**-**	**250**	**200**	**50**	**150**	**650**	**06**	**-**	**14**	**13**
Additional Courses for obtaining Honours or minor Specialization by desirous students			**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**												

***All of these courses will run through SWAYAM/NPTEL/ MOOC**

 # Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG program(participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events and technical events)

List of Des and Ocs:

Department Electives-1 (DE-5) (1408XX)	Power Management Integrated Circuits **(140853)**	Fundamental of Power Electronics **(140854)**	Biomedical Signal Processing **(140855)**

Open Course-4 (OC-4)	Linear Dynamical Systems (900601)	Sensors and Actuators (900602)

Item 3

To propose the list of courses which the students can opt from SWAYAM/NPTEL/ other MOOC Platforms/ Institution (MITS) MOOC, to be offered in ***online mode under Departmental Elective (DE) category courses (DE-5) and open category (OC4)***for credit 11ransferrin the ***VIII Semester***under the flexible curriculum **(*Batch admitted in* 2019-20*)***

Followings are the list of courses decided which the students can opt from SWAYAM/NPTEL/ other MOOC Platforms/ Institution (MITS) MOOC, to be offered in ***online mode under Departmental Elective (DE) category,*** for credit transfer in the ***VIII Semester*** under the flexible curriculum (*Batch admitted in 2019-20)*

S. No.	Category Code	Course Code	Name of The course	Duration of the course	Course Registration
	Electronics Engineering				
1	DE-5	140853	Power Management Integrated Circuits	12	January 23, 2023
2		140854	Fundamental of Power Electronics	12	January 23, 2023
3		140855	Biomedical Signal Processing	12	January 23, 2023

Followings are list of courses which the students can opt from SWAYAM/NPTEL/MOOC Platform, to be offered in ***online mode from*** SWAYAM/NPTEL/MITS MOOCs/ other MOOC Platforms) ***under Open Category (OC)*** Courses, for credit transfer in the ***VIII Semester under*** the flexible curriculum (*Batch admitted in 2019-20)*

S. No.	Category Code	Course Code	Name of The course	Duration of the course	Course Registration
	Electronics Engineering				
1	OC-4	900601	Linear Dynamical Systems	8	January 23, 2023
2	OC-4	900602	Sensors and actuators	12	January 23, 2023

Item 4

To propose the list of "Additional Courses" which can be opted for getting an

(i) Honours (for students of the hostdepartment)

(ii) Minor Specialization (for students of otherdepartments)

[These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the VI semester (for the batch admitted in 2020-21) and for VIII semester students for the batch admitted in* 2019-20. *The list should be additive; such that those MOOCs which were offered in previous semesters are also included provided they are being offered on the platform during Jan-June 2023 semester]

Category	Semester	Name of The course	Duration of the course	Course Registration		Track wise Domain
				Start Date	End Date	
Electronics Engineering (VI Semester)						
Hons	VI	Electromagnetic Waves in Guided and Wireless Media	08	January 23, 2023	March 17, 2023	Communication and Signal Processing
	VI	Communication Networks	12	January 23, 2023	April 14, 2023	
	VI	Analog IC Design	12	January 23, 2023	April 14, 2023	VLSI Design
	VI	Op-Amp Practical Applications: Design, Simulation and Implementation	12	January 23, 2023	April 14, 2023	
Minors	VI	Communication Networks	12	January 23, 2023	April 14, 2023	Communication and Signal Processing
	VI	Fundamentals Of MIMO Wireless Communication	8	January 23, 2023	March 17, 2023	
	VI	Microprocessors and Microcontrollers	12	January 23, 2023	April 14, 2023	Control & Sensor Technology
	VI	Network Analysis	12	January 23, 2023	April 14, 2023	
Electronics Engineering(VIII Semester)						
Hons	VIII	Cloud Computing and Distributed Systems	8 Weeks	January 23, 2023	March 17, 2023	-
	VIII	Architectural Design of Digital Integrated Circuits	12 Weeks	January 23, 2023	April 14, 2023	
Minors	VIII	Microwave Integrated Circuits	8 Week	January 23, 2023	March 17, 2023	-
	VIII	Signal Processing Techniques and its Applications	12	January 23, 2023	April 14, 2023	
	VIII	Computer Vision and Image Processing – Fundamentals and Applications	12	January 23, 2023	April 14, 2023	

Annexure-II

Item 5

To review and finalize the syllabi for all ***Departmental Core (DC) Courses*** of ***VI Semester (for b*atches admitted in *2020-21)*** under the flexible curriculum along with their Cos

Batch 2020-2024: Scheme for Electronics Engineering

S.No	Category	Course Code	Course Name
1	DC	140602	Digital Signal Processing
2	DC	140603	VLSI Design

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Electronics Engineering

B. Tech. VI Semester Electronics Engineering

Effective for academic session 2020-21, 2021-22 & 2022-23

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Online, Offline, Blended)	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs			L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam							
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.		MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	MCQ
2.	140602	DC	Digital Signal Processing	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP
3.	140603	DC	VLSI Design	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP
4.	14060XX	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MOOC
5.	14060XX	OC	Open Category (OC-1)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	MCQ
6.	140606	DLC	Minor Project-II	-	-	-	-	60	40	-	-	-	100	-	-	4	2	Offline	SO
7.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	1	Interactive	SO
Total				**200**	**40**	**80**	**80**	**290**	**100**	**60**	**25**	**75**	**950**	**15**	**-**	**12**	**21**	**-**	**-**
8.	100008	MAC	Intellectual Property Rights (IPR)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	MCQ
			Summer Internship-III (On Job Training) for Four weeks duration: Evaluation in VII Semester																
Additional Course for Honors or minor Specialization			**Permitted to opt for maximum two additional courses for the award of Honors or Minor specialization**																

$proficiency in course/subject-includes the weight age towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

$$**MCQ:** Multiple Choice Question $$**AO:** Assignment + Oral $$**PP:** Pen Paper $$**SO:** Submission + Oral

***Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform with credit transfer**

Department Elective-1 (DE-1) (MOOC) 1406XX	Spread Spectrum Communications and Jamming 140651	Digital IC Design 140652	Fuzzy Sets, Logic and Systems & Application 140653

Open Course-1 (OC-1)	Intelligent Control 900117	Embedded Systems 900116

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	200	3	-	2	4

Artificial Intelligence & Machine Learning

Course Objectives: To provide the fundamental knowledge of Artificial Intelligence, Neural Network and Machine Learning, to present the basic representation and reasoning paradigms used in AI & ML, to understand the working of techniques used in AI & ML.

Unit – I Introducing Artificial Intelligence: Definition, Goals of AI, Task of AI, Computation, Psychology and Cognitive Science. Perception, Understanding, and Action. Artificial intelligence vs machine learning vs deep learning and other related fields. Applications of Artificial intelligence and Machine Learning in the real world.

Unit – II Problem, Problem Space and Search: Production System, Blind Search: BFS & DFS, Heuristic Search, Hill Climbing, Best First Search
Introduction to Neural Networks: History, Biological Neuron, Artificial Neural Network, Neural Network Architectures, Classification, & Clustering

Unit – III Introduction to Machine Learning: Traditional Programming vs Machine learning. Key Elements of Machine Learning: Representation, process (Data Collection, Data Preparation, Model selection, Model Training, Model Evaluation and Prediction), Evaluation and Optimization. Types of Learning: Supervised, Unsupervised and reinforcement learning. Regression vs classification problems.

Unit – IV:Supervised Machine Learning: Linear regression:implementation, applications & performance parameters. Decision tree classifier, terminology, classification vs regression trees, tree creation with Gini index and information gain, IDE3 algorithms, applications and performance parameters. Random forest classifier. Case study on regression and classification for solving real world problems.

Unit – V:Unsupervised Machine Learning: Introduction, types: Partitioning, density based, DBSCAN, distribution model-based, hierarchical, Agglomerative and Divisive, Common Distance measures, K-means clustering algorithm. Case study on clustering for solving real world problems.

Text Books/Reference Books:

1. Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
3. Introduction to AI & Expert System: Dan W. Patterson, PHI.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop
5. Introduction to Machine Learning using Python: Sarah Guido
6. Machine Learning in Action: Peter Harrington

Course Outcomes:
After successful completion of the course, students will be able to:
CO1. Define basic concepts of Artificial Intelligence & Machine Learning.
CO2. Illustrate various techniques for search and processing..
CO3. Identify various types of machine learning problems and techniques.
CO4. Analysis various techniques in Artificial Intelligence, ANN & Machine Learning.
CO5. Apply AI and ML techniques to solve real world problems.
CO6. Build AI enabled intelligent systems for solving real world problems.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
140602	DC	Digital Signal Processing	50	10	20	20	60	20	20	200	3	-	2	4

Digital Signal Processing (140602)

Course Objectives: understanding of the fundamental concepts of digital signal processing, designing of digital filters, and brief knowledge about the Multirate digital signal processing.

Unit I Review of Transform Domain Techniques: Review of discrete time signals and systems, Properties and applications of discrete time Fourier transform, Review of Z transform, Analysis of minimum phase, maximum phase and inverse system.

Unit II Discrete Fourier Transform (DFT): Introduction and properties of DFT, Computation of circular convolution using DFT, Decimation in time FFT algorithm, Decimation of frequency FFT algorithm with radix-2, and radix-4.

Unit III Digital Filters (Part-I): Characteristics of practical frequency selective filters, Various **s**ignal flow graph structure of IIR filters. **IIR Filter design:** Overview of Butterworth, Chebyshev and Elliptic approximations, Design of discrete time IIR filters using Impulse invariant, and Bilinear transformation methods, Spectral transformation of IIR filters.

Unit IV Digital Filters Part-II: Introduction and Signal flow graph structure of FIR Filter.

FIR Filter design: Symmetric, and Asymmetric FIR filters, Design of linear phase FIR filters using windows, and Frequency sampling method, Design of Optimum Equiripple linear phase FIR filters, Design of FIR differentiators.

Unit V Multirate Digital Signal Processing: Introduction, Decimation and Interpolation, Sampling rate conversion by a Rational factor.

Implementation of Sampling rate Conversion: Sampling rate conversion with Cascaded integrator, Comb filters,Polyphase structures for decimation, and interpolation filters, Application of multirate signal processing.

Text Books:

7. John. G. Proakis, "Digital Signal Processing", 4th Edition, Pearson Education.
8. Oppenheim and Schafer, "Digital Signal Processing", 2nd Edition, PHI Learning.

Reference Books:

1. Johnny R. Johnson, "Introduction to Digital Signal Processing", 1st Edition, PHI Learning.
2. Rabiner and Gold, "Theory and Application of Digital Signal Processing",3rd Edition, PHI Learning.
3. Ingle and Proakis, "Digital Signal Processing- A MATLAB based Approach", 3rd Edition, Thompson, Cengage Learning.

Course Outcomes:

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

CO3. **Analyze** discrete time system using transform methods.
CO4. **Compute** DFT using FFT algorithms.
CO5. **Design** IIR Filters.
CO6. **Design** FIR Filters.
CO5. **Apply** the concept of multi-rate signal processing in practical applications.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
140603	DC	VLSI Design	50	10	20	20	60	20	20	200	3	-	2	4

VLSI Design (140603)

Course objectives: To understand the fundamental properties of digital CMOS logic circuits using basic MOSFET equations and to develop skills for various logic circuits using CMOS design.

Unit I MOS Transistor: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitances.

Unit II MOS Inverters Static Characteristics: Introduction, Voltage Transfer Characteristic (VTC), Noise Immunity and Noise margins, Resistive-Load Inverter, Inverters with n-Type MOSFET Load and CMOS Inverter, DC Characteristics of CMOS Inverter, Calculation of VIL, VIH, VOL, VOH and Vth, Design of CMOS Inverters, Supply Voltage Scaling in CMOS Inverters, Power and Area considerations.

Unit III MOS Inverters Dynamic Characteristics: Switching Characteristics and Interconnect Effects, Switching Characteristics of CMOS Inverter- Delay-Time Definitions, CMOS Propagation Delay, Calculation of Delay times, Power Dissipation-Switching, Short-Circuit and Leakage Components of Energy and Power, Power-Delay Product.

Unit IV CMOS Logic Structures and Layout Design: Combinational MOS logic circuits- CMOS Logic circuits (NAND, NOR and Complex Logic Gates, Multiplexers etc.), CMOS Transmission Gates (Pass Gates). CMOS n-Well Process, layout design rules, layout design of CMOS Inverter, designing of stick diagram.

Unit V Semiconductor Memories and Low-Power CMOS Logic Circuits: Semiconductor memories: non-volatile and volatile memory devices, flash memories, SRAM cell design, 1T DRAM cell design, dynamic CMOS logic circuits, domino logic CMOS circuits.

Text Books

1. Sung-Mo Kang & Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", 3rd Edition, Tata McGraw-Hill, New Delhi, 2003.
2. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "Digital Integrated Circuits: a design perspective", 2nd Edition, Pearson Education, 2003.

Reference Books

1. David A. Hodges, Horace G. Jackson, Resve A. Saleh, "Analysis and Design of Digital Integrated Circuits: In Deep Submicron Technology", McGraw, 2003.
2. David A. Johns and Ken Martin, "Analog Integrated Circuit Design" John Wiley and Sons Inc., 1997.
3. Neil Weste and David Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Addison-Wesley, 2010
4. John P.Uyemura, "CMOS Logic Circuit Design", Springer International Edition.2005.Logic Circuit Design", Springer International Edition.2005.

Course Outcome:

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

CO1. **Analyze** the working of CMOS Transistors in different Modes of Operation.
CO2. **Derive** the Static Characteristics of Resistive Load, N-Type MOSFET Load CMOS Inverters.
CO3. **Evaluate** the Propagation Delay and Power Dissipation of a CMOS Inverter.
CO4. **Design** a CMOS Logic Circuit and Layout Design for a Given Boolean Function.
CO5. **Analyze** the Design and Operation of Various Semiconductor Memories.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
100008	MAC	Intellectual Property Rights	50	10	20	20	-	-	-	100	2	-	-	2

Intellectual Property Rights (100008)

Course Objectives: To acquaint the learners with the basic concepts of Intellectual Property Rights. To develop expertise in the learners in IPR related issues and sensitize the learners with emerging issues in IPR and the rationale for the protection of IPR.

UNIT – I: Introduction: Introduction to IPRs, Basic concepts and need for Intellectual Property – Meaning and practical aspects of Patents, Copyrights, Geographical Indications, IPR in India and Abroad. Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT – II: Intellectual Property Rights: The IPR tool kit, Patents, the patenting process, Patent cooperation treaties: International Treaties and conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT – III: Intellectual Property Protections: IPR of Living Species, protecting inventions in biotechnology, protections of traditional knowledge, biopiracy and documenting traditional knowledge, Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection. Case studies: The basmati rice issue, revocations of turmeric patent, revocation of patent.

UNIT – IV: Exercising and Enforcing of Intellectual Property Rights: Rights of an IPR owner, licensing agreements, criteria for patent infringement. Case studies of patent infringement, IPR – a contract, unfair competitions and control, provisions in TRIPs.

UNIT- V: Role of Patents in Product Development & amp: Commercialization, Recent changes in IPR laws impacting patents and copy rights, intellectual cooperation in the science and allied industry. Patentable and non-patentable research. Case studies

Reference Books:

1. P.B. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy. Tata Mc Graw Hill, 2001.
2. Steve Smith, The Quality Revolution.1st ed., Jaico Publishing House, 2002.
3. Kompal Bansal and Praishit Bansal. Fundamentals of IPR for Engineers, 1st Edition, BS Publications, 2012.
4. Prabhuddha Ganguli. Intellectual Property Rights. 1st Edition, TMH, 2012.

Course Outcomes: At the end of this course, the student will be able to

CO1. Imbibe the knowledge of Intellectual Property and its protection through various laws

CO2. Apply the knowledge of IPR for professional development

CO3. Develop a platform for protection and compliance of Intellectual Property Rights & knowledge

CO4. Create awareness amidst academia and industry of IPR and Copyright compliance

CO5. Deliver the purpose and function of IPR and patenting.

Item 6

To review and finalize the courses & syllabi to be offered ***(for batches admitted in 2020-21)*** under ***Departmental Elective (DE) Course*** in the ***VI Semester.***

Item 7

To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered ***(for batches admitted in 2020-21)*** in online mode under ***Departmental Elective (DE) Course*** with credit transfer, in the ***VI Semester***

S.No	Category	Course Code	Course Name
1	**DE-1**	140651	Spread Spectrum Communications and Jamming
2	**DE-1**	140652	Digital IC Design
3	**DE-1**	140653	**Fuzzy Sets, Logic and Systems & Application**

Annexure-III

Item 8

To review and finalize the courses & syllabi to be offered ***(for batches admitted in 2020-21)*** under the ***Open Category (OC) Courses*** (in traditional mode) for ***VI semester*** students of other departments along with theirCos

S.No	Category	Course Code	Course Name
1	OC-1	900117	Intelligent Control
2	OC-1	900116	Embedded System

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
900117	OC-1	Intelligent Control	70	20	10	-	-	100	2	-	0	2

Intelligent Control (900117)

Course Objectives: The main objective of this course is to develop the basic understanding of an Intelligent control i.e. control system with optimization and prediction using Artificial Neural Network to the students.

Unit I - Adaptive Control: Introduction, Close loop and open loop adaptive control. Self-tuning controller, Parameter estimation using least square and recursive least square techniques, Gain Scheduling, Model Reference Adaptive Control, Self Tuning Regulators, Adaptive Smith predictor control, Auto tuning and self tuning smith predictor.

Unit II– Artificial Neural Network (ANN) Based Control: Introduction to ANN, Different activation functions, Different architectures and different learning methods, Back Propagation and Radial Basis Function networks.

Unit III- Modeling of Control System: Representation and identification, Modeling the plant, Control structures – supervised control, Model reference control, Internal model control, Predictive control, Indirect and direct adaptive controller design using neural network.

Unit IV– Fuzzy Logic Based Control: Fuzzy Controllers: Preliminaries – Mamdani and Sugeno inference methods, Fuzzy sets in commercial products – basic construction of fuzzy controller – fuzzy PI, PD and PID control, Analysis of static properties of fuzzy controller, Analysis of dynamic properties of fuzzy controller , Simulation studies and case studies , Stability issues in fuzzy control.

Unit V– Hybrid Control: Introduction to Genetic Algorithm (GA), Neuro-Fuzzy and Fuzzy-GA based hybrid system design.

Text Books:

1. Astrom **.**K, Adaptive Control, Second Edition, Pearson Education Asia Pvt. Ltd, 2002.
2. Shivanandan**,** Introduction to Artificial Neural Network with MATLAB 6.0.1, Third Edition, Mcgraw Hill India Ltd, 2015.

Reference Books:

1. Klir G.J and Folger T.A, Fuzzy sets, Uncertainty and Information, Prentice Hall of India, New Delhi 1994.
2. Bose and Liang, Artificial Neural Networks, Tata Mcgraw Hill, 1996.
3. Kosco B, Neural Networks and Fuzzy Systems: A Dynamic Approach to Machine Intelligence, Prentice Hall of India, New Delhi, 1992.
4. Chang C. Hong, Tong H. Lee and Weng K. Ho, Adaptive Control, ISA press, Research Triangle Park, 1993.

Course Outcomes:

After successful completion of this course; students will be able to:

CO1. **Explain** the fundamental principle behind adaptive control.

CO2. **Estimate** various parameter of control system using artificial neural network.

CO3. **Apply** the concept of artificial neural network to the field of control.

CO4. **Optimize** the throughput of the system using optimization methods like Genetic algorithm.

CO5. **Design** fuzzy logic based control system.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
900116	OC-2	Embedded System	70	20	10	-	-	100	2	-	0	2

Embedded System (900116)

Course objectives: To introduce the basic concepts of microcontroller and to develop assembly language programming skills along with the introduction of microcontroller applications.

Unit I Introduction: Embedded system architecture, classification, challenges and design issues, fundamentals of embedded processor and microcontrollers, Von Neumann/Harvard architectures, CISC vs. RISC, microcontrollers types and their selection, Overview of the 8051 family, architecture, pin description, Flags, Register Banks, Internal Memory Organization, I/O configuration, Special Function Registers, addressing modes.

Unit II Assembly programming and instruction of 8051: An Overview of 8051 instruction set, Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

Unit III 8051 Timer, Serial port, interrupt Programming: Basics of Timers/Counters, Programming 8051 timers/Counter, basics of serial communication, 8051 connection to RS232, 8051 serial port programming, basics of 8051 Interrupts, 8051 interrupts programming: Timer interrupts, external hardware interrupts and serial communication interrupt, 8051 Interrupt priority.

Unit IV Interfacing real world devices with 8051 microcontroller: Memory address decoding, 8051 interfacing with memory, 8051 interface with 8255 PPI and various interfacings like: LCD and Matrix Keyboard interfacing with 8051 microcontroller, ADC, DAC and Temperature Sensor interfacing with 8051 microcontroller, Stepper motor interfacing.

Unit V Interfacing real world devices with Arduino : Overview of Arduino, Configuration, Interfacing, Board layout, Atmega328 specifications, Interfacing of Arduino with LED, Switches, Light dependent resistor (LDR), PWM, 16*2 LCD, Serial, L293D for motor interfacing, ADC.

Text Book:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mckinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C" Pearson Education India, 2nd Edition

Reference Books:

1. Kenneth Ayal, "The 8051 Microcontroller", Architecture, Programming and Applications.
2. Subrata Ghoshal, "Embedded Systems and Robots, Projects using the 8051Microcontroller".

Course Outcomes

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

CO1. **Explain** the architecture of embedded system and 8051.
CO2. **Develop** assembly language programming skills for 8051.
CO3. **Analyze** the concept of Timers/Counters, Serial communication and interrupt handling processes of 8051 microcontroller.
CO4. **Interface** memory and I/O devices with 8051microcontroller.
CO5. **Interface** Arduino with LED, Switches, Light dependent resistor (LDR), PWM, 16*2 LCD, Serial, L293D for motor interfacing, ADC.

Annexure-IV

Item 9

To review and finalize the Experiment list/ Lab Manual for Laboratory Courses to be offered in **VI semester** ***(for batches admitted in2020-21)***

S.No	Category	Course Code	Course Name
1	DC	140602	Digital Signal Processing
2	DC	140603	VLSI Design

Digital Signal Processing Lab

Subject Code: 140602

Lab Objectives

The objective of the course is to practically implement the convolution, correlation, DFT, IDFT and to design FIR & IIR filter.

1. To generate the following signals:-Unit Impulse Signal, Unit Step Signal, Unit Ramp Signal, Exponential Growing and Decaying Signal, Sine Signal And Cosine Signal.
2. Verification of sampling theorem.
3. To perform the Discrete Fourier Transform (DFT) and Inverse Discrete Fourier Transform(IDFT)
4. To perform the Linear Convolution of given sequences using DFT and IDFT.
5. To perform the Circular Convolution of given sequences.
6. To perform the Linear Convolution using Circular Convolution.
7. To perform autocorrelation of a given sequence and verify of its Properties.
8. To perform the computation of N-point DFT of a given sequence also to plot magnitude and phase spectrum.
9. To analyze the spectral parameters of the given window functions.

Value Added Experiments

10. To design the low pass and high pass FIR filters using the given window functions.
11. To design the band pass and band stop FIR filters using the window functions
12. To design IIR Butterworth filter corresponding to given order and specifications.

Course Outcomes

After studying this course the students would be able to-

- **CO1.** Generate discrete/digital signals using MATLAB
- **CO2.** Calculate and Plot convolution of two given DT signal.
- **CO3.** Plot frequency response of a given system and verify the properties of LTI system.
- **CO4.** Implement FFT of given sequence and identify the reduction of computations using FFT.
- **CO5.** Design FIR and IIR filters.

VLSI Design Lab

Subject Code: 140603

Lab Objectives
To learn the fundamental principles of CMOS VLSI circuit design using SYMICA EDA CAD tool.

List of Experiments:

Digital CMOS logic circuit design using SYMICA CAD tool:

1. Design and simulate basic CMOS logic Gates: AND, OR, NOT.
2. Design and simulate CMOS logic universal gates: NAND and NOR.
3. Design and simulate CMOS logic 2:1 MUX.
4. Design and simulate CMOS logic 2 x 4 Decoder.
5. Design and simulate CMOS logic Half-Adder and Full Adder.
6. Design and simulate CMOS logic RS, JK and D flip-flops.

Gate level design using SYMICA CAD tool:

1. Design and simulate a Verilog program for the following combinational designs:
    a) 2 to 4 decoder
    b) 8 to 1 multiplexer
    c) 4 bit binary to gray converter
2. Design and simulate a Verilog code to describe the functions of a full adder using three modeling styles.
3. Design and simulate a model for 32 bit ALU.

Course Outcomes

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

CO1. **Demonstrate** a clear understanding in hardware design language Verilog and SPICE.
CO2. **Model** a combinational circuit using hardware description language Verilog and SPICE Netlist.
CO3. **Model** a sequential circuit using hardware description language Verilog and SPICE Netlist.
CO4. **Model** a computational circuit using hardware description language Verilog and SPICE Netlist.
CO5. **Simulate** and validate the functionality of the CMOS VLSI circuits using CAD tools.

Annexure-V

Item 10

To review and finalize the scheme and syllabi of **B. Tech.** ***IV Semester (for batches admitted in 2021-22)*** under the flexible curriculum along with their Cos

Batch 2021-2025: Scheme for Electronics Engineering

B. Tech. (Electronics Engineering) IV Semester

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam	Duration of Exam.
				Theory Slot				Practical Slot										
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project		L	T	P				
				End Term Evaluation	$Proficiency in subject /course													
1.	100003	BSC	Engineering Mathematics-III	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs.
2.	140411	DC	Analog Integrated Circuits	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
3.	140412	DC	Digital Communication	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
4.	140413	DC	Linear Control Theory	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
5.	140414	DLC	Software Lab Introduction to MATLAB	-	-	-	-	60	20	20	100	-	-	4	2	Offline	SO	-
6.	100004	MC	Cyber Security	50	10	20	20				100	3	-	-	3	Blended	MCQ	1.5 Hrs
7.		CLC	Novel Engaging Course	-	-	-	-	-	50	-	100	-	-	2	1	Interactive	SO	-
Total				**250**	**50**	**100**	**100**	**180**	**110**	**60**	**900**	**12**	**3**	**10**	**20**			
Summer Internship Project-II (Softskills Based) for two weeks duration: Evaluation in V Semester																		
9.	1000002	MAC	Indian Constitution & Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ	

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
3	6	6	3	4	1	18	0	2	1	1	22
13.63%	27.27%	27.27%	13.63%	18.18%	4.54%	81.81%	0%	9.09%	4.54%	4.54%	Credits %

B.Tech IV Sem (Electronics Engineering)

Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
140411	DC	Analog Integrated Circuits	50	10	20	20	60	20	20	200	2	1	2	4

Analog Integrated Circuits (140411)

Course objective: Students will be able to learn the concepts of power, multistage and operational amplifiers. Further, they will learn to design multivibrators using IC 555 and active filter design using Opamp.

Unit I Power Amplifiers: Introduction, amplifier classification, 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 II Multistage Amplifiers: classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, types of coupling, low frequency response of an RC coupled stages, effect of an emitter bypass capacitor on low frequency response, two Stage RC coupled Amplifier.

Unit III Multivibrator Design using 555 IC: The 555 IC Circuit, 555 IC block diagram, Using the 555 IC as Astable and Monostable Multivibrator Circuits and its applications: Phase Locked Loops (PLL), Phase Detectors.

Unit IV: Operational Amplifier: Differential amplifier and analysis, Introduction of op-amp, Block diagram, characteristics and equivalent circuits of an op-amp, Power supply configurations for op-amp, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio (CMRR), Slew rate and its Effect, Gain bandwidth product, frequency limitations and compensations. OP AMP Application circuits such as: Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Schmitt Trigger, Logarithmic and anti-logarithmic amplifier etc.

Unit V Active Filter Design: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter; all pass filters, self-tuned filters.

Text Books:

1. Electronics Devices and Circuits: Boylested & Nashelsky,11thEdition**,** Pearson Education India
2. Op-Amp and Linear Integrated Circuit: R.A.Gayakwad, 4th Edition, Prentice Hall of India.

Reference Books:

1. Integrated Electronics: Millman&Halkias, 2nd Edition,McGraw Hill Education
2. Electronics Devices and Circuits: Shalivanan, 2nd Edition, Tata Mcgraw Hill Education.
3. Microelectronic Circuits- Theory and Application: Sedra& Smith,7th Edition**,** Oxford Press.

Course Outcomes

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

CO1. Compare the efficiency of various power amplifiers.

CO2. Analyze the parameters of multistage amplifiers.

CO3. Design Multivibrator circuits using IC 555.

CO4. Design the electronic circuits using Operational amplifier.

CO5. Implement the active filters based on given specifications.

B.Tech IV Sem (Electronics Engineering)

Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
140412	DC	Digital Communication	50	10	20	20	60	20	20	200	2	1	2	4

Digital Communication (140412)

Course Objectives: The main objective of this course is to understand the basic concepts of digital modulations and digital transmission techniques.

Unit I Sampling: Sampling theorem for Low pass signal, Ideal sampling, Natural sampling and Flat top sampling, Time division Multiplexing, Generation and detection of PAM, PPM and PWM.

Unit II Digital Modulation Systems: Pulse Code Modulation, Quantization, Quantization noise, Companding, Eye pattern, Delta modulation, Adaptive delta modulation and DPCM.

Unit III Band Pass Data Transmission: ASK, Binary phase shift keying (BPSK), QPSK, DPSK, Coherent and Non coherent BFSK.

UNIT IV Information Theory Concept of information theory, Entropy and Information rate, Channel capacity, Shannon's theorem, Shannon Hartley theorem.

Unit V Coding Techniques: Coding Efficiency, Shannon Fano coding, Huffman coding.

Text Books:

1. Singh, R.P. & Sapre, S.D, "Communication Systems: Analog & Digital", Tata McGraw-Hill, 5th reprint, 2000.
2. John G. Proakis, "Digital Communication", McGraw Hill Inc, 5th Edition, 2008.

Reference Books:

1. Simon Haykin, "Communication Systems", John Wiley & Sons, 4th Edition, 2000.
2. Taub & Schilling, "Principle of Communication Systems", 2nd Edition, 2003.

Course Outcomes:

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

CO1: Explain the process of sampling and pulse modulation.
CO2: Analyze digital modulation systems
CO3: Describe the different band pass data transmission techniques.
CO4: Illustrate the concepts of information theory and source coding.
CO5: Apply error correcting codes in digital communication.

B.Tech IV Sem (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
140413	DC	Linear Control Theory	50	10	20	20	-	-	-	100	3	-	-	3

Linear Control Theory (140413)

Course Objectives: learning of control system theory and its implementation in practical systems using electronic devices.

UNIT I: Introduction to Control Systems: Basic control system terminology, Open loop and 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 feedback.

UNIT II: **Time Domain Analysis:** Test input signals, First order systems, Second order systems, Effects of addition of poles and zeros to open and closed loop transfer functions, Steady state error, Constant and error coefficients for type 0, 1, and 2 systems.

UNIT III: Stability Analysis: Concept of stability of linear systems, Relation between the closed loop poles and stability, Relative stability, Absolute stability, Routh Hurwitz criteria and its applications, Root locus plot.

UNIT IV: Frequency Domain Analysis: Performance specifications in frequency domain, Co-relation between frequency domain and time domain, Polar plots and Bode plots of transfer function, Nyquist stability criterion, Assessment of relative stability.

Unit V: Introduction to Controllers: Introduction to Proportional, Integral, and Derivative controller, PD controller, PI controller, PID controller, Design of various controllers and their limitations.

Text Books:

1. Control System Engineering- I. J. Nagrath & M. Gopal, New Age International.
2. Modern Control Engineering –K. Ogata, Prentice Hall.
3. Control System- A. Anand Kumar, PHI
4. Control System Engineering – B.S. Manke, Khanna publications.

Reference Books:

1. Automatic Control System— B. C. Kuo,Wiley.
2. Control System Engineering- Norman Nise, John Wiley & Sons.

Course Outcomes:

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

CO1. **Determine** the transfer function of linear control system.
CO2. **Evaluate** the time domain response of control system for different standard inputs.
CO3. **Compute** the steady state error for type 0,1,2 systems.
CO4. **Analyze** the stability of control system using time and frequency domain methods.
CO5. **Design** proportional, integral, and derivative controller, PD, PI, PID controllers.

B.Tech IV Sem (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
100004	MC	Cyber Security	50	10	20	20	-	-	-	100	3	-	-	3

TOPIC-WISE MOOC LINKS FOR CYBER SECURITY (100004)

UNIT - 1:
Topic of the lecture: Overview of Cyber Security
Topic of the lecture: Introduction to Cyber Security, Cyber-crime
Topic of the lecture: Types of Cyber Attacks
Topic of the lecture: Cyber Vandalism (Hacking), Cyber Stalking, Internet Frauds and Software Piracy

UNIT - 2:
Topic of the lecture: Basics of Internet and Networking
Topic of the lecture: Network Topologies
Topic of the lecture: Wired and Wireless networks, E-commerce
Topic of the lecture: OSI Model:
Topic of the lecture: Internetworking Devices:
Topic of the lecture: Firewall:

UNIT - 3:
Topic of the lecture: Security Principles and Attacks
Topic of the lecture: Cryptography:
Topic of the lecture: Symmetric key Cryptography
Topic of the lecture: Symmetric key Ciphers
Topic of the lecture: Public key cryptography
Topic of the lecture: SSL

UNIT - 4:
Topic of the lecture: Hacker, Types of Hacker
Topic of the lecture: Malicious Softwares (Part 1)
Topic of the lecture: Malicious Softwares (Part 2)

UNIT - 5:
Topic of the lecture: Introduction of Intellectual Property and patent
Topic of the lecture: More About Patent
Topic of the lecture: All about Trademark
Topic of the lecture: Industrial Design
Topic of the lecture: Geographical Indication
Topic of the lecture: All about copyright
Topic of the lecture: IT act 2000
Topic of the lecture: Digital Crime Investigation

Annexure-VI

Item 11

To review and finalize the Experiment list/ Lab Manual for Laboratory Courses to be offered in **IV** ***(for batch admitted in 2021-22)***

S.No	Category	Course Code	Course Name
1	DC	140411	Analog Integrated Circuits
2	DC	140412	Digital Communication
3	DLC	140414	Software Lab (Introduction to MATLAB)

Subject Name: Analog Integrated Circuit
Subject Code: 140411

List of Experiments

1 Design of the circuit using IC 741 Op-amp
- a Summer and Subtractor
- b Inverting and Non Inverting Amplifier
- c Voltage Follower
- d Comparator and Schmitt trigger
- e Integrator and Differentiator

2 To Design the Multivibrator circuit using 555 timer IC.
- a Astable Multivibrator
- b Bistable Multivibrator
- c Monostable Multivibrator

3 To Design the RC Low pass and High pass Filter

Course Outcome:
After successful completion of the lab, students will be able to:
- CO1: Design various applications using Op-amp.
- CO2: Troubleshoot fabricated circuit individually and in a team.
- CO3: Design various amplifier circuits.

Subject Name: Digital Communication Lab
Subject Code: 140412

List of Experiments

1. To perform sampling and reconstruction.
2. To identify the various encoding schemes for a given data stream.
3. To analyze pulse amplitude modulation.
4. To analyze pulse width modulation.
5. To generate amplitude shift key signal.
6. To generate amplitude shift key signal using MATLAB.
7. To generate phase shift key signal using MATLAB.
8. To generate frequency shift key signal using MATLAB.
9. To generate quadrature phase shifted key signal using MATLAB.

Course Outcome:
After successful completion of the lab, students will be able to:
- CO1. Understand sampling theorem.
- CO2. Perform lines coding technique.
- CO3. Construct different pulse modulation technique.
- CO4. Implement different digital modulation technique
- CO5. Evaluate the performance of the digital communication system using MATLAB

Subject Name: Software Lab : Introduction to MATLAB
Subject Code: 140414

List of Experiments

1. Study of MATLAB.
2. Write a program perform the MATRIX manipulation using MATLAB command window.
3. Write a program to plot the various ANALOG function using plot command. Also label x axis ,y axis and provide the tittle of figure.
4. Write a program to plot the various DISCRETE function using plot command. Also label x axis ,y axis and provide the tittle of figure.

5. Write a program to plot more than one ANALOG function in a single window using subplot.
6. Write a program to plot more than one DISCRETE function in a single window using subplot.
7. Write a program to plot Amplitude Modulated signal along with baseband signal.
8. Write a program to plot SSB Modulated signal along with baseband signal.
9. Write a program to plot Frequency Modulated signal along with baseband signal.
10. Write a program to plot Phase Modulated signal along with baseband signal.
11. Write a program to draw root locus of the given function.

12. 1/(2s^4+5s^3+4s^2+6s+8)

13. Write a program to draw Bode Plot of the given function.

14. 1/(2s^4+5s^3+4s^2+6s+8)

15. Write a program to draw Nyquist Plot of the given function.

1/(2s^4+5s^3+4s^2+6s+8)

Annexure-VII

Item 12

To review and finalize the suggestive list of projects under the 'Skill based mini-project' category in various laboratory courses to be offered in Jan - June 2023 semester during **IV Semester** ***(for the batch admitted in 2021-22)***.

S.No	Category	Course Code	Course Name
1	DC	140411	Analog Integrated Circuits
2	DC	140412	Digital Communication
3	DLC	140414	Software Lab (Introduction to MATLAB)

Subject Name: Analog Integrated Circuit
Subject Code: 140411

Skill Based Mini Project List

1. Design oscillators using 555 timer IC.
2. Design pulse generators using 555 timers IC.
3. Design one-bit memory storage element using 555 timer IC.
4. Design frequency divider circuit using 555 timer IC.
5. Design phase lock loop using 555 timer IC.

Subject Name: Digital Communication Lab
Subject Code: 140412

Skill Based Mini Project List

1. Implementation of sampling theorem. (a) Sampling at Nyquist rate (b) Over sampling and (c) Under sampling.
2. Implementation of Eye Diagram/Eye Pattern for any of the modulation technique.
3. PPM using IC 555.
4. PAM using IC 555.
5. PWM using IC 555.
6. Generation of On-off Keying signal.
7. Generation of ASK, FSK and PSK signal.
8. Generation of QAM signal and its constellation diagram.
9. To develop a GUI based project in MATLAB for PCM.
10. To develop a GUI based project in MATLAB for Differential-PCM.
11. To develop a GUI based project in MATLAB for Delta Modulation.
12. To develop a GUI based project in MATLAB for Adaptive Delta Modulation

Subject Name: Software Lab : Introduction to MATLAB
Subject Code: 140414

Skill Based Mini Project List

1. GUI model for various waveform generation of various frequencies anddisplay.
2. Calculator Design using MATLAB.
3. Draw and calculate the area of circle of given radius.
4. GUI model for various waveform generation and display.
5. GUI model for display of various transform of specific waves.

Annexure-VIII

Item 13

To ratify the ***Scheme & Syllabi, list of experiments and skill based mini projects of First Semester & Second Semester*** **B. Tech. programmes [admitted batch 2022-23 Session]**

B.Tech. I Semester (Electronics Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam
				Theory Slot				Practical Slot										
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work & Sessional	Skill Based Mini Project		L	T	P				
				End Term Evaluation	$Proficiency in subject /course													
1.	100022	BSC	Basic Electrical & Electronics Engineering	50	10	20	20	60	20	20	200	2	1	2	4	Blended	MCQ	1.5 Hrs
2.	140121	DC	Electronic Engineering Material	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
3.	140122	DC	Electronic Devices	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	140123	DC	Network Theory	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
5.		ESC	Computer Programming	50	10	20	20	60	20	20	200	2	1	2	4	Blended	AO	2 Hrs
6.	140124	DLC	Devices & Network Lab	-	-	-	-	60	20	20	100	-	-	4	2	Offline	AO	2 Hrs
Total				**250**	**50**	**100**	**100**	**180**	**60**	**60**	**800**	**11**	**4**	**6**	**19**			
6	3000002	Natural Sciences and Skills	Engineering Chemistry	50	10	20	20	-	-	-	-	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Induction programme of three weeks (MC):Physical activity, Creative Arts,Universal Human Values,Literary,ProficiencyModules,Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences& Skills: Engineering Physics / Engineering Chemistry / Environmental Science/ Language

Credits of Natural Sciences & Skills will be added in the VI Semester.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching					Mode of Examination				Total Credits
Theory				Lab	Theory			Lab	
Offline	Online	Blended		Offline	PP	A+O	MCQ	SO	
		Offline	Online						
0	0	10	5	8	9	6	4	0	19
0%	0%	52.63%	26.31%	42.10%	47.36%	31.57%	21.05%	0%	

B.Tech. II Semester (Electronics Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam
				Theory Slot				Practical Slot										
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work & Sessional	Skill Based Mini Project		L	T	P				
				End Term Evaluation	$Proficiency in subject /course													
1.	100011	BSC	Engineering Mathematics –I	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
2.	140221	DC	Digital Circuits &Systems	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
3.	140222	DC	Electronic Circuits	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
4.	140223	DC	Signals and Systems	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
5.	140224	DC	Python Programming	50	10	20	20	60	20	20	200	2	1	2	4	Blended	AO	1.5 Hrs
Total				**250**	**50**	**100**	**100**	**180**	**60**	**60**	**800**	**11**	**5**	**6**	**19**			
6	3000001	Natural Sciences and Skills	Engineering Physics	50	10	20	20	-	-	-	-	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Summer Internship Project – I (Institute Level) (Qualifier): Minimum two-week duration: Evaluation in III Semester.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences& Skills: Engineering Physics / Engineering Chemistry / Environmental Science/ Language

Credits of Natural Sciences & Skills will be added in the VI Semester.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching					Mode of Examination				Total Credits
Theory				Lab	Theory			Lab	
Offline	Online	Blended		Offline	PP	A+O	MCQ	SO	
		Offline	Online						
4	0	8	4	6	15	4	0	0	19
21.05%	0%	42.10%	21.05%	31.57%	78.94%	21.05%	0%	0%	

Syllabus, List of Experiments, Skill based mini projects- Semester I

Syllabus, List of Experiments, Skill based mini projects- Semester II

Annexure-IX

Item 14

To review the CO attainments, to identify gaps and to suggest corrective measures for the improvement in the CO attainment levels for Jan-June 2022.

Annexure-IX

Annexure X

Item 15

To review curricula feedback from various stakeholders, its analysis and impact

{**Stakeholder feedback analysis must also contain an action taken report (ATR) and the details/data of the stakeholder who have responded through GOOGLE form (such as Name, organization, mail id, phone no if available) must also be shared along with the feedback for the alumni/employer.}**

Student Feedback: Annexure-X-A (EC, ET)

Alumni Feedback: Annexure-X-B

Employer Feedback: Annexure-X-C

Annexure-XI

Item 16

To review Course Outcomes (COs) feedback of various courses, its analysis and impact

Annexure-XI

Annexure-XII

Item 17

Any other Item

1. To finalize M.E. (CCN) schemes of I and II Semester.
2. To revise syllabi of M.E. (CCN) I Semester.

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Department of Electronics Engineering

Recommended W.E.F JULY 2022

M. E. Communication Control &Networking (Semester – I)

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Periods per week			Total Credits	Mode of Exam
			Theory Slot			Practical Slot		MOOCs							
			End Sem	Mid Sem	Quiz/ Assignment	End Sem	Lab work/ Sessional	Assignment	Exam		L	T	P		
1.	600111	Computational Techniques	70	20	10	-	-	-	-	100	3	-	-	3	PP
2.	600112	Computer Communication Networks	70	20	10	-	-	-	-	100	3	-	-	3	PP
3.	600113	Communication System Design and Applications	70	20	10	-	-	-	-	100	3	-	-	3	PP
4.	600114-116	**Elective-I**	70	20	10	-	-	-	-	100	3	-	-	3	PP
5.	800102-104	***Open Category Course -1 (OC-1)**	70	20	10	-	-	-	-	100	3	-	-	3	PP
6.	600120	Project Lab- I	-	-	-	90	60	-	-	**150**	-	-	4	2	AO
7.	600121	$ Self Learning / Presentation	-	-	-	-	100	-	-	**100**	-	-	2	1	AO
		Total	**350**	**100**	**50**	**90**	**160**	**-**	**-**	**750**	**15**	**-**	**6**	**18**	

During labs, students have to perform practical/assignments/ minor projects related to theory subjects/theoretical concepts of respective semester using recent technologies / languages / tools etc.

***Open Category course (OC-1) will have to be opted from the pool of open courses (offered by other than parent department) and based on** interdisciplinary aspects.

$Self learning / presentation through SWAYAM / NPTEL

*Elective-I (1) Communication Protocols (600114) (2) RADAR Signal Processing (600115) (3) Adaptive Control System (600116)

**OC: (1) Soft Computing Techniques for RF Engineering (800102) (2) 5G Networks (800103) (3) Image and Video Signal Processing (800104)

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Department of Electronics Engineering

Recommended W.E.F JULY 2022

M.E. Communication Control &Networking (Semester-II)

Scheme of Examination

S. No.	Subject Code New	Subject Name	Maximum Marks Allotted							Total Marks	Contact Periods per week			Total Credits	Mode of Exam
			Theory Slot			Practical Slot		MOOCs							
			End sem	Mid sem	Quiz/ Assignment	End Sem	Lab work/ sessional	Assignment	Exam		L	T	P		
1.	600211	Information Coding Theory	70	20	10	-	-	-	-	100	3	-	-	3	PP
2.	600212	Computer Aided Control System	70	20	10	-	-	-	-	100	3	-	-	3	PP
3.	600213	Digital Filter Design and Algorithms	70	20	10	-	-	-	-	100	3	-	-	3	PP
4.	600214-217	**#Elective-II**	-	-	-	-	-	**25**	**75**	100	3	-	-	3	MCQ
5.	800201-800203	**##Open Category Course - 2 (OC-2)**	-	-	-	-	-	**25**	**75**	100	3	-	-	3	MCQ
6.	600222	Project Lab - II	-	-	-	90	60	-	-	150	-	-	4	2	AO
7.	600223	$Self Learning / Presentation	-	-	-	-	100	-	-	100			2	1	AO
		Total	**210**	**60**	**30**	**90**	**160**	**50**	**150**	**750**	**15**	**-**	**6**	**18**	

During labs, students have to perform practical/assignments/ minor projects related to theory subjects/theoretical concepts of respective semester using recent technologies / languages / tools etc.

#Elective-II course *will run through SWAYAM / NPTEL /MOOC based learning platform (with credit transfer facility)*

##Open Category course will have to be opted from the pool of open courses (offered by other than parent department) and based on interdisciplinary aspects. [This course may be run through SWAYAM/NPTEL based platform *(with credit transfer facility)* and accordingly, OC- 2 pool may be created from the list of SWAYAM/NPTEL courses)

$Self learning / presentation through SWAYAM / NPTEL

#Elective-II: (1) Fundamental of Power Electronics (2) Biomedical Signal Processing (3) Power Management Integrated Circuit

##OC-2: (1) Linear Dynamical Systems (2) Sensors and Actuators

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Department of Electronics Engineering

Subject Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
		End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Marks	Lab work & Sessional Marks		L	T	P	
600112	Computer Communication networks	70	20	10	-	-	100	3	-	-	3

COMPUTER COMMUNICATION NETWORKS 600112

To develop an understanding of computer networking basics and different components of computer networks, various protocols, modern technologies and their applications.

Unit I Computer Networks and its Standards: Computer Network, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards.

Unit II Network Models: Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, OSI Versus TCP/IP.

Unit III Data-Link Layer: Introduction: Nodes and Links, Services, Categories of link, Sublayers, Link Layer addressing: Types of addresses, ARP, Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol**.**

Unit IV Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing.

Unit V Wireless LANs: Introduction: Architectural Comparison, Characteristics, IEEE 802.11: Architecture, MAC Sublayer, Addressing Mechanism, Physical Layer, Bluetooth Architecture, Layers, Connecting Devices: Hubs, Switches**.**

Text Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
3. Computer Networks by Andrew S. Tanenbaum (Fifth Edition), Pearson Education.

Reference Books:

1. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.
2. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw Hill, 2011.

Course Outcomes:

After the completion of the course, student will able to:

CO1. Analyze various Computer Networks
CO2. Describe Network model and their Architectures.
CO3. Describe Data link layer and its protocols.
CO4. Illustrate Media Access Control Systems.
CO5. Analyze Wireless LAN architecture and its Connecting devices

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Subject Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
		End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Marks	Lab work & Sessional Marks		L	T	P	
600113	Communication System Design And Applications	70	20	10	-	-	100	3	-	-	3

COMMUNICATION SYSTEM DESIGN AND APPLICATIONS (600113)

Course Objectives: To understand and analyze the concepts of digital modulation techniques and communication through band limited linear filter channels.

Unit I Random Variables and Random Process: Random Variables, Discrete and Continuous random variable, PDF, CDF, properties of PDF and CDF, Joint CDF, Cauchy PDF, Rayleigh PDF, Random process, Wide Sense Stationary process, Ergodic process, Gaussian process.

Unit II Digital Transmission Techniques: Geometric Representation of Signal Waveforms, Gram-Schmidt Orthogonalization procedure, BPSK ,BFSK, QPSK, DPSK.

Unit III Communication Through Band Limited Linear Filter Channels: Baseband binary data transmission system, Optimum Receiver for Channels with ISI and AWGN Linear Equalization, Minimum Mean Square Error Equalizer, Adaptive Equalizer.

Unit IV Spread Spectrum Signals for Digital Communication: Principle of Spread spectrum, Pseudo noise sequence, direct sequence spread spectrum signals, Frequency hopped spread spectrum signals, Synchronization.

Unit V Multicarrier Communication: Generation and detection of OFDM, Cyclic prefix, Importance of Orthogonality, Difference between FDM and OFDM, advantages and disadvantages, applications.

Text Books:

1. John G. Proakis and Masoud Salehi, Digital Communications, Tata McGraw-Hill, 5th Edition, 2014.
2. Simon Haykin, Digital Communications, John Wiley India Pvt., Ltd, 2008.

Reference Books:

1. Richard Van Nee & Ramjee Prasad, 'OFDM for Multimedia Communications' Artech House Publication, 2001
2. Bernard Sklar, Digital communication, Pearson education, 2009.

Course Outcomes:

After the completion of the course, student will able to:

CO1. Analyze random variables and random processes.
CO2. Explain base band transmission and reception schemes.
CO3. Illustrate communication through band limited linear filter channels.
CO4. Discuss spread spectrum signals and its synchronization.
CO5. Describe the generation and the processing of OFDM signals.

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Subject Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
		End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Marks	Lab work & Sessional Marks		L	T	P	
600116	Elective-I	70	20	10	-	-	100	3	-	-	3

ADAPTIVE CONTROL SYSTEM (600116)

Course Objectives: The students will be able to understand the concepts of Control Systems, Mathematical Modeling and analyze the behavior of Adaptive Control systems.

Unit I State Space Analysis: Concepts of State, State variables, State Model of Linear Systems, State Space Representation using Physical Variables, State Space Representation using Phase Variables, Decomposition of Transfer Function, Diagonalization.

Unit II Solution of State Equation: State Transition Matrix and State Transition Equation, Computation of the State Transition Matrix, Transfer Function from the State Model, Stability, Controllability and Observability of Linear Systems.

Unit III Adaptive Control: Linear Feedback, Effects of Process Variations, Adaptive Schemes- Gain Scheduling, Model Reference Adaptive Systems, Self-Tuning Regulators, Dual Control, Applications of Adaptive Control.

Unit IV Real Time Parameter Estimation: Least Squares and Regression Models, Estimating Parameters in Dynamical Systems, Experimental conditions, Simulation of Recursive Estimation, Prior information.

Unit V Z-Plane Analysis of Discrete Time Control Systems: Impulse Sampling and Data Hold, Reconstructing Original Signal from Sampled Signals, Mapping Between S Plane and Z Plane, Concept of Pulse Transfer Function, Stability Analysis of Closed-Loop Systems in the Z-Plane, Jury Stability Test.

Text Books:

1. Katsuhiko Ogata, "Modern Control Engineering" 5th Edition, Prentice Hall, 2010
2. M. Gopal, "Modern Control System Theory" Revised 2nd Edition New Age International Publishers, 2005
3. Karl J. Astron and Bjorn Wittenmark, " Adaptive Control" 2nd Edition, Dover Publications, 2008
4. Katsuhiko Ogata " Discrete Time Control Systems" 2nd Edition Pearson Education,2002

Reference Books:

1. H. K. Khalil, "Nonlinear Systems", Pearson India, 2019
2. Gang Tao, "Adaptive Control Design and Analysis" Wiley, 2003
3. G. Feng and R. Lozano, "Adaptive Control Systems" Oxford University Press, 1999.

Course Outcomes:

After completion of the course, the student will be able to:

CO1. Apply the State Space Techniques in Control Systems.
CO2. Design the Compensators to meet the Control System specifications.
CO3. Demonstrate the behavior of Adaptive Control System.
CO4. Analyze the Adaptive Model for Control System.
CO5. Derive Discrete-Time Mathematical Models in Z Domain.

Subject Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
		End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Marks	Lab work & Sessional Marks		L	T	P	
600117	OC I	70	20	10	-	-	100	3	-	-	3

SOFT COMPUTING TECHNIQUES FOR RF ENGINEERING (600117)

Course Objective: To make students understand about the application of Neural Network techniques for RF circuits modelling.

Unit I Modelling and Optimization for RF Design: The Design Process: Anatomy of the Design Process, Conventional Design Procedures, CAD Approach, Knowledge-Aided Design (KAD) Approach, RF and Microwave Circuit CAD, Modelling of Circuit Components, Computer-Aided Analysis Techniques, Circuit Optimization, CAD for Printed RF and Microwave Antennas, Role of ANN's in RF and Microwave CAD.

Unit II Neural Network Structures: Generic Notation, Highlights of the Neural Network Modelling Approach, Multilayer Perceptrons (MLP), Radial Bias Function Networks (RBF), Comparison of MLP and RBF Neural Network and Self-Organizing Maps, Recurrent Neural Networks.

Unit III Training of Neural Networks: Key Issues in Neural Model Development, Neural Network Training, Back Propagation Algorithm and Its Variants, Non gradient-Based Training: Simplex Method, Training with Global Optimization Methods, , Feed forward Neural Network Training.

Unit IV Modelling for RF and Microwave Components-I: Modelling Procedure, Selection of Model Inputs and Outputs, Training Data Generation, Error Measures, Integration of EM- ANN Models with Circuit Simulators, Microstrip Transmission Line Model ,Broadband, Stripline-to-Stripline Multilayer Interconnect, Integration of EM-ANN Models with a Network Simulator.

Unit V Modelling for RF and Microwave Components-II: EM-ANN Models for CPW Components, EM-ANN Modelling of CPW Transmission Lines, CPW Symmetric T-junctions, Microstrip Patch Antennas and Waveguide Filter Components

Text Book:

1. Q J Zhang, K C Gupta,Neural Networks for RF and Microwave Design, Artech House, 2000.

Reference Books:

1. Rajasekaran and G. A. Vijaylakshmi Pai S. Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India. 2003
2. Christos Christodoulou, Michael Georgiopoulos, Application of Neural Networks in Electromagnetics, Artech House Publication,2001

Course Outcomes:

After the completion of the course, student will able to:

CO1. Illustrate the concept of Modelling and Optimization for RF Design.
CO2. Explain Neural Network Structures.
CO3. Evaluate the performance of Neural Networks.
CO4. Describe RF and Microwave circuits.
CO5. Apply Neural Network techniques for the Modelling of RF and Microwave Components