Mekelle Institute of Technology

V Year Degree Program

Curriculum

October 2007

Department of Electrical and Electronics Engineering

COURSE MATRIX

I Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 101	English for Engineers	-	3	1	-	3
GC 103	Civics and Ethical Education	-	3	-	-	3
SC 101	Freshman Mathematics	-	4	1	-	4
SC 103	Freshman Physics	-	3	-	-	3
CSE 101	Principles of Computing	-	3	-	3	4
		Total	**16**	**2**	**3**	**17**

I Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 102	Communication Skills	GC 101	1	1	-	1
GC 104	Introduction to Economics	-	3	-	-	3
SC 102	Engineering Mathematics I	SC 101	4	1	-	4
SC 104	Modern Physics	SC 103	3	1	-	3
CSE 102	Programming in C	CSE 101	3	1	3	4
EEE 102	Electric Circuit Analysis	-	3	1	3	4
		Total	**17**	**5**	**6**	**19**

II Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 201	Engineering Mathematics II	SC 102	4	1	-	4
SC 203	Applied Mechanics	-	3	1	-	3
ECE 201	Analog Electronics I	EEE 102	3	1	3	4
ECE 203	Digital Electronics I	-	3	1	3	4
EEE 201	Electrical and Electronic Workshop Practice	-	-	-	3	1
		Total	**13**	**4**	**9**	**16**

II Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 202	Engineering Mathematics III	SC 201	3	1	-	3
ECE 202	Signals and Systems	SC 201	3	1	-	3
ECE 204	Analog Electronics II	ECE 201	3	1	3	4
ECE 206	Digital Electronics II	ECE 203	3	1	3	4
EEE 202	Electromagnetic Field Theory	SC 201	3	1	-	3
		Total	**15**	**5**	**6**	**17**

III Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
ECE 303	Network Analysis and Synthesis	ECE 202	3	1	-	3
ECE 305	Electronic Measurements & Instrumentation	EEE 102	3	-	3	4
ECE 307	Fundamentals of Communication Systems	-	3	-	3	4
CSE 301	Microprocessors	ECE 206	3	-	3	4
EEE 301	Electrical Machines I	EEE 102	3	-	3	4
		Total	**15**	**1**	**12**	**19**

III Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
ECE 306	Digital Signal Processing	ECE 202	3	1	3	4
EEE 302	Linear Control Systems	ECE 202	3	-	3	4
EEE 304	Electrical Machines II	EEE 301	3	-	3	4
EEE 306	Power Electronics	ECE 204	3	-	3	4
EEE 308	Electrical Power Generation	EEE 301	2	-	-	2
		Total	**14**	**1**	**12**	**18**

IV Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 401	Advanced Microprocessors	CSE 301	3	-	3	4
CSE 201	Object Oriented Programming with C++	CSE 102	3	-	3	4
CSE 403	Computational Methods	SC 202	2	1	2	3
EEE 401	Transmission, Distribution and Utilization of Electrical Energy	EEE 308	3	1	2	4
EEE 403	Electrical Machine Design	EEE 304	3	-	3	4
		Total	**14**	**2**	**13**	**19**

IV Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 402	Research Methods and Presentation	-	-	3	-	2
EEE 402	Advanced Control Systems	EEE 302	3	1	-	3
EEE 404	Power System Analysis and Stability	EEE 401	3	1	2	4
EEE 406	Switch Gear and Protection	EEE 401	3	-	-	3
EEE 408	Solid State Drives and Control	EEE 306	3	-	3	4
		Total	**1**	**5**	**5**	**16**

	2				

V Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 407	Microcontrollers	-	3	-	3	4
EEE 501	Power System Operation and Control	EEE 404	3	-	-	3
EEE 503	Electrical Installation	-	3	-	3	4
EEE 505	Power Supply Systems	EEE 306	3	-	-	3
EEE 507 / ECE 502B / CSE 507 / CSE 505	Elective I		3	-	-	3
EEE 509	Mini Project	-	-	-	3	1
		Total	**15**	**-**	**9**	**18**

V Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 502	Engineering Economics and Management	-	3	-	-	3
GC 504	Entrepreneurship	-	3	-	-	3
EEE 502 / EEE 502A / EEE502B / CSE 508	Elective II	-	3	-	-	3
EEE 504	Final Project	-	-	-	12	4
		Total	**9**	**-**	**12**	**13**

Elective I

Course Code	Subject
EEE 507	PLCs and its Applications
ECE 502B	Logic Design using VHDL
CSE 505	Neural Networks and Fuzzy Logic
CSE 507	Embedded Systems

Elective II

Course Code	Subject
EEE 502	Renewable Energy Sources
EEE 502A	Advanced Electrical Machines
EEE 502B	Power System Planning
CSE 508	Computer Communication Networking

Summary of EEE Course Listings

Year	I Semester				II Semester			
	L	T	P	Cr	L	T	P	Cr
I	16	2	3	17	17	5	6	19
II	13	4	9	16	15	5	6	17
III	15	1	12	19	14	1	12	18
IV	14	2	13	19	12	5	5	16
V	15	-	9	18	9	-	12	13
Total	73	9	46	89	67	16	41	83

Total Credit Hours	172
Total Lecture Hours	140
Total Tutorial Hours	25
Laboratory/Practice Hours	87

Department of Electronics and Communication Engineering

COURSE MATRIX

I Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 101	English for Engineers	-	3	1	-	3
GC 103	Civics and Ethical Education	-	3	-	-	3
SC 101	Freshman Mathematics	-	4	1	-	4
SC 103	Freshman Physics	-	3	-	-	3
CSE 101	Principles of Computing	-	3	-	3	4
		Total	**16**	**2**	**3**	**17**

I Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 102	Communication Skills	GC 101	1	1	-	1
GC 104	Introduction to Economics	-	3	-	-	3
SC 102	Engineering Mathematics I	SC 101	4	1	-	4
SC 104	Modern Physics	SC 103	3	1	-	3
CSE 102	Programming in C	CSE 101	3	1	3	4
EEE 102	Electric Circuit Analysis	-	3	1	3	4
		Total	**17**	**5**	**6**	**19**

II Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 201	Engineering Mathematics II	SC 102	4	1	-	4
SC 203	Applied Mechanics	-	3	1	-	3
ECE 201	Analog Electronics I	EEE 102	3	1	3	4
ECE 203	Digital Electronics I	-	3	1	3	4
EEE 201	Electrical and Electronic Workshop Practice	-	-	-	3	1
		Total	**13**	**4**	**9**	**16**

II Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 202	Engineering Mathematics III	SC 201	3	1	-	3
ECE 202	Signals and Systems	SC 201	3	1	-	3
ECE 204	Analog Electronics II	ECE 201	3	1	3	4
ECE 206	Digital Electronics II	ECE 203	3	1	3	4
EEE 202	Electromagnetic Field Theory	SC 201	3	1	-	3
		Total	**15**	**5**	**6**	**17**

III Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
ECE 301	Transmission Lines, Antennas and Propagation	EEE 202	3	-	3	4
ECE 303	Network Analysis and Synthesis	ECE 202	3	1	-	3
ECE 305	Electronic Measurements & Instrumentation	EEE 102	3	-	3	4
CSE 301	Microprocessors	ECE 206	3	-	3	4
EEE 303	Electrical Machines	EEE 102	3	-	3	4
		Total	**15**	**1**	**12**	**19**

III Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
EEE 302	Linear Control Systems	ECE 202	3	-	3	4
ECE 302	Communication Systems	ECE 202	3	-	3	4
ECE 304	Information Theory and Coding	ECE 206	3	1	3	4
ECE 306	Digital Signal Processing	ECE 202 3	1	3		4
ECE 308	VLSI Design	ECE 206	3	-	-	3
		Total	**15**	**2**	**12**	**19**

IV Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 401	Advanced Microprocessors	CSE 301	3	-	3	4
CSE 201	Object Oriented Programming with C++	CSE 102	3	-	3	4
CSE 403	Computational Methods	SC 202	2	1	2	3
ECE 401	Digital Communication Systems	ECE 302/ ECE 306	3	-	3	4
ECE 405	Industrial Electronics	ECE 204	3	-	3	4
		Total	**14**	**1**	**14**	**19**

IV Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 402	Research Methods and Presentation	-	-	3	-	2
ECE 402	Microwave and Satellite Communications	ECE 301	3	1	3	4
ECE 404	Fiber Optic Communications	-	3	-	3	4
ECE 406	Radio Telephony and Systems	-	3	-	-	3
EEE 402	Advanced Control Systems	EEE 302	3	1	-	3
		Total	**1**	**5**	**6**	**16**

	2				

V Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 407	Microcontrollers	-	3	-	3	4
ECE 501	Wireless and Mobile Communications	-	3	-	-	3
ECE 503	Broadband Communications	-	3	-	-	3
ECE 505	Telecommunication Networks	-	3	-	-	3
ECE 507 / CSE 507 / CSE 507A	Elective I	-	3	-	-	3
ECE 509	Mini Project	-	-	-	3	1
		Total	**15**	**-**	**6**	**17**

V Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 502	Engineering Economics and Management	-	3	-	-	3
GC 504	Entrepreneurship	-	3	-	-	3
ECE 502 / ECE 502A / ECE 502B	Elective II	-	3	-	-	3
ECE 504	Final Project	-	-	-	12	4
		Total	**9**	**-**	**12**	**13**

Elective I

Course Code	Subject
ECE 507	Micro Electronics
CSE 507	Embedded Systems
ECE 507A	Stochastic Signal Processing

Elective II

Course Code	Subject
ECE 502	Radar Systems
ECE 502A	Solid State Microwave Devices and Applications
ECE 502B	Logic Design with VHDL

Summary of ECE Course Listings

Year	I Semester				II Semester			
	L	T	P	Cr	L	T	P	Cr
I	16	2	3	17	17	5	6	19
II	13	4	9	16	15	5	6	17
III	15	1	12	19	15	2	12	19
IV	14	1	14	19	12	5	6	16
V	15	-	6	17	9	-	12	13
Total	73	8	44	88	68	17	42	84

Total Credit Hours	172
Total Lecture Hours	141
Total Tutorial Hours	25
Laboratory/Practice Hours	86

Department of Computer Science and Engineering

COURSE MATRIX

I Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 101	English for Engineers	-	3	1	-	3
GC 103	Civics and Ethical Education	-	3	-	-	3
SC 101	Freshman Mathematics	-	4	1	-	4
SC 103	Freshman Physics	-	3	-	-	3
CSE 101	Principles of Computing	-	3	-	3	4
		Total	**16**	**2**	**3**	**17**

I Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 102	Communication Skills	GC 101	1	1	-	1
GC 104	Introduction to Economics	-	3	-	-	3
SC 102	Engineering Mathematics I	SC 101	4	1	-	4
SC 104	Modern Physics	SC 103	3	1	-	3
CSE 102	Programming in C	CSE 101	3	1	3	4
EEE 102	Electric Circuit Analysis	-	3	1	3	4
		Total	**17**	**5**	**6**	**19**

II Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 201	Engineering Mathematics II	SC 102	4	1	-	4
SC 205	Discrete Mathematics	- 3	1	-		3
ECE 201	Analog Electronics I	EEE 102	3	1	3	4
ECE 203	Digital Electronics I	-	3	1	3	4
CSE 201	Object Oriented Programming with C++	CSE 102	3	-	3	4
		Total	**16**	**4**	**9**	**19**

II Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 202	Engineering Mathematics III	SC 201	3	1	-	3
ECE 202	Signals and Systems	SC 201	3	1	-	3
ECE 204	Analog Electronics II	ECE 201	3	1	3	4
ECE 206	Digital Electronics II	ECE 203	3	1	3	4

CSE 202	Computer Organization & Architecture	ECE 203	3	-	-	3
		Total	**15**	**4**	**6**	**17**

III Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 301	Microprocessors	ECE 206	3	-	3	4
CSE 303	Data Structures	CSE 202	3	-	3	4
CSE 305	Data Communications	-	3	-	-	3
CSE 307	Systems Analysis and Design	-	3	1	-	3
CSE 309	Database Management Systems	-	3	-	3	4
		Total	**15**	**1**	**9**	**18**

III Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
ECE 306	Digital Signal Processing	ECE 202	3	1	3	4
CSE 302	Design and Analysis of Algorithms	CSE 303	3	-	3	4
CSE 304	Software Engineering	CSE 307	3	-	-	3
CSE 306	Computer Networks	CSE 305	3	-	3	4
CSE 308	Computer Graphics	-	3	-	3	4
		Total	**15**	**1**	**12**	**19**

IV Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 401	Advanced Microprocessors	CSE 301	3	-	3	4
CSE 403	Computational Methods	SC 202	2	1	2	3
CSE 405	Systems Programming	CSE 301	3	-	3	4
CSE 407	Microcontrollers	CSE 301	3	-	3	4
CSE 409	System Simulation & Modeling	-	3	-	3	4
		Total	**14**	**1**	**14**	**19**

IV Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 402	Research Methods and Presentation	-	-	3	-	2
CSE 402	Operating Systems	CSE 405	3	1	-	3
CSE 404	Compiler Design	CSE 405	3	1	3	4
CSE 406	Artificial Intelligence & Expert Systems	-	3	-	3	4
CSE 408 /	Elective I	-	3	-	-	3

CSE 408A / CSE 408B						
		Total	**12**	**5**	**6**	**16**

V Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 501	PC Hardware Troubleshooting	CSE 401	3	-	3	4
CSE 503	Cryptography and Network Security	CSE 306	3	-	3	4
CSE 505	Neural Networks and Fuzzy Logic	-	3	-	3	4
CSE 507 / CSE 507A / CSE 507 B	Elective II	-	3	-	-	4
CSE 509	Mini Project	-	-	-	3	1
		Total	**12**	**-**	**12**	**17**

V Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 502	Engineering Economics and Management	-	3	-	-	3
GC 504	Entrepreneurship	-	3	-	-	3
CSE502 / CSE 502 A / CSE 502 B	Elective III	-	3	-	-	3
CSE 504	Final Project	-	-	-	12	4
		Total	**9**	**-**	**12**	**13**

Elective I

Course Code	Subject
CSE 408	Real Time Systems
CSE 408A	Distributed Systems
ECE 507	Micro Electronics

Elective II

Course Code	Subject
CSE 507	Embedded Systems
CSE 507A	Design using HDLs
CSE 507B	Software Testing and Validation

Elective III

Course Code	Subject
CSE 502	Image Processing
CSE 502A	Performance Evaluation of Computer Systems
CSE 502B	Pattern Recognition

Summary of CSE Course Listings

Year	I Semester				II Semester			
	L	T	P	Cr	L	T	P	Cr
I	16	2	3	17	17	5	6	19
II	16	4	9	19	15	4	6	17
III	15	1	9	18	15	1	12	19
IV	14	1	14	19	12	5	6	16
V	12	-	12	17	9	-	12	13
Total	73	8	47	90	68	15	42	84

Total Credit Hours	174
Total Lecture Hours	141
Total Tutorial Hours	23
Laboratory/Practice Hours	89

Department of Information Technology

COURSE MATRIX

I Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 101	English for Engineers	-	3	1	-	3
GC 103	Civics and Ethical Education	-	3	-	-	3
SC 101	Freshman Mathematics	-	4	1	-	4
SC 103	Freshman Physics	-	3	-	-	3
CSE 101	Principles of Computing	-	3	-	3	4
		Total	**16**	**2**	**3**	**17**

I Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 102	Communication Skills	GC 101	1	1	-	1
GC 104	Introduction to Economics	-	3	-	-	3
SC 102	Engineering Mathematics I	SC 101	4	1	-	4
SC 104	Modern Physics	SC 103	3	1	-	3
CSE 102	Programming in C	CSE 101	3	1	3	4
EEE 102	Electric Circuit Analysis	-	3	1	3	4
		Total	**17**	**5**	**6**	**19**

II Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 201	Engineering Mathematics II	SC 102	4	1	-	4
SC 205	Discrete Mathematics	-	3	1	-	3
ECE 201	Analog Electronics I	EEE 102	3	1	3	4
ECE 205	Digital Electronics	-	3	1	3	4
CSE 201	Object Oriented Programming with C++	CSE 102	3	-	3	4
		Total	**16**	**4**	**9**	**19**

II Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
SC 202	Engineering Mathematics III	SC 201	3	1	-	3
IT 202	Programming Languages and	CSE 201	3	-	-	3

	Paradigms					
IT 204	Web Design and Development	-	3	-	3	4
CSE 202	Computer Organization & Architecture	ECE 203	3	-	-	3
		Total	**12**	**1**	**3**	**13**

III Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 303	Data Structures	CSE 202	3	-	3	4
CSE 305	Data Communications	-	3	-	-	3
CSE 307	Systems Analysis and Design	-	3	1	-	3
CSE 309	Database Management Systems	-	3	-	3	4
		Total	**12**	**1**	**6**	**14**

III Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
IT 302	Advanced Database Programming	CSE 309	3	-	3	4
CSE 302	Design and Analysis of Algorithms	CSE 303	3	-	3	4
CSE 304	Software Engineering	CSE 307	3	-	-	3
CSE 306	Computer Networks	CSE 305	3	-	3	4
CSE 308	Computer Graphics	-	3	-	3	4
		Total	**15**	**-**	**12**	**19**

IV Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
IT 401	Management Information Systems	IT 302	3	-	-	3
IT 403	Rapid Application Development	IT 302	3	-	3	4
IT 405	Object Oriented System Design	IT 302	3	-	3	4
CSE 403	Computational Methods	SC 202	2	1	2	3
CSE 409	System Simulation & Modeling	-	3	-	3	4
		Total	**14**	**1**	**11**	**18**

IV Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 402	Research Methods and Presentation	-	-	3	-	2
IT 402	Object Oriented Database Design	IT 405	3	-	3	4

IT 404	System Administration	CSE 306	3	-	3	4
IT 406	Principles of User Interface Design	IT 403	3	-	3	4
IT 408 / IT 408A/IT 408B	Elective I	-	3	-	-	3
		Total	**12**	**3**	**9**	**17**

V Year I Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
CSE 503	Cryptography and Network Security	CSE 306	3	-	3	4
IT 501	Data Warehousing and Mining	IT 402	3	-	3	4
IT 503	Client Server Computing	IT 404	3	-	3	4
IT 505 / IT 505A / IT 505B	Elective II	-	3	-	-	4
IT 507	Mini Project	-	-	-	3	1
		Total	**12**	**-**	**12**	**17**

V Year II Semester

Course Code	Course Title	Pre-Requisite	L	T	P	Credit
GC 502	Engineering Economics and Management	-	3	-	-	3
GC 504	Entrepreneurship	-	3	-	-	3
IT 502	Multimedia Systems	-	3	-	3	4
IT 504 / IT 504A / IT 504B	Elective III	-	3	-	-	3
IT 506	Final Project	-	-	-	12	4
		Total	**12**	**-**	**15**	**17**

Elective I

Course Code	Subject
IT 408	Natural Language Processing
IT 408A	Data Compression Techniques
IT 408B	Mobile Computing

Elective II

Course Code	Subject
IT 505	Information Theory and Coding
IT 505A	Software Project Management
IT 505B	Geographical Information Science

Elective III

Course Code	Subject
IT 504	Distributed Databases
IT 504A	Decision Support Systems
IT 504B	Active Server Pages

Summary of IT Course Listings

Year	I Semester				II Semester			
	L	T	P	Cr	L	T	P	Cr
I	16	2	3	17	17	5	6	19
II	16	4	9	19	12	1	3	13
III	12	1	6	14	15	-	12	19
IV	14	1	11	18	12	3	9	17
V	12	-	12	17	12	-	15	17
Total	70	8	41	85	68	9	45	85

Total Credit Hours	170
Total Lecture Hours	138
Total Tutorial Hours	17
Laboratory/Practice Hours	86

Course Descriptions

General Courses

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
GC 101	**English for Engineers**	**3**	**0**	**1**	**3**	**-**

The course provides students with:

- English used every day in business and interaction with internationals e.g. conversation, business correspondence, curriculum vitae and interview skills
- the speaking, writing and organizational skills required in Engineering e.g. critical thinking, prioritizing information, describing processes and procedures, presenting information coherently and effective time management.

Topics used to practise these skills include Forms of Energy and Alternative Energy, Technical Systems and Processes, Measurement and Quantitative and Qualitative Data, Time Management, Effective Communication and Development Issues in Ethiopia.

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

- Research, summarize and describe data and information
- Clearly write, order, signpost and reference technical papers and essays
- Prepare and follow technical procedures and instructions
- Structure, develop and discuss an argument
- Make a coherent presentation
- Write effective notes
- Write curriculum vitae and business correspondence.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
GC 103	**Civics and Ethical Education**	3	0	0	3	-

Introduction – Foundation of Civics Education – Significance and Interdisciplinary nature of civic education. The State, Government and Citizenship – Constitutional Development – Concept of Democracy – Process of Democratization and Development in Ethiopia.

Introduction - Foundation of ethical education- Significance- Interdisciplinary nature of ethical education.

Understanding Ethics, Morality and Moral obligation: Conceptual approach, overview of moral and ethical rules, Contending theories of ethics, moral development and moral order, morality and law, Morality and ethics in the context of profession

References

1. Modern Politics and Government, Allan, Ball, R.
2. International Organization: A view from within, Bilgrami, S.J.R., Vikas Publishing House, New Delhi
3. Participatory Democracy in Action International Profiles of Community Development, Chekki, Don, A., Vikas Publishing House, New Delhi
4. Basics forms of Government: A Sketch and a Model, Crick, Don A. McMillan
5. Comparative Government, Finer,S.E., Pentium Books, England
6. Principles of Modern Political Science, Johoric, J.C., Sterling Publishers, New Delhi
7. The Philosophy of Liberty: Essays on Political Philosophy, Oruka, Odera H,
8. The Constitution of the Federal Democratic Republic of Ethiopia (August 21, 1995)
9. Universal Declaration of Human Rights: Adopted by the UN General Assembly in 1948

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
GC 102	**Communication Skills**	1	1	0	1	GC 101

UNIT – I

Skills: Developing a focused, critical argument and presenting it in written and verbal form.

Topic: Contentious social topics such as capital punishment, Fair Trade

UNIT – II

Skills: Analyzing and describing processes using flow diagrams

Topic: Processes including computer processes such as virus protection, data collection, mechanical processes such as waste recycling

UNIT-III

Skills: Preparing instruction for a procedure

Topic: New Technology

UNIT-IV

Skills: Writing technical reports and proposals

Topic: New Technology

UNIT-V

Skills: Presenting a model unknown to the audience

Topic: Robotics

UNIT-VI

Skills: Writing formal business correspondence, preparing a curriculum vitae

Topic: Job Applications

UNIT-VII

Skills: Making references to source materials

Topic: Mobile communications

Important grammar points, such as the passive tense, are integrated within appropriate modules of the course. Tutorials concentrate on listening and speaking skills including pronunciation.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
GC 104	**Introduction to Economics**	3	0	0	3	-

An introduction to economics with emphasis on macroeconomics. The first three weeks cover aspects of general economics that everyone should know, including how the market system works, how prices are determined, why shortages and surplusses occur, and, mosting interestingly, why some people earn high incomes and others earn low incomes. Topics include: supply and demand, competition vs. monopoly, inflation, unemployment, recessions, booms, fiscal and monetary policy, budget deficits, international trade, and exchange rates.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
GC 402	**Research Methods and Presentation**	**-**	**3**	**0**	**2**	**-**

Course Objective:

- To enable the students to understand and apply methodologies/techniques and process of doing research projects
- Presentation skills both in written and oral form with/without the aid of audiovisual equipment

Research methods: necessity, types and levels of researches; problem formulation, modeling & experimentation.

Data collection techniques – data generation and processing the collected/generated data to extract the required information.

Presentation skills:

Research and Project proposals: oral presentations formats; applications of audiovisual equipment;

Management aspect of Research and Development (R&D) works and outputs: Discussion forums; intellectual property rights.

Management of R&D works.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
GC 502	**Engineering Economics and Management**	3	0	0	3	-

Unit - I

Nature and Functions of Organization Introduction - Aim of the Organization - Legal Establishment of Organization - Strategies of Survival - Importance of management - Definition of management - Management functions - Management process - Roles of Manager

Unit - II

Human Resource Management: Functions of HRM - Industrial Relations - Employee Compensation - Industrial Safety and Security

Unit – III

Materials Management: Importance of Materials Management - Types of Inventory

Unit - IV

Project Planning using PERT/CPM: Introduction to Project Planning - PERT/CPM - Construction of the network diagram - Critical paths computations.

Total Quality Management: Importance of Quality - International Quality Standards - Total Quality Management - Tools of TQM - Role of Inspection

Unit - V

Nature and significance of Economics: Economic development and its impact on science, Engineering technology and society, Micro and Macro economics, Economic theory and managerial economics, managerial economists- role and responsibility, business objectives and decisions. Fundamental economic concepts: Basics of supply and demand, Law of demand, Functions of markets, Market structures and kinds of competitive situations, Elasticity and equilibrium, Law of diminishing returns, Social and opportunity costs, Incremental and marginal costs, Marginal relationship concept, Time value concepts.

References

1. Gail Freeman, Bell James Balkwill, Management in Engineering, Prentice Hall
2. Koontz, O'Donnell and Heinz, Management - A Global Perspective, International Saunderrs Editions.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
GC 504	**Enterpreneurship**	3	0	0	3	-

The course focuses on conceptual, outside-in approach, exploring Technopreneurship and the process of new venture creation by studying and discussing a number of cases covering the entrepreneurial process from various angles. The cases and supporting readings will illustrate issues and concepts like:

1. what does it take (and what not) to be an entrepreneur;
2. what is entrepreneurship and administrative versus entrepreneurial behavior;
3. academic versus surrogate entrepreneurship and the role of the scientist in academic spin-offs;
4. the framing of ventures in terms of people, opportunity, context and deal;
5. spotting and framing opportunities;
6. the phases and critical junctures in new venture formation;
7. the importance and pitfalls of patent protection;
8. factors influencing the early growth of academic spin-offs;
9. options for commercializing science & technology, business models and value creation;
10. value, valuation and risk/reward ratio in new venture financing;
11. How venture capitalists assess business plans and start-up companies.

Cases are based on situations and decisions that entrepreneurs have faced and that course participants will be facing in preparing for and discussing in class.

1. Participants have to write a fully developed business plan that can be presented to stakeholders such as scientists that invented the technology, the institutions that own the technology and investors that are necessary to fund its commercialization.

2. The business plans are to be based on realistic, science- and technology-driven ideas or inventions.

3. Participants will usually work in teams of 2-4 persons to be able to accommodate and to enhance the leaning experience, though, if circumstances so require, individual participation may be allowed.

4. Participants will interact with scientists or the inventors, i.e. the staff that has done the research on which the business idea is based. The role of these staff members may differ from that of scientific consultant to being actively involved as an academic entrepreneur.

Supportive Courses

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 101	Freshmen Mathematics I	4	1	0	4	Nil

Unit I Matrices and Determinants

Definition of a matrix, Types of Matrices, operations on matrices; addition of matrices, scalar of a matrix and multiplication of matrices, transpose of a matrix, skew matrix, skew – symmetric matrix, orthogonal matrix, matrix and system of linear equations, determinant of a square matrix, minors and cofactors, determinant of a triangular matrix, properties of determinants, singular and non- singular matrix, inverse of a matrix, Elementary operation (transformation), inverse of a matrix by E – operation and by using determinant, solving of a system of linear equations by inverse of a matrix and Cramer' rule.

Unit II Limits and Continuity

Definition of a limit, evaluation of limits of some functions, theorems on limits, evaluation of limit of sine, cosine ,exponential and logarithmic functions, one side limits, limit at infinity, infinite limits, continuity of a function at a point, types of discontinuity, algebra of continuous functions, composition of functions and continuity of composition of functions, intermediate value theorem

Unit III Derivative

Definition and basic concepts, differential formulas, derivatives of trigonometric, logarithmic and exponential functions, Derivatives of inverse trigonometric functions, derivatives of hyperbolic functions and their inverses higher derivatives, implicit differentiation, Intermediate forms

Unit IV Application of Derivatives

Rate of Change, extrema of a function, interval of monotonicity and first derivative test, second derivative test, curve sketching, tangent line approximation and differentials

Unit V Integration

Definite integral, special properties of the definite integral, fundamental theorem of calculus, indefinite integral and integration rules, techniques of integration; integration by substitution, integration by parts, integration by trigonometric substitution, and integration by partial fraction.

Unit VI Application of the definite integral

Area between two curves, volume of solids, length of an arc, surface area, improper integral

Reference Books

1. Robert Ellis and Denny Gulick: Calculus with analytic geometry, 5th edition.
2. N.P. Bali: comprehensive Engineering Mathematics, Lexi Publication (P) LTD.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 103	**Freshmen Physics**	3	-	0	3	Nil

Unit I

Thermal Physics: Introductory material on Heat and Temperature – Effects of Heat and Temperature rise – Heat and changes of state – Heat transfer mechanisms – Ideal Gas equation, properties of ideal gases – Thermodynamic processes and First law of thermodynamics.

Unit II

Magnetic fields and Magnetism: Magnetic fields and forces – Electromagnetic induction: Magnetic flux, Faraday's Law, Lenz's law – different induction – induced electric fields – inductance: self and mutual inductance. Magnetic materials: Origin of magnetism at atomic level - Magnetic moments – types – relationship between B,H and M. Definition of H. Hysteresis curves – Magnetic circuits.

Unit III

Waves and Optics

Waves: Mechanical vibrations – introduction to waves – mathematical descriptions of waves – transverse and longitudinal waves – energy propagation – principles of superposition – interference – standing waves – resonance

Geometrical Optics: Principles of reflection and refraction – Lenses and mirrors – formation of images by plane mirrors, spherical mirrors and thin lenses

Physical Optics: Interference – Young's double-slit experiment – Diffraction – principle – single-slit diffraction, diffraction grating – Polarization.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 102	**Engineering Mathematics I**	4	1	0	4	SC 101

UNIT - I

Ordinary Differential Equations (ODE): Basic concepts: ordinary differential equations (ODEs), order and degree of D.E.s, linear and non-linear D.E.s, homogeneous and non-homogeneous D.E.s, explicit and implicit D.E.s, solutions of D.E.s, Initial value problem (IVP) and Boundary value problem (BVP), formulation of O.D.E.s, Classifications – Separable first order ODE – Homogeneous first order ODE – integrating factor, exact first order ODE – Linear first order ODE – Bernouilli's Equations – Some applications of first order ODE – second order ODE – Wronskian - The method of undetermined coefficients – Variation of parameters – Applications of second order linear differential equations.

UNIT – II

Series and Sequences: Limit of sequences – Monotonic and bounded sequences – Series and convergence – Geometric series – n*th* – term test for divergence – Integral test and *p*-series – Harmonic series – Direct comparison test – Limit comparison test – Alternating series – Ratio and Root test – Taylor Polynomials – Power Series – Interval of convergence – Differentiation and integration of power series – representation of functions by power series – Operations with power series – Taylor series and Mclaurin series – Power series Method in solving differential equations – Gamma and Beta functions and their properties. Bessel functions and their properties, Legendre equations, Rodrigue's formula, recurrence relation.

UNIT – III

Vector algebra: Vectors in the plane – Space coordinates and vectors in space – Dot product of two vectors – Projection and vector components – Applications – Cross product of two vectors in space and applications – Triple scalar product – The equations of lines and planes in space – Distances between lines and planes, between points and planes and between points and lines.

UNIT – IV

Vector valued functions: Space Curves – Limits and continuity – Differentiation and Integration of vector-valued functions – Velocity and acceleration – curvilear motions - Projectile motion.

UNIT – V

Functions of severable variables: Level curves – Limits and continuity – Partial derivatives – Differentials – Chain rules for functions of several variables – Implicit partial differentiation – Directional derivatives – Gradients – Tangent plane and normal lines to a surface – Tangent plane approximation and differentials - Extrema of functions of two variables – The second partials test – Applications – Lagrange Multipliers

Reference Books:

1. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley Eastern.
2. Calculus - Larson - Hostetler and Edwards

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 104	**Modern Physics**	3	1	0	3	SC 103

UNIT-I

Relativity: Invariance of physical laws; The Michel son Morley Experiment; The special Theory of Relativity; The Lorentz Transformation; Time dilation and Length contraction; Velocity transformation; Twin Paradox; Relativistic mass and momentum; Equivalence of mass and Energy; Relativity and Electromagnetism; General relativity.

UNIT-II

The particle properties of wave: The photoelectric effect; The Quantum theory of light; X ray production and scattering; The Compton effect; Pair production and pair annihilation.

UNIT-III

Atomic Structure: Atomic models; Ruther ford scattering; Electron orbits; Bohr model of the Hydrogen atom; Atomic spectra; Energy levels and spectra; Atomic excitation by electrons; Correspondence principle; Nuclear Motion and Reduced mass.

UNIT-IV

Wave properties of particles: De Broglie Waves; Phase and Group Velocity; Particle Diffraction; Wave particle Duality; Relation ship between probability and wave function; The Uncertainty principle and its applications.

UNIT-V

The Quantum Theory: Shrodinger's Equation; Normalization and probability; Time dependent form; Steady state form; Square well potential; The particle in a Box; Energy quantization; Momentum quantization; Operators; Barriers and Tunneling.

UNIT-VI

Semiconductor Physics: Band theory of solids; Electrons and holes in semiconductors; Impure semiconductors (Extrinsic); Semiconductor junctions; Diodes *Zener; Bipolar transistors.

UNIT-VII

Superconductors: Meissner effect; London equation; BCS Theory; Flux quantization; Type II super conductors; High TC super conductors; Josephson super conductor tunnelling - DC and AC effect.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 201	**Engineering Mathematics II**	**4**	**1**	**0**	**4**	**SC 102**

UNIT – I

Multiple Integrals: Double integrals – double integrals in polar coordinates – surface area – Triple integrals - triple integrals in cylindrical coordinates – triple integrals in spherical coordinates – moments and centers of gravity – change of variables in multiple integral.

UNIT- II

Fourier Analysis: Periodic functions, Trigonometric series, Fourier Series, Fourier coefficients – Convergence and Sum of Fourier series – Functions of any period – Even and odd functions – Half-range functions – Fourier (cosine and Sine) Integrals – Fourier (cosine and Sine transforms)

UNIT- III

Laplace Transforms: Laplace transform – Linearity- Shifting – Transforms of Derivatives and Integrals – Differential Equations – Unit step functions – Second shifting function – Inverse Transform - Differentiation and Integration of Transforms – Convolution – Partial fractions – Differential equation.

UNIT-IV

Vector Calculus: Divergence – Curl – Line Integrals – Surface Integrals – Volume Integrals – Green's Theorem – Stoke's Theorem

UNIT-V

Partial Differential Equation: Basic concepts – Wave equation; vibrating string – Separation of variables – D'Alemberts solution of the wave equation – Heat equation

UNIT-VI

Complex Analysis: Complex numbers – complex plane – polar form of complex numbers, powers and roots – Derivative – Analytic function – Cauchy –Riemann equations – Elementary functions: exponential, trigonometric, hyperbolic and logarithmic functions. Line integral in complex plane and basic properties – Cauchy's theorem – Cauchy's Integral formulae

Reference Books:

1. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley Eastern.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 203	**Applied Mechanics**	3	1	0	3	Nil

UNIT-I

Equivalent force system: Basic concepts of force-couple systems, planar force systems, parallel force systems, Equations of statics and its applications, Dynamics – Linear motion, Angular motion, mass, force, weight, momentum, Newton's law of motion, work, energy and power, torque and angular acceleration, angular work, power and Kinetic Energy, Equivalent mass of rotating body, Fly wheel – turning moment diagram.

UNIT – II

Friction clutches, bearings and gear train: Plate clutches and cone clutches, bearings – Journal bearings, collar and footstep bearings.

Gear train – Terminology – Simple, compound and epicyclic gear trains, torques in gear trains.

UNIT – III

Mechanics of solids: simple stress and strain; shearing force and bending moment, bending and shearing stresses, torsion.

UNIT – IV

Vibration: Free vibrations – Simple harmonic motion – Linear and angular motion of an elastic system – Motion of a pendulum, two rotor torsion system, Transverse vibration and whirling speeds.

Reference Books:

1. Mechanical Technology- D.H.Bacon & R.C.Stephens, Butterworth-Heinemann Ltd, Linacre House, Jordon Hill , Oxford.
2. Engineering Mechanics- S.Timoshenko, D.H.Young, McGraw Hill International

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 205	**Discrete Mathematics**	4	1	0	4	SC 101

Unit - I

Set Theory

Sets and Subsets - Operations on Sets - Cardinality - Countable and Uncountable Sets – Basic counting – permutation and combinations – Binomial theorem – the principle of inclusion – exclusion – recurrence relation – solving recurrence relation – generating functions of sequence – calculating coefficients of generating functions.

Unit - II

Relations and Digraphs

Relations and directed graph – special properties of binary relations – images of sets under relations – equivalence relation and partition of a set – relations and databases – partial order and Hasse diagrams – chains –duality – constructing new POSETs – complete partial orders – Lattice – Directed graphs and adjacency matrices – Boolean algebra.

Unit - III

Induction

Induction on Natural numbers - Inductively defined sets - Proof by structural induction - recursive definitions of functions - Constructors - simultaneous inductive definitions - propositional logic Grammars - Peano's Axioms - Well founded sets and Induction - Fixed points and its Induction.

Unit - IV

Graph Theory

Basic concepts – isomorphism and sub-graphs – trees and their properties – directed trees – Binary trees – planar graphs – Euler’s formula – Multi-graph – application of graph theory.

References

1. S. Sahni, Concepts in Discrete Mathematics, Narosa Publishing House
2. N. Biggs, Discrete Mathematics, Oxford/Claredon Press.
3. Joe L. etal, Discrete Mathematics for Computer Scientists and Mathematics, 2nd Edition

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
SC 202	**Engineering Mathematics III**	**3**	**1**	**0**	**3**	**SC 201**

UNIT – I

Sets and Probability : The concept of a set, Venn Diagrams, Set operations, Sample spaces, Events, The concept of probability, Conditional Probability, Baye's Theorem, Permutations and Combinations.

UNIT – II

Random Variables and Probability Distributions: Random Variable, Discrete and Continuous probability distributions, Distribution functions for discrete and continuous random variables, Joint distributions, Independent random variables.

UNIT – III

Mathematical Expectation: Definition and theorems of expectation, Variance and standard deviation, standardized random variable, Covariance, Mode, Median and Percentiles.

UNIT – IV

Special Probability Distributions: Binomial Distribution, Normal Distribution, Poisson Distribution, Central limit theorem, Gamma distribution, Beta distribution, Chi-square distribution

UNIT – V

Numerical Methods: Introduction, Fixed point iteration for solving equations f(x)=0, Newtons method of solving equations f(x)=0, Lagrange Interpolation, Inverse Interpolation, Numerical Differentiation, Trapezoidal rule, Simpson's one-third rule, Numerical evaluation of Fourier Coefficients, Difference equations with constant coefficients, solutions, solutions of systems of linear equations.

UNIT – VI

Statistics: Sampling theory, Estimation Theory, Tests of hypothesis and significance, Curve fitting, regression and correlation

References

1. Probability and Statistics- Spiegel
2. A first course in Probability- Ross
3. Advanced Engineering Mathematics- Kreyszig

Electrical & Electronics Engineering Specialization

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 102	**Electric Circuit Analysis**	3	1	3	4	Nil

Course Objective:

- To enable students to understand the basic electrical circuit phenomenon, circuit variables and parameters.
- To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc and steady state poly-phase ac circuits;

Unit – I

Circuit fundamentals – Voltage – Current - Power - Energy - Circuit - Resistance- Inductance – Capacitance - Energy sources - Dependent and independent sources - Kirchhoff's laws

Unit - II

Mesh analysis - Super mesh analysis - Nodal analysis - Super node analysis - Source transformation technique.

Unit - III

Useful theorems in circuit analysis - Star-delta transformations - Superposition theorem - Thevenin's theorem-Norton's theorem - Reciprocity theorem -Compensation theorem - Maximum power transfer theorem - Duals and Duality- Millman's theorem

Unit - IV

Transients – Steady state and transient response – DC response of RL, RC and RLC circuit – Sinusoidal response of RL, RC and RLC circuit.

Unit - V

Single phase AC circuit: Terminology - Phase relations in pure resistor, inductor and capacitor - Impedance diagram - Phasor diagram - Series-parallel - Series parallel circuits - Instantaneous power - Average power - Apparent power - Power factor - Causes of low power factor - Disadvantages of low power factor - Power factor improvements. Power Triangle. Resonance – Series and Parallel resonance – Quality factor. Steady state AC analysis: Mesh-nodal analysis, Super position, Thevenin's, Norton's and Maximum power transfer theorem

Unit – VI

Coupled circuits – Coefficient of coupling, Dot Convention, Analysis of Coupled circuits, Coupled coils in series in parallel.

Unit – VII

Poly-phase circuits – Two phase system – Three phase system voltages – Balanced three phase Star and Delta connected loads – Power in three phase circuits - Two wattmeter method for measurement of power

References

1. Engineering circuit analysis - William Hayt and Jack E. Kemmerly, Mc Graw- Hill Companies, 5th Edition.
2. Electric Circuits: J Edminister and M Nahvi, - Schaum's Outlines, Tata Mc Graw-Hill Publishing company Ltd., 1999.
3. Alternating current circuits – R.M. Kerchner and G.F. Corcoran.
4. Basic Engineering circuit analysis- J.D.Irwin

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 201	**Electrical and Electronic Workshop Practice**	**0**	**0**	**3**	**1**	**Nil**

Course Objectives:

- To learn and understand the electrical and electronic wiring system and use electrical instruments for practical measurements
- To practice and understand, the connection of domestic lighting systems.
- To practice measurement of dynamic parameters by cathode ray oscilloscope.

Wire splicing: simple twist joint, married joint, single strand 'T joint, Three strand 'T' joint, Brittanina straight joint, double branch splice, pig tail joint of two solid conductors.

Lighting Installation: Wiring methods – series, parallel and series-parallel wiring of lamps, Control of lamp from different locations. Fluorescent, sodium-vapor lamp.

Electro-mechanical Switches: Contactors, timers, call bell system, alarm bell system, traffic light control system.

Design, Construction and Testing of Small Single-Phase Transformer

Analog Meters: Ammeter, voltmeter and its range extension.

Soldering Practice: Circuit construction on matrix board.

PCB design and manufacture using simple methods.

Testing of Semi-Conductor devices: Like diodes, BJTs and other electronic devices and identifying its terminals.

Measurement using CRO: Placing the oscilloscope in operation, obtaining the trace, calibration, phase-angle measurement.

Batteries: Types, maintenance and inspection.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 202	**Electromagnetic Field Theory**	3	1	0	3	SC-201

Course Objectives:

- Understand and quantify the electrical effects of static charge distributions in vacuum and material body.
- Apply the laws governing electrostatic to different charge distribution.
- Understand and quantify the effects of charges moving with uniform velocity
- Understand the elements of steady magnetic field.
- To study electromagnetism through Maxwell's equations.

UNIT-I

Electrostatics: Coulomb's law, Electric field intensity, Field due to continuous distribution of charges, Work done in moving an electric charge in an electric field.

UNIT – II

Electric potential, Potential gradient, potential due to charge distribution, Concept of electric flux and flux density, Gauss's law and its applications, Concept of Divergence, statement of Gauss law in point form, Divergence theorem.

UNIT – III

Electric dipole and dipole moment, Potential and field intensity due to dipole, Capacitance, Capacitance of parallel plate and spherical capacitors, Capacitance of two wire line, Laplace's and Poisson's equation - Solutions with examples, Uniqueness theorem.

UNIT - IV

Behavior of conductors in an electric field - Conductors and insulators, Electric field inside a dielectric material – Polarization - Dielectric - Conductor and dielectric - Dielectric boundary conditions - Energy stored and energy density in a static electric field.

UNIT - V

Steady magnetic field: Biot-Savart's law, Applications of Biot–Savart's law to determine the magnetic field intensity due to simple current carrying conductor configurations, Relation between magnetic flux, flux density and magnetic field intensity. Maxwell's

second equation. Ampere's circuital law and applications, concept of Curl, statement of Ampere's circuital law in point form for time invariant fields, Stoke's theorem in Cartesian coordinates only. Gauss's law for magnetic field, Solenoid nature of the B-field, Magnetic vector potential, Lorentz force equation, Force on a moving charge, Force between current carrying conductors, Magnetic boundary conditions, Inductance from the field point of view.

UNIT - VI

Time varying fields: Induced emf transformer, Faraday's law and its applications, Maxwell's equations in integral and point forms, Introduction to Uniform plane wave.

Reference Books

1. Engineering Electromagnetics- William H, hayt Jr. and john A. Buck, Tata-McGraw Hill, 6th Edition,2001
2. Electromagnetics with Applications- John .Krauss and Daniel A. Fleisch, McGraw Hill, 5th Edition, 1999
3. Electromagnetics- Joseph Edminster, Schaum Outline series, McGraw Hill
4. Electromagnetic Waves and radiating Systems- Edward C.Jordan and Keith G.Balmain, PHI,II Edition, 1968 Reprint 2002.
5. Field and Wave Electromagnetics- David K.Cheng, Pearson Education Asia, II Edition 1989, Reprint-2001
6. Engineering Electromagnetics- Narayana Rao, Prentice Hall.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE-301	**Electrical Machines – I**	3	0	3	4	EEE 102

Course Objectives:

- To understand basic concepts of electromagnetic circuits as they relate to voltages, currents, and physical forces induced in conductors.
- To understand and gain insight into principles of operation & construction of transformer, induction machines, D.C. machines, and synchronous machines.
- To learn and understand analytical models for transformers and electrical rotating machines.
- To use such models to analyze power requirements, power capability, efficiency and operating characteristics.

UNIT - I

Introduction to Electro mechanical energy conversion – Single Phase Transformer: Types, Constructional details, Principle of operation - Emf equation - Operation on No load and load - Phasor diagrams - Equivalent circuit - Losses and efficiency - OC and SC tests - Voltage regulation – Power and distribution transformer - All day efficiency - Cooling of transformers - Polarity test - Sumpner's test - Parallel operation with equal and unequal voltage ratios - Auto transformer, Isolation and pulse transformer.

Poly-phase transformers – Poly-phase connections - Three winding transformer - Scott connection.

UNIT-II

DC Generators - Principle of operation - Single action of commutator -constructional features - Armature windings - Lap and wave windings - EMF equation - Parallel paths - Armature reaction - Cross magnetizing and demagnetizing AT per pole - Compensating winding -Commutation - Reactance voltage - Methods of improving commutation.

Methods of excitation - Separately excited and self excited generators - Build up of emf and causes for failure - Critical field resistance and critical speed - Characteristics of shunt, series and compound generators - Parallel operation - Use of equalizer bar - Load sharing.

UNIT-III

DC Motors: Concept of back emf - Torque equation – Types - Characteristics and

applications - Speed control of DC motor: Armature control, Field control, Ward-Leonard control - Series parallel control - Effect of armature reaction.

Testing of DC motors for losses and efficiency.

UNIT-IV

Rotating Amplifiers, Metadyne Generator, Amplidyne, PMDC Motors,

Reference Books

1.Performance and Design of DC machines- A.E.Clayton and Hancock,ELBS Publication

2.Direct Current Machinery- Langsdorf

3. Electrical Machinery- Fitzgerald and Kingsley, Mc-Graw Hill

4. Electrical Machinary- Dr.P.S. Bhimra, Khanna Publishers, Fourth Reprint-2005

5.Electrical Machines and transformers-Kosow, 2nd Edition, PHI

6.Theory of Alternating current Machines- A.Langsdorf, TMH

7.Performance and Design of AC machines-M.G.Say, CBS Publishers

8.Electrical Machines- I.J.Nagarath and Kothari, TMH

9.Electrical Machines, Drives and Power Systems- Theodore Wildi, 4th Edition, Pearson Education Asia, Reprint-2001

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 303	**Electrical Machines**	3	-	3	4	EEE 102

Course Objectives:

- To understand and gain insight into principles of operation & construction of transformer, induction machines, D.C. machines, and synchronous machines.
- To understand and practice the operation of AC motors and to study their load characteristics for different types of loads.
- To understand the construction and application for Stepper motors.

Unit – I

Single phase Transformer: Types, constructional details, Principle of operation – EMF equation – Operation on No load and load – Phasor diagrams –Equivalent circuit – Losses and Efficiency – OC and SC tests – Voltage regulation – Power and Distribution – Polyphase transformers – Polyphase connections.

Unit – II

DC Generators – Principle of operation – Single action of commutator – constructional features – Armature windings – Methods of excitation – Separately excited and self excited generators – Build up of EMF and causes for failure – Critical field resistance and critical speed – Characteristics of shunt, series and compound generators.

Unit - III

DC Motors: Concept of back EMF – Torque equation – Types – Characteristics and Applications – Speed control of DC motor: Armature control, Field control, Ward-Leonard control – Series parallel control.

Unit - IV

Three phase induction motors: Rotating magnetic field, principles of operation, Constructional features, Production of torque, Slip, Rotor induced EMF and its frequency, approximate equivalent circuit and phasor diagram.

Unit - V

Synchronous machines: Salient pole construction, operation of cylindrical rotor and salient pole synchronous generator, advantages of stationary armature, methods of excitation, winding factors, EMF equation.

Unit – VI

Stepper Motor, Single Phase Induction Motor

References

1.Performance and Design of DC machines- A.E.Clayton and Hancock,ELBS Publication

2.Direct Current Machinery- Langsdorf

3. Electrical Machinery- Fitzgerald and Kingsley, Mc-Graw Hill

4. Electrical Machinary- Dr.P.S. Bhimra, Khanna Publishers, Fourth Reprint-2005

5.Electrical Machines and transformers-Kosow, 2nd Edition, PHI

6.Theory of Alternating current Machines- A.Langsdorf, TMH

7.Performance and Design of AC machines-M.G.Say, CBS Publishers

8.Electrical Machines- I.J.Nagarath and Kothari, TMH

9.Electrical Machines, Drives and Power Systems- Theodore Wildi, 4th Edition, Pearson Education Asia, Reprint-2001

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 302	**Linear Control Systems**	3	-	3	4	ECE-202

Course objectives:

- To study and understand the open loop systems and closed loop systems.
- To learn the modeling of mechanical, electrical and electromechanical system.
- To understand the concept of stability, stability analysis of a system and to design a stable system.
- To study the various types of compensation for a system.

UNIT - I

System Concepts: Types of systems – Open loop systems, Closed loop systems, Effects of feed back.

Mathematical models of physical systems: Differential equations, Transfer functions and block diagrams of simple electrical networks, D.C. servo motor, A.C. servo motor, synchros, potential dividers, Translational and rotational mechanical systems, Block diagram representation and reduction, signal flow graph representation and reduction, Mason's gain formula.

Feedback Characteristics of Control Systems: Reduction of parameter variations by use of feedback, Control over system dynamics by use of feed back, PID controller.

UNIT - II

Time Response Analysis of Control Systems: Standard test signals, Time response of first order and second order systems, Time domain specifications, Steady state error and error constants.

Concepts of Stability and Algebraic Criteria: The concept of stability, methods of determining stability, Routh-Huriwitz stability criterion – Qualitative stability and conditional stability.

UNIT – III

The root locus Technique: The root locus concept, Construction of root loci.

UNIT – IV

Frequency Response Analysis: Frequency response of systems – Correlation between time and frequency response – Gain and phase margins, Bode plots.

Nyquist Stability criterion: Polar plots, Nyquist stability criterion, Relative stability using Nyquist criterion.

Lag-lead compensation.

Reference Books

1. Modern control Engineering- Katsuhiko Ogata, Prentice Hall of India
2. Automatic Control systems- B.C.Kuo, 7th Edition,Prentice Hall of India
3. Modern Control Systems- Richard C.Dorf and Robert II. Bishop, Pearson Education, 8th Edition,2002.
4. Control systems Engineering- I.J.Nagarath and M.Gopal, New Age Publishers
5. Analysis of Linear Systems- David K.Cheng, Narosa Publishing House, 1996.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 304	Electrical Machines – II	3	0	3	4	EEE-301

Course objectives:

- To understand and practice the operation of AC motors and to study their load characteristics for different types of loads.
- To study the effect of different types of loads on the AC and synchronous motor.
- To study in detail AC Generator
- To study the different types of excitations, voltage regulations and its significance

UNIT - I

Three phase induction motors: Rotating magnetic field, Principles of operation, Constructional features, Production of torque, Slip, Rotor induced emf and its frequency, Approximate equivalent circuit and phasor diagram. Power stages: Rotor input, Rotor copper loss, Rotor output, Torque equation, Torque-slip characteristics, Effect of rotor circuit resistance, Circle diagram, No load and blocked rotor tests. Harmonic torques, cogging, crawling.

UNIT - II

Methods of starting of Induction motors: Direct on line starting, Star delta starting, autotransformer starting, Rotor resistance starting for slip ring induction motor. Speed control of induction motor: Variable voltage method, Variable frequency methods, Pole changing methods, Rotor resistance method for slip ring motor.

UNIT - III

Synchronous machines: salient pole construction, operation of cylindrical rotor and salient pole synchronous generator, Advantages of stationary armature, Methods of excitation, Winding factors, EMF equation, Harmonics and their minimization. Armature reaction in synchronous generator, Synchronous impedance, Voltage regulation by EMF, MMF, ZPF and ASA methods.

Two-reaction theory of salient pole machine, Determination of X_d and X_q from slip test.Power Angle characteristics

Synchronization: Synchronizing with infinite bus bar, Parallel operation of two alternators, Operation on infinite bus, Load sharing, hunting

UNIT - IV

Synchronous motors: Principle of operation, Vector diagrams and effect of excitation, V and inverted V curves, Synchronous condensers for pf improvement, Methods of starting.

Unit-V

Single phase Induction Motor, Double field revolving theory, Types and applications Universal Motor and Schrage Motor, Synchros and Servo motor

Reference Books

.1.Electrical Machinery- Fitzgerald and Kingsley, Mc-Graw Hill

2. Electrical Machinary- Dr.P.S. Bhimra, Khanna Publishers, Fourth Reprint-2005

3.Electrical Machines and transformers-Kosow, 2nd Edition, PHI

4.Theory of Alternating current Machines- A.Langsdorf, TMH

5.Performance and Design of AC machines-M.G.Say, CBS Publishers

6.Electrical Machines- I.J.Nagarath and Kothari, TMH

7.Electrical Machines, Drives and Power Systems- Theodore Wildi, 4th Edition, Pearson Education Asia, Reprint-2001

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 306	**Power Electronics**	3	0	3	4	ECE 204

Course objectives:

- To study the structure and operation of solid state power devices.
- To study the basic principle of different power converters for different loads.
- To study the various types converters.

UNIT - I

Thyristors-SCR-BJT-power MOSFET-GTO, Power IGBT and their characteristics,

Basic theory and operation of SCR - static characteristics - Two-transistor analogy- Ratings of SCRs- Dynamic characteristics of SCR during turn ON and OFF. Triggering methods- gate triggering, SCR protection schemes, Series and parallel connection of SCRs

UNIT - II

Single phase converters: Half wave, mid -point, Half-controlled and fully controlled bridge converters with resistive and R-L loads, Effect of freewheeling, Active and reactive power inputs to the converters with and without free wheeling diode.

Three-phase converters: Three-pulse and six-pulse converters, Qualitative treatment of quadrant converters

Dual converters - types

UNIT – III

Choppers: Forced commutation techniques, Time ratio control, Constant frequency TRC and variable frequency TRC, Step down and step up chopper – multiphase choppers

UNIT - IV

Inverters: Basic series inverter, Single phase VSI – Half bridge and full bridge inverter – performance parameters – Three phase bridge VSI – 120^{o} and 180^{o} mode of operation - voltage control techniques, PWM inverters – different types of PWM techniques used in inverters – harmonic elimination schemes - Mc - Murray inverter, Mc-Murray-Bedford inverters – Single phase and three phase CSI. Parallel inverter,

UNIT - V

AC voltage controllers – types – applications - Cycloconverters.

Reference Books

1. Power Electronics-C.W.Lander,Mc-Graw Hill
2. Power Electronics: Principles and Applications- J.Vithayathil,Mc-Graw Hill

3. An introduction to Thyristors and their applications-M.Ramamoorthy, East-west Press Pvt. Ltd.
4. Power Electronics: Circuits, devices and applications- M.H.Rashid, PHI
5. Power Electronics HandbookAcademic Press Series in Engineering
J. David Irwin, Auburn University, Series Editor, Copyright 2001.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 308	Electrical Power Generation	2	0	0	2	EEE 301

Course objectives:

- To study the different types of energy sources.
- To study and understand the various methods of power generations based on the availability of natural resources.
- To learn to optimize the utilization of power and minimize the cost.

UNIT – I

Introduction – Sources of Energy – conventional and non-conventional energy sources, Principal types of power plants – Merits and Demerits - Different Types of Power Generation with Block Diagram Representation.

UNIT - II

Thermal power plant, Plant layout and details of different units in brief – Selection of sites for steam power station – capacity of steam power plant – fuel handling – ash handling – classification of boilers – Steam turbines – cooling ponds and cooling towers.

UNIT – III

Hydro power generation - General arrangements and operation of a Hydroelectric plant, Selection of site for hydro-electric plant, Function of different components in storage reservoir plant, classification, Types of Turbine, Governing of Turbine, Study of mini and micro hydroelectric stations.

UNIT – IV

Nuclear power plants, Site selection, Elements of Nuclear Power Station, Principle of operation, Types of Reactors, Radiation hazards-Safety measures, Radio active disposal.

UNIT – V

Variable load on the power station, Factors affecting the cost of generation, Diversity factor, Load factor, Plant capacity factor and Plant use factor, load curve and load duration curve, Selection of generating units, Interconnected grid system, Base load and Peak loads.

Reference Books

1. A Course in Electric Power- Soni,Gupta and Bhatnagar, Dhanapat rai and Sons
2. A course in electrical power- S.L.Uppal, Khanna Publishers, New Delhi
3. Elements of Power Station Design-M.V.Deshapande. A.H. Wheeler & Co.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 401	**Transmission, Distribution & Utilization of Electrical Energy**	3	1	2	4	EEE 308

Course objectives:

- To understand the concept of economic power transmission from power station to consumers.
- To study the different types of power transmission and distribution systems.
- To study and design the safety distribution systems

UNIT - I

Typical transmission and distribution system schemes, Standard voltages and advantages of high voltage transmission, Feeders, Distributors and service mains, Single phase and three phase distribution, Kelvin's law, Neutral earthling.

UNIT - II

Mechanical characteristics of overhead lines: Sag calculations in conductors suspended on level supports and supports at different levels, effect of wind and ice, tension and sag at erection, stringing chart. Insulators: Types, Constructional features, Potential distribution in a string of suspension insulators and methods of equalizing the potential string efficiency, arcing horn, testing of insulators, corona- Disruptive critical voltage- Visual corona- Corona power loss.

UNIT - III

Under ground cables: Materials used - Constructional features – Types of cables- electrostatic stress and capacitance in single core cables, Intersheath and capacitance grading – Insulation resistance of cables, Capacitance of three core cables-laying of cables. Causes of over voltages in transmission lines - Lightning and switching surges, travelling waves - Arcing ground and Peterson coil - Ground wire surge absorber and lightning arresters.

UNIT- IV

Line parameters: Resistance - Calculation of inductance of single phase and three phase lines with equilateral and unsymmetrical spacing, Transposition GMR and GMD capacitance. Line performance: Short and medium lines – Nominal T and π methods, rigorous solution for long lines- ABCD constants- Equivalent T and π circuits, receiving

end power circle diagram, regulation system of transmission by reactive power control, voltage control.

UNIT-V

Heating and welding: resistance heating, Induction Heating, Dielectric heating, the arc furnace, heating of building, electric welding, resistance and arc welding

Electrolytic process

Reference Books:

1. Transmission and Distribution of Electrical Energy- H.Cotton, The English Universities Press Ltd.
2. Elements of Power System Analysis- W.D.Stevenson, Mc-Graw Hill International.
3. The Principles of Electrical power transmission – H.Waddicor, Asia Pub. House
4. Electrical Power systems C.L.Wadhwa, Wiley Eastern.
5. Electric power generation, transmission and Distribution-S.M.Singh. PHI
6. Elements of power system analysis- W.D. Stevenson,McGraw Hill.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 403	Electrical Machine Design	3	0	3	4	EEE 304

Course objectives:

- To understand the basic construction and different parts of AC and Dc machines quantitatively.
- To optimize and design the transformers, DC and AC machines.

UNIT – I

Design of Transformers: Output equation - design of core, coils, tank and cooling system. Calculation of circuit parameters, magnetizing current, losses and temperature rise from design data.

UNIT – II

Design of DC Machines: Output equation - specific magnetic and electric loadings-output coefficient-choice of poles and speed, design of armature conductors, slot, air gap, field poles (main poles only) and field coils, commutator. Temperature rise from design data.

UNIT – III

Three phase induction Motors: Output equation, electric and magnetic loadings, main dimensions, stator and rotor windings and slots. Calculation of machine constants, magnetizing current and temperature rise from design data.

UNIT – IV

Design of Alternator: Output equation, electric and magnetic loadings, output coefficient, design of main dimensions armature windings, slot. Calculation of machine constants, magnetizing current and temperature rise from design data.

Reference Books

1. Performance and design of DC Machines-A.E.Clayton, Sir Issac Pitman and Sons Ltd.
2. Performance and design of AC machines-M.G.Say,ELBS
3. Electrical Machine design – Gray, Mc-Graw Hill, New York
4. A course in electrical machine design- Sawhney- Dhanapat rai and Sons.
5. Design of Electrical machines. 4th Edition, Standard Publishers
6. Principles of Electrical machine design-R.K Aggarwal
7. A simplified text in Electrical Machine Design-A Nagoor Kani

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 402	Advanced Control Systems	3	1	-	3	EEE 302

Course Objectives

- Analysis of the system using state space analysis and using MATLAB for the study the behavior of the system
- Design of the system using pole placement
- To study the discrete control system and its stability.

UNIT – I

Control System Analysis Using State Variable Method: Conversion of state variable models to transfer functions, conversion of transfer functions to canonical state variable models, State space analysis in controllable, observable and Jordan forms, Eigen values and Eigen vectors, transformation of controllable model to Jordan form, Solution of state equations, Concepts of controllability and observability.

UNIT – II

Pole Placement Techniques: stability improvements by state feed back, Necessary and sufficient conditions for arbitrary pole-placement, State regulator design-Design of state observers.

UNIT – III

Discrete Data Controlled System: Basic discrete-time signals, Time domain models for discrete-time systems, transfer function models, Stability on the Z-plane and the Jury stability criterion,

UNIT – IV

Models of Digital Control Devices: Z-domain description of sampled continuous-time plants, Z-domain description of systems with dead-time, Implementation of digital controllers, Z-plane specifications of control system design.

Reference Books

1. Control System engineering-I.J. Nagrath and M.Gopal, New age International
2. State Space Analysis of Control systems-Katsuhiko Ogata,PHI
3. Automatic Control Systems-Benjamin C.Kuo and Farid Golnaraghi
4. Digital control and state variable methods-M.Gopal, TMH,1997.
5. Modern control Engineering-Ogata
6. Optimal control systems-De-Kink

7. Modern control system-Richard C. Dorf, Robert H. bishop Pearson education

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 404	Power System Analysis and Stability	3	1	2	4	EEE 401

Course objectives:

- To understand the basic power systems components and to draw the one-line diagrams for their representation.
- To study the different types of faults, their effects on systems components and to protection the systems from their severity.

UNIT - I

Representation of Power System Components: Circuit models for transmission line, Synchronous machine, Transformer and Load, One-line diagram, Impedance and Reactance diagram, Per unit system, Per unit impedance diagram of power system, Formation of Y-bus and Z-bus.

UNIT – II

Symmetrical Three-phase faults: Short circuit current and the Reactance of synchronous machines, selection of circuit breakers,

Symmetrical Components: Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in Y - Δ transformer bank, Power in terms of symmetrical components, Sequence impedances and Sequence networks, Sequence impedance of power system elements (Alternator, Transformer, and Transmission line), Positive, negative and Zero sequence networks of power system elements.

UNIT – III

Unsymmetrical faults: L-G, L-L, L-L-G faults on an unloaded alternator with and without fault impedance, Unsymmetrical faults on a power system with and without fault impedance, Open conductor faults in power systems.

UNIT-IV

Stability Studies: Steady state and transient stability, Rotor dynamics and the swing equation, Power angle equation, Equal-area criterion of stability and its application.

Operation of 3-phase induction motor on unbalanced three-phase voltages.

Reference Books

1. Elements of Power System Analysis, W.D.Stevenson, McGraw Hill
2. Modern Power System Analysis, I.J.Nagarath and D.P.Kothari, TMH

3. Symmetrical Components and Short Circuit Studies, P.N.Reddy, Khanna Publication.
4. Computer aided PSA.GLKusic,PHI
5. Power system analysis- Hali Sadat,TMH
6. Power system Analysis-Bergen Arthur R, 2-Edition, Pearson Education.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 406	Switch Gear and Protection	3	0	-	3	EEE 401

Course objectives:

- To study the basic mechanical and electrical devices used in electrical power distribution and transmission.
- To understand the switching operation and to design suitable switching devices to have safety to the consumers.
- To study the different types of power system protection systems

UNIT – I

Switches and Fuses: Knife switch – Isolating switch – Earthing switch – Load breaking switch – Fuse law – Cut-off characteristics – Time current characteristics – Fuse material – HRC Fuse – Liquid Fuse, Application of Fuse – Control system – Open loop and Closed loop systems – Classification – characteristics of linear control systems – Examples.

UNIT – II

Principles of Circuit Breakers: Principles of AC circuit breaking, Principles of DC circuit breaking, Problems encountered in DC breaking, Production of current zero-prevention of restriking, Dissipation of stored energy, Initiation of arc, Maintenance of arc-Arc interruption-high resistance and low resistance interruption, Arc interruption theory, Slepian's theory and energy balance theory, Restricking voltages, Recovery voltages-Rate of rise of restriking voltages, Current chopping-Capacitance switching-Resistance switching, Rating of circuit breakers. Circuit breakers: ACB, Air blast CB- Axial blast and cross blast versions, compressed air supply systems, OCB-Single break, double break, explosion pot, minimum oil CB, SF_6 CB, Buffer type and non buffer type breakers, Vacuum CB, Testing of CB.

UNIT-III

Protective relaying: Requirement of protective relaying, Zones of protection, primary and backup protection, essential qualities of protective relaying, classification of protective relaying. Electromagnetic relays: Operating principles of attracted armature, solenoid, plunger type and induction type relays, Make type and break type contact relays for CB tripping, Over current relay: Induction type non directional and directional over current relays, IDMT and directional characteristics, Differential Relay, Distance relay-Impedance, Reactance and Mho relays, Buchholz relay and negative sequence relay

UNIT-IV

Protection schemes: Generator protection: Merz-price protection, stator protection, Prime mover faults, Field failure, field earth fault, Winding protection, Rotor faults, Transformer protection, Frame leakage protection, Differential protection, Buchholz protection.

References

1. Power system protection and Switcher, Ravindranath and Chander, New Age publications.
2. Switch gear and Protection-Sunil S. Rao,Khanna Publication.
3. A course in Electrical Power, Soni,Gupta & Bhatnagar
4. Power system protection & Switch gear-Badrinath & Vishwa Karma,TMH
5. Fundamental of power System Protection-Y.G.Painthankar & S.R Bhide,PHI Publication.
6. A Course in electrical Power-Chakraborthy,Soni Gupta & Bhatnagar,Dhanapatai publications.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 408	**Solid State Drives and Control**	3	0	3	4	EEE 306

Course objectives:

- To understand elements and characteristics, and operation principles of electric drives.
- To study and design the desired operating characteristics of various industrial driven units and their control.
- To select drive elements and develop drive system for common industrial driven units

UNIT- I

Variable speed Drive systems: Elements of a drive system – Components of load torque – Gear Drive – Belt Drive – Compressor – Centrifugal pump or Fan drive – Constant power drive – Transportation drive – Winch drive – Crane Hoist – Loads with rotational motion – Loads with translational motion – Required Drive characteristics – Steady state stability and load equalization – Selecting the drive elements.

UNIT – II

Direct current motor control: Starting method: Thyristor starting with resistance – Thyristor starting without resistance. Rectifier fed DC drive: Single phase rectifier fed DC drive – Three phase rectifier with motor load – Three phase bridge rectifier with FWD (without regeneration) – Operation with controlled fly wheeling – Power in load and source circuits.

UNIT – III

Chopper fed DC drive: Introduction – Class–A chopper circuit: Continuous conduction mode, Discontinuous conduction mode, Harmonic Analysis, Monitoring control of series motors – Class-B chopper – Class-C two quadrant chopper – Class-D chopper – Class-E4 quadrant chopper – Input filter: Necessity and Design of Input filter – Choice of chopping frequency – Multiphase chopper.

UNIT – IV

Induction motor Drives: Introduction – Speed control by AC power controller – Static rotor resistance control – Static Scherbius drive – PWM inverters: SPWM – Voltage source inverter (VSI) driven induction motor: Constant terminal volts/hertz operation,

Constant air gap flux operation, Operation with field weakening – CSI drive – Comparison of VSI and CSI drive – Current controlled PWM inverters.

UNIT – V

Special Machine Drive: Synchronous motor drive – Single phase induction motor drive – Stepper motor : Types, Principle of operation and control – Switched reluctance motor and drive –Brushless DC Motors and its control

Reference Books

1. Power Electronics, M.H.Rashid, PHI
2. Thyristor control of electric drives, V Subramanyam,TMH,1988
3. Fundamentals of Electrical Drives, Gopal.K.Dubey, Narosa publishing house.
4. Electic Drives,-N.K.De and P.K.Sen, Prentice of India
5. S.K.Pillai,A First Course on electric Drives,Wiley Eastern Limited.
6. Modern Electric Traction-H.Partab.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 501	Power system Operation & Control	3	0	0	3	EEE 404

Course objectives:

- To understand the recent automatic and supervised control systems used in the power systems.
- To study the effect of reactive power on to the system, their effects and to reduce them for safe operation

UNIT- I

Control center Operations of Power systems: Introduction to SCADA, Control center, Digital computer configuration, Automatic generation control, Area control error, Expression for tie line flow and frequency deviation, parallel operation of generator, area lumped dynamic model.

UNIT – II

Control of Voltage and reactive power Introduction, generation and absorption of reactive power, relation between voltage, power and reactive power at a node, single machine infinite bus system, methods of voltage control, sub synchronous resonance, voltage stability and voltage collapse.

UNIT – III

Power system optimization: optimal system operation with thermal plants, incremental production cost for steam power plants, analytical form of generating cost of thermal plants, Constraints in economic operations, flow chart, transmission loss as a function of plant generation, B-coefficients ,Examples

UNIT – IV

Unit commitment: Statement of the problem, need and importance of unit commitment, methods-priority list method, dynamic programming method, constraints, spinning reserve, examples

UNIT – V

Power system security: Introduction, factors effecting power system security, power system contingency analysis, detection of network problems, network sensitivity methos, calculation of network sensitivity factor, contingency ranking.

Reference Books

1. Computer aided power system analysis- GL Kusic,PHI
2. Modern power system analysis-I.J. Nagrath and D.P.Kothari,TMH,1993
3. Power generation, operation & Control-A.J Wood & woolenburg,John wiley & sons
4. Electric Power systems-B.M.Weedy.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 503	**Electrical Installation**	3	0	3	4	-

Course objectives:

- To understand the basic standard symbols and tools used in domestic and industrial electrical wiring systems.
- To study and practice Domestic and industrial wiring systems and design optimized lighting systems.
- To learn the installation and testing of electrical machines and their accessories.

UNIT- I

Electrical symbols and standards: need-list of symbols, Electrical diagram- methods of representation of wiring diagrams- Wiring diagrams for simple circuits.

Tools, wire splicing and termination, types of house wiring

UNIT- II

Lighting installation- laws of illumination, design of lighting schemes, types of electrical lamps, Street lighting and flood lighting.

UNIT- III

Domestic electrical Installation and estimates; general rule for wiring, determination of number of points, Number of sub circuits, electrical layout diagram. Electrical installation in small industries: Induction Motor installation- Specifications for different types of motors, installation, commissioning tests, electrical tests, specific tests, Maintenance schedule, Transformer installation- Commissioning tests - specific tests - Synchronous machines- Specifications, Installation, commissioning tests, performance tests. Installation and estimates of service connections. Contract planning

Reference Books

1. Testing and commissioning of electrical equipment, S.Rao
2. Testing and commissioning of electrical equipment, BVS Rao
3. J&P transformer handbook
4. J&P Switch gear hand book

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 505	**Power Supply Systems**	3	0	0	3	EEE 306

Course objectives:

- To understand the basic principle of switch mode DC-to-DC converters, switch mode DC-to-AC converters,
- To study and design the switched mode power supply systems

UNIT – I

Line-Frequency Phase-Controlled Rectifiers and Inverters (50 Hz AC–Controlled DC): Introduction – Control of line-frequency controlled rectifiers and inverters – Three-Phase converter analysis with $L_s = 0$ – Effect of AC side inductance L_s – Effect of discontinuous current – Inverter operation – AC-side waveforms – Other three-phase converters.

UNIT – II

DC-to-DC Switch Mode Converters: Introduction – Control of DC-DC converters – step-down (buck) converter – step-up (Boost) converter – Buck-Boost converter – Cuk DC-DC converter – Full-bridge DC-DC converter – DC-DC converter comparison.

UNIT – III

Switch mode DC-to-AC Inverters (DC- Sinusoidal AC): Design of High frequency transformers - Introduction – Basic concepts of switch-mode inverters – Single-phase inverters – Three-phase inverters – Effect of blanking time on output voltage in PWM inverters – Other inverter switching schemes – Rectifier mode of operation.

UNIT –IV

Resonant Converters (zero-voltage and / or zero current switching), Types, operation of different types of resonance Converters

UNIT – V

Switching DC Power Supplies: Introduction – Linear power supplies – Overview of switching power supplies – DC-DC converters with electrical isolation – Control of switch-mode DC power supplies – Power supply protection – Electrical isolation in the feedback loop – Designing to meet the power supply specifications.

Reference Books

1. Power electronics: Converter, applications and design, N.Mohan, T.M.Undeland and W.P.Robbins, John Wiley and Sons.
2. Power Electronics converters, R.Bausiere and G.Seguier, Springer-Verlag.
3. DC-DC switching regulator analysis, D.M.Mitchell, Mc-Graw Hill.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 509	**Mini Project**	0	0	3	1	-

The students will be assigned to carry out the design and implementation of hardware project. The student can choose or instructor can assign project on any topic which they have studied. This work starts from the beginning of the semester . The students have to present the work they have done to the committee nominated by the department to evaluate the work for grading.

Elective-1

Course	Course Title	Lecture	Tutorial	Practice	Credit	Pre-

Number						Requisite
ECE 507	**PLCs and its applications**	3	0	0	3	-

Unit I

Introduction to Programmable controllers: Definition, A Historical Background Principles of Operation, PLCs Versus Other Types of Controls, PLC Product Application, Ranges Ladder Diagrams and the PLC Advantages of PLCs .

Unit II

Number Systems and Codes:1 Number Systems, Number Conversions, One's and Two's Complement, Binary Codes, Register Word Formats, Logic Concept, The Binary Concept, Logic Functions, Principles of Boolean Algebra and Logic, LC Circuits and Logic Contact Symbology

Unit III

COMPONENTS AND SYSTEMS: Processors, the Power Supply, and Programming Devices, Introduction, Processors 4-3 Processor Scan, Error Checking and Diagnostics, The Memory System and I/O Interaction, Memory Overview, Memory Types, Memory Structure and Capacity, Memory Organization and I/O Interaction Configuring the PLC Memory—I/O Addressing Summary of Memory, Scanning, and I/O Interaction Memory Considerations

Unit IV

The Discrete Input/Output System: Introduction to Discrete I/O Systems, I/O Rack Enclosures and Table Mapping, Remote I/O Systems, PLC Instructions for Discrete Inputs, Types of Discrete Inputs, PLC Instructions for Discrete Outputs, Discrete Outputs, Discrete Bypass/Control Stations, Interpreting I/O Specifications

Unit V

Programming Languages Introduction to Programming Languages, Types of PLC Languages, Ladder Diagram Format, Ladder Relay Instructions, Ladder Relay Programming, Timers and Counters, Timer Instructions

Reference Books

1. Programmable controller : Theory and Implementations–I.A. Bryan and E.A Bryan, second Edition

Course	Course Title	Lecture	Tutorial	Practice	Credit	Pre-

Number						Requisite
EEE 504	**Final Project**	0	0	12	4	-

Project assignments on specific areas of specialization are given to groups/individuals. At the end of the semester the students are requested to submit a report about the work performed and they have to present it to a committee formed by the department for evaluation of the work done.

Elective II

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
EEE 502	**Renewable Energy Sources.**	3	0	0	3	-

Course objectives:

- To study and understand the Alternative methods of generation of Energy from natural resources
- To study how to obtain the energy from non-conventional energy sources.

Unit I

An Introduction to energy sources: Energy consumption as measure of prosperity, world energy futures, conventional energy sources and their availability, non conventional energy sources.

Unit II

Solar energy: Solar constants, solar radiation earth surface, Radiation geometry and measurements, Solar energy collectors, Solar energy storage, Application of solar energy.

Unit III

Wind energy: Basic principles of wind energy conversion, Nature of wind, power in the wind, maximum power wind energy conversion site selection consideration, basic concept of WECS Classification of WECS, Advantage and disadvantages of WECS.

Unit IV

Energy fro Biomass: Biomass as a renewable energy, different types of Biomass fuels, gas liquid-soli, Biomass conversion technologies, Wet process, Dry processPhoto synthesis, Biogas generation, Classification of biogas plants,advantage and disadvantage, janatha Model, KVIC type

Unit V

Energy from Oceans, Introduction to Ocean source of energy, Ocean thermal electric conversion(OTEC) open type OTEC, Closed OTEC Hybrid cycle, energy from tides, tidal power, components of tidal power, Single and double basin arrangement , advantage and limitations of Tidal power

References

1. Non conventional sources of Energy-G.D Rai, Khanna Publishers
2. Solar Energy-Sukhatma,2nd edition,TMH
3. Solar energy handbook-edited by William C.Dikkinson ASISES

4. Renewable energy sources-Twiddle,ELBS

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite

EEE 502A	**Advanced Electrical Machines**	**3**	**0**	**0**	**3**	**-**

Course objectives:

- To understand the basic principle of transformation of machines

Unit I

D.C. Machines: Elements of generalized machine theory, Linear Transformation application to DC Machines

Unit II

Synchronous machine: Ideal synchronous machine, Synchronous machines Inductances Transformation to DQO variable, Basic relation in DQO variables. Steady state analysis, Steady state P-S Characteristics and voltage regulation

Unit III

Induction machines: Ideal Induction machine, Transformation to DQO variables basic machine relations to DQO variables, Steady state analysis

References

1. Generalized Theory of electic machines-Bhimbra, Khanna publishers.
2. Electric Machines-Fitzgerlad & Kingsley,2nd edition MGH

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite

EEE 502B	**Power System Planning**	**3**	**0**	**0**	**3**	**-**

Course objectives:

- To understand the basic principle of power system planning

Unit I

Load forecasting: Classification and characteristics of loads, forecasting methodologies, Extrapolation, Correlation, Energy forecasting, Peak demand forecasting, Annual and monthly demand forecasting.

Unit II

Generation system Reliability Analysis: Probabilistic generating Unit model, Probabilistic load models, Reliability analysis of an isolated system, Reliability analysis of interconnected areas.

Unit III

Transmission system Reliability analysis, Deterministic contingency analysis, Probability transmission system, Reliability analysis, Reliability calculation for single area, multi area reliability analysis

Unit IV

Automated Transmission system expansion planning: Planning concept, Automated network design, Automated transmission planning

References

1. Power system planning-Robert L. Sullivan.

Electronics & Communication Engineering Specialization

Course	Course Title	Lecture	Tutorial	Practice	Credit	Pre-

Number						Requisite
ECE 201	**Analog Electronics – I**	3	1	3	4	EEE 102

Course Objectives:

- To learn and understand the basic semiconductor devices and their characteristics
- To study the BJT & JFET characteristics
- To design an BJT and JFET amplifier and practice them
- To study design IC regulator and power amplifier

UNIT – I

Semiconductor Diodes and Rectifiers: Construction, Principle of operation, V-I characteristics, Symbol, Equivalent circuit, Rectifier circuits and power supplies, filters used in power supply circuits, clipping and clamping circuits, voltage multipliers, diode specifications, Zener diode – applications – a voltage regulator, Load line method, special diodes: schottky, varactor, tunnel, PIN, photodiode, LED.

UNIT – II

BJT V-I characteristics, BJT Equivalent circuit for DC analysis, BJT as a switch, BJT as an amplifier and biasing. Methods for stabilizing the operating point – PNP compared to NPN transistors. FET description, classification (JFET, MOSFET, etc.) and characteristics – FET biasing and Transistor maximum ratings.

UNIT - III

Low Frequency Amplifier Circuits: Concept of a small-signal model – two terminal devices – Transistor small signal mode – the h-parameter model – BJT common emitter amplifier: voltage gain – Concept of input and output resistances of an amplifier - input and output resistances of an common emitter amplifier – behavior of RC coupled amplifiers at low frequencies; choice of capacitor values – common source FET amplifier – Common collector BJT amplifier – comparison of amplifier configurations – multistage amplifiers

UNIT – IV

Voltage regulator: voltage regulation, discrete transistor regulator, IC regulator, monolithic regulator, switching regulator, basic switching topology, load regulation, line regulation

UNIT - V

Power amplifiers: Definition of Class A, B, AB and C amplifiers – Design and efficiency of Class A amplifiers - Design and efficiency of Class B amplifiers – problem of cross-over distortion in Class B amplifiers and solutions.

References

1. Electronic Devices – Floyd, Pearson Education.
2. Electronic Devices and Circuit Theory – Boylestad and Nashelsky, Pearson Education
3. Integrated Electronics – Millman and Halkias, McGraw Hill
4. Microelectronics-Jacob Millman & Grabel, second edition MGH

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 203	**Digital Electronics – I**	3	1	3	4	Nil

Course Objectives:

- To study and understand the digital principles and number systems.
- Understand the basic and universal gate and use them to realize the Boolean Expression
- To design and synthesis combinational and sequential logic

UNIT – I

Introduction: What is Digital Electronics? From ones and zeroes to DStv – Number Systems

Unit II

Combinational Logic (Gates and Boolean Algebra): Logic gates and truth tables – Boolean algebra – Boolean algebra and digital circuits – Timing diagrams – Electrical characteristics of logic gates – Positive and negative logic conventions – Boolean algebra – theorems – Some applications of Boolean algebra - Universal NAND/NOR gate – NAND and NOR Realizations, XOR and XNOR gates

UNIT – III

Simplification of Combinational Logic: SOP form – Simplification of logic – Karnaugh map for up to four variables – Dealing with Don't care – Simplification of 5 or 6 variables - simplification of expressions with any number of variables – POS form, Map entered Variables.

UNIT - IV

Logic Design with MSI Components: What is MSI Logic :Arithmetic Circuits: Binary arithmetic: Signed numbers –Addition, subtraction,– BCD and Hexadecimal arithmetic – Half and full adders – Carry look Ahead Adder Comparators

Decoders – encoders – multiplexers – demultiplexers, Logic Design with Decoders and encoders

UNIT - V

Introduction to Sequential Logic (Flip-flops): Simple SR Latch – D flipflops –

JK, T and Transparent latch – Asynchronous inputs – Applications: data storage, shift registers and counters –— Ring counters

UNIT - VI

Sequential Logic (Counters and Registers):– Synchronous counters and Design, mod -6 counters, Asynchronous counters and design

UNIT – VII

Memory and Programmable Logic: Introduction to memory circuits- ROM – ROM applications – RAM – Programmable logic

References

1. Digital Systems: Principles and Applications – Ronald J. Tocci and Neal S Widmer, Prentice Hall.
2. Digital Design – Morris Mano, Pearson Education
3. Hughes Electrical Technology, McKenzie Smith, Pearson Education
4. Digital principles and Design-Donald D. Givone, Tata McGraw Hill,2002.
5. Logic Design-Charles H. Roth
6. Digital logic applications and design- John M.Yarbrough, Thomsan learning.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 205	**Digital Electronics**	3	1	3	4	Nil

Course Objectives:

- To study and understand the digital principles and number systems.
- Understand the basic and universal gate and use them to realize the Boolean Expression
- To design and synthesis combinational and sequential logic

Unit I

Introduction: What digital electronics is? - Advantages of Digital over Analog systems - Number systems - Combinational logic (Gates and Boolean Algebra): Logic gates, Symbols and Truth tables - Boolean Algebra and Digital Circuits - Timing diagrams - Positive and Negative logic conventions - Boolean Theorems - Universal NAND and NOR gates - More examples and exercises -Simplification of combinational logic(5hrs) Sum of Product form, SOP/ Product of Sum - Simplification of logic circuits: Algebraic simplification method, Karnaugh Map method - Designing combinational logic circuits -Exclusive -OR and Exclusive -NOR circuits - Parity Generator and Checker-Circuits with multiple outputs - More examples and exercises

Unit II

Sequential Logic(Flip-Flops) - Simple SR latches - Clocked D-type flip-flops - Other flip-flops and latches: JK, T and Transparent latch - Asynchronous inputs - Applications: Data storage, Shift registers, Counters: Asynchronous Counters, Synchronous Counters, Counter decoding, Ring counters -Analyzing sequential circuits - Clock circuits - More examples and exercises

Unit III

Arithmetic Circuits: Binary Arithmetic: Signed numbers(2's complements) - Addition, Subtraction, Multiplication and Division - 1's complements - BCD and Hexadecimal arithmetic - Design of Adders: Half adders, Full adders - Carry propagation More examples and exercises. MSI Logic: What is MSI logic, why do we learn it? – Decoders – Encoders -Multiplexers (data selectors) - Multiplexer applications - Demultiplexers (data distributors) - Counters - Shift registers. Memory and Programmable Logic: Introduction to memory circuits - Read-only memory (ROM) - ROM Applications - Random access memory (RAM) - Programmable logic

Unit IV

Implementation of digital circuits: Diodes and Bipolar transistors - Transistor-transistor Logic, TTL - CMOS logic - Overview of logic families - TTL-CMOS interfacing - Three state (tri-state) outputs. Sequential logic Design methods: Design and implementation of synchronous state machines - State encoding - Dealing with asynchronous inputs - Decomposing state machines - Asynchronous sequential logic - More examples and exercises

Unit V

Timing considerations: Propagation delay of combinational circuits - Maximum clock frequency of clocked sequential circuits - Potential timing problems of FF circuits, setup and hold times of FFs - Fast adder circuits carry look ahead. Fast synchronous counters Further concepts of Building blocks: Serial data transmission - Error detection and error correction - Multiplexer circuits - FIFOs and other special memories

References

1. Digital Systems: Principles and Applications - Ronald J. Tocci and Neal S Widmer, Prentice Hall.
2. Digital Design - Morris Mano, Pearson Education
3. Digital design- Principles and practices, John F. wakerly, Pearson Education

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 202	**Signals and Systems**	3	1	0	3	SC 201

Course Objectives:

- To study the basic signals and their derivatives
- To study Fourier and Laplace transforms and their applications in Engineering field.
- To learn and apply the Z-Transform method to problem solving

UNIT – I

Introduction – Signal Representation - Classification of signals – Common signals and signal operations – System representation – Classification of systems – System modeling.

UNIT – II

Unit step – Ramp and Impulse functions – Properties of impulse functions – signal construction.

UNIT - III

Convolution: Introduction – Representation of signals by a continuum of impulses – continuous Time L1 system and the Convolution integral – Evaluation of the Convolution integral – Convolution Algebra.

UNIT - IV

Fourier Series Representation of Periodic Signals: Introduction – Exponential form of Fourier series – Trigonometric form of Fourier series – Relation between the Trigonometric and Exponential Fourier Series – Properties of Fourier Series.

UNIT - V

Fourier Transform: Introduction – Fourier transform –Fourier Transform of common functions – Properties of Fourier transform – Energy Spectrum – System function – Transform of Power signals – Sampling theorem.

UNIT - VI

Laplace Transforms: Introduction – Integral Laplace transform – Properties of Laplace transform – Laplace transforms of Common signals – Relation between Fourier and Laplace transform – Inverse Laplace transform – Solution of Linear systems – LTI system analysis.

UNIT - VII

Z-Transforms: Z-Transforms – Properties of Z-transform – Inverse Z-transform – Analysis and characterization of LTI system in Z-transform.

References

1. Signals and Systems: Continuous and Discrete – R.E. Ziemer and W.H. Tranter, Person Education.
2. Signals and Systems – S. Haykins and B.V. Veen, John Wiley and Sons.
3. Signals and Systems- A.V.Oppenheim, A.S.Willsky and I.T.Young, Prentice Hall
4. Signal and systems: Analysis Through linear systems-Michel J. Roiberts TMH,2003

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 204	**Analog Electronics – II**	3	1	3	4	ECE 201

Course Objectives:

- To learn the basic concept of feed back amplifier, effects of feedback and its characteristics
- To study and practice Oscillator design and frequency response of amplifier
- Basic concept of Differential amplifier and components of Operational amplifier
- Application of Operational amplifier & 555 timer

Unit – I

Concept of Feedback: Classification of Feedback amplifiers – General Characteristics Voltage series and current Series amplifiers, Oscillators: RC and LC type oscillators – Conditions for oscillation – Frequency and Amplitude Stability of Oscillations – Crystal Oscillators

Unit - II

Transistor Amplifier Frequency Response: RC Coupled Amplifier-Frequency response – High frequency model of transistors – Transistor cutoff frequency – Miller Effect – Calculation of bandwidth of single and multistage amplifiers – Concept of gain bandwidth product – Amplifier configurations appropriate for high frequencies – Tuned amplifiers

Unit - III

Differential Amplifier Implementation: Terminologies – Small signal equivalent circuit – Differential and common mode gains – CMRR – Differential and Common mode input impedance – Differential amplifier frequency response.

Unit – IV

Operational Amplifiers: Ideal OPAMP – Non inverting and inverting amplifier configurations – Summer – Integrator – Differentiator – Current to voltage converter.

Unit – V

Non-Linear OPAMP Applications: Half-wave rectifier – Clipping and clamping circuits – Comparators – Schmitt Trigger–Sample and hold circuit- Zero crossing Detectors- Wave form generators – Voltage-frequency and frequency – voltage converters

Unit – VI

Practical Considerations of OPAMPs: Slew rate and Setting time – Offsets

Frequency response and compensation.

Regenerative Circuits: Timers (555) and applications: Astable multivibrator – Monostable multivibrator –.Square and triangle wave generator.

References

1. Electronic Devices – Floyd, Pearson Education.
2. Electronic Devices and Circuit Theory – Boylestad and Nashelsky, Pearson Education
3. Integrated Electronics – Millman and Halkias, McGraw Hill
4. Microelectronics-Sedra and Smith.
5. Microelectronics-Jacob Millman & Grabel, second edition MGH

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 206	Digital Electronics – II	3	1	3	4	ECE 203

Course Objectives:

- To learn and understand the implementation of TTL and CMOS Gate and their comparisons
- To design Synchronous sequential circuits
- To study the delay in the combinational and sequential circuts.
- Hazards in the digital circuits

Unit – I

Implementation of Digital Circuits: Diode and bipolar transistor logic – TTL – CMOS logic – Overview of logic families – TTL-CMOS interfacing – Three state outputs, open collector/drain outputs, pull-up resistors

Unit – II

Synchronous Sequential Logic Design Methods: Design and documentation of Clocked Synchronous finite state machines – State encoding –state diagrams- Dealing with asynchronous inputs – Decomposing state machines – Asynchronous sequential logic.

Unit – III

Timing Considerations: Propagation delay of combinational circuits – Maximum clock frequency of clocked sequential circuits – Potential timing problems in Flip-flops circuits – fast adder circuits – Carry look ahead – Fast synchronous counters.

Unit – IV

Further concepts of Building Circuits: Serial data transmission – Error detection and error correction – multiplier circuits – FIFOs and other special memories

Unit - V

Hazards and glitches – Asynchronous sequential logic is considered dangerous – benefits of synchronous design methods. Switch debounce circuits – metastability – reset circuits – clock skew and clock distribution – PCB layout issues – Transmission line effects and terminations.

References

1. Digital Design: Principles and Practices, John F. Wakerly, Pearson Education

2. Digital Systems: Principles and Applications, Ronald J. Tocci and Neal S. Widmer, Prentice Hall
3. Digital Design, M. Morris Mano, Pearson Education
4. Digital principles and Design-Donald D. Givone, Tata McGraw Hill,2002.
5. Logic Design-Charles H. Roth
6. Digital logic applications and design- John M.Yarbrough, Thomsan learning.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 301	Transmission Lines, Antennas and Propagation	3	0	3	4	EEE 202

Course Objectives:

- Understand and quantify the effects of accelerated charges in producing time-varying electromagnetic waves.
- Be able to derive- from Maxwell's equations- the governing equations for EM wave propagation, RF transmission lines.
- Have gained insight into the applications of RF transmission lines, the use of Smith Chart and matching techniques.
- Understand and quantify how antennas launch electromagnetic waves into the surrounding medium.
- Have gained insight into how radio waves (Ground waves, Sky waves, Line of Sight waves, etc.) propagate in to space.

Unit – I

Transmission Lines: Introduction – Properties of Transmission lines – Transmission line parameters – Transmission line equations – Input impedance – Reflection coefficient – Standing wave ratio – power – the Smith Chart and its applications – Some applications of the transmission line: Impedance matching, single stub and double stub matching, the quarter wave transformer, transients on transmission lines.

Antennas: Introduction – the Hertzian dipole – the half wave dipole antenna – Quarter wave monopole – Small loop antenna – Antenna characteristics – Near field and far field, radiation resistance, Antenna patterns, gain and directivity, antenna patterns, effective area and Friis equation, the radar equation, antenna types.

Electromagnetic Wave Propagation: Waves in general, plane waves in lossy and loss less dielectrics, plane waves in space, plane waves in good conductors, ground wave, space wave and sky wave propagation.

References

1. Elements of Electromagnetics, M.N.O. Sadiku
2. Principles and Applications of Electromagnetics, R. Plonsey and R.E. Collin
3. Engineering Electromagnetics, W.H. Hayt and J.A. Bruck
4. Fields and Waves in Communication Electronics, Ramo, Whineery and Van Duzer

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 303	Network analysis & synthesis	3	1	0	3	ECE 202

Course Objectives:

- To learn basic network functions and network topology.
- Poles and zeros of the systems and partial fraction expansions
- Tow port networks and parameters
- Synthesis of network using different methods

UNIT - I

Network functions: Singularity functions, Unit functions, Shifter functions Network analysis in time domain, Initial and final conditions, Step and Impulse responses, Network Topology: Graph of a network, Concept of Tree and co-tree, Incidence matrix, tie set and cut set schedule.

UNIT - II

Review of Laplace transform: Use of Laplace transforms to networks, Partial fraction expansions, Poles and zeros, Evaluation of residues, Initial and final value theorems

Transform methods in network analysis: Transformed circuits, System function, step and impulse responses, Convolution integral, Duhamal superposition integral.

UNIT - III

Two port networks – Z parameters – Y parameters – Transmission (ABCD) parameters – Inverse transmission parameters – Hybrid (h) parameter – Interrelationship of differential parameter – interconnection of two-port networks – T and π network – Lattice network – terminated two-port network – image parameters.

UNIT - IV

Filters and Attenuators: Two port reactive networks, Characteristic impedance and propagation constant, Transmission and attenuation bands, Ladder networks, constant K- low pass, high pass, Band pass and band elimination filters, M- derived T and π sections. Active filters.

Attenuators: T, π , lattice, bridged T, L type attenuators.

UNIT - V

Introduction to Network synthesis – Hurwitz polynomials – positive real functions – synthesis of network by Foster's method, Cauver's method.

References

- Network Analysis and Synthesis- Franklin F.Kuo
- Network lines and fields- John D Ryder.
- Network Analysis- M.E.Vanvalkenburg
- Introduction to modern Network synthesis-M.E.VanNalkenburg,Wiley Western Ltd.
- Networks and systems-Roy Chowdhary, New age International Publications.
- Analog signal processing with Laplace Transform & Active filter Design-Mmeador, Thomson learning

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 305	Electronic Measurements and Instruments	3	0	3	4	EEE 102

Course objectives:

- To learn the importance of standard measuring units and dimensions
- To understand the operations of different measuring instruments
- To measure the electrical, electronics and mechanical parameters and convert them to one form to another form

Unit – I

Measurement and Error: Accuracy and Precision – Significant figures – Types of Error – Probability of Errors – Limiting Errors.

Standard units of Measurements and dimensions: Classes of Standards – Standards for Mass, Length and Volume – Time and Frequency – Standards – Electrical Standards – Standards of Temperature and Luminous intensity – IEEE standards, Fundamental units and derived units

Unit – II

Electro Mechanical Indicating Instruments: Suspension Galvanometer – Torque and Deflection of Galvanometer – Permanent Magnet Moving Coil Mechanism – DC Ammeter and Voltmeters – Voltmeter sensitivity – Series and Shunt type Ohm-meter – VOM – Calculation of DC instruments – AC instruments – Watt Hour meter – Power Factor meters – Instrument Transformers

Bridge Instruments: Wheatstone bridge – Kelvin bridge – General Wheatstone bridge – AC bridges and Applications – Maxwell bridge – Hay bridge – Scheving bridge – Wien bridge - Wagner ground connection

Unit – III

Electronic Instruments for Measuring Basic Parameters: Amplified DC meter – AC voltmeter using Rectifiers – RMS responding voltmeter – Electronic Multimeter – Digital voltmeter – Component measuring instruments – Q meter – Vector Impedance meter – Vector Voltmeter – RF power and Voltage measurement

Unit – IV

Signal Generators and Signal Analysis: Sine wave generator – Frequency synthesized signal generator – Frequency –divider generator – Signal generator

modulator – Sweep frequency generator – Pulse and square wave generator – function generator.

Wave analyzer – Harmonic distribution analyzer – Spectrum analyzer

Unit - V

Frequency Counters and Time Interval Measurements: Simple frequency counter – measurement error – Extending frequency range of counter – Automatic and Computing Counters.

Unit – VI

Transducers as Input Elements to Instrumentation Systems: Classification of Transducers – Selecting Transducers – Strain gages – Displacement Transducers – Temperature measurement – Photosensitive Devices. Interfacing transducers to Electronic Control and Measuring Systems.

References

1. Modern Electronic Instruments and Measuring Techniques – Helfrick and Cooper.
2. Electrical and Electronic measurements & Instrumentation- A.K Sawhney Dhanpat Rai & sons.
3. Electronic instrumentation – H.S. Kalasi,TMH
4. Electrical measurements and Measuring Instruments- Golding D & Weddies,Pitman.
5. Electric Measurements-Harris, Wiley,Newyork
6. Principles of measurement systems- John P Beately. 3rd Edition Pearson Education.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 302	Communication Systems	3	0	3	4	ECE 202

Course Objective:

- To give a strong background in communication systems engineering.
- To teach the different analog modulation and demodulation techniques that are common to many communication systems.
- To enable students to analyze the performance of receivers in the presence of noise.

Unit – I

Noise: Introduction, Thermal Noise, Short Noise, Partition Noise, Low Frequency or Flicker noise, Burst noise, Avalanche Noise, Dipolar Transistor Noise, Equivalent input noise, generators and comparison of BJTs and FETs, Signal-to-noise Ratio, S/N ratio of tandem connection noise factor, Amplifier input noise in terms of R, Noise factor and equivalent input noise generators, Noise factors of lossy network, Narrowband-Band pass noise.

Unit – II

Amplitude Modulation: Introduction, Amplitude Modulation, Amplitude Modulation Index, Modulation index for sinusoidal AM, Frequency spectrum for sinusoidal AM, Average power for sinusoidal AM, effective voltage and current for sinusoidal AM, Non-sinusoidal modulation, Double sideband suppressed carrier (DSBSC) modulation, amplitude Demodulator circuits, Amplitude Modulated transmitters, AM receivers, Noise in AM systems.

Unit – III

Single Sideband modulation: Introduction, Single sideband principles, Balanced Modulator, SSB generation, SSB reception, Modified SSB systems, Signal-Noise ratio for SSB, compounded single sideband.

Unit - IV

Receivers: Introduction, Super Heterodyne receivers, tuning range, tracking sensitivity and gain, Image rejection, adjacent channel selectivity, AGC, Double Conversion, Electronically Tuned IC receivers.

Unit – V

Angle Modulation: Introduction, FM, Sinusoidal FM, Frequency spectrum for sinusoidal FM, Average power in sinusoidal FM, Non-sinusoidal modulation; deviation Radio, Measurement of Modulation index for sinusoidal FM, Phase modulation, sinusoidal phase modulation, Digital phase modulation, Angle modulation circuits, AFC, Amplitude Limiters, Noise in FM systems, Pre-emphasis and De-emphasis, FM Broadcast receivers, FM broadcast Receivers, FM stereo receivers.

Unit - VI

Pulse Modulation: Introduction: sampling, S/H, quantisation. PAM, PPM and PWM.

References

1. Electronic communications, Dennis Roddy and John Coolen (IV Edition) PHI
2. Electronic Communication Systems Kennedy (III Edition) TMH
3. Communications Systems, Simon Haykin-John Wiley

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 304	Information Theory and Coding	3	1	3	4	ECE 206

Objectivs

- To understand theoretical approach for finding channel capacity.
- To develop instantaneous codes using Shannon's procedure and Huffman's procedure
- To understand thoroughly the design and implementation of linear block codes and cyclic codes.
- Introduction to convolutional codes.

Mutual information, entropy for discrete ensembles; Shannon's noiseless coding theorem; Encoding of discrete sources.

Markov source; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.

Techniques of coding and decoding; Huffman codes and uniquely detectable codes; Cyclic codes, convolutional arithmetic codes.

References

1. Information and Coding, N. Abramson, McGraw Hill
2. Introduction to Information Theory, M. Mansurpur, McGraw Hill
3. Information Theory, R.B. Ash, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 306	Digital Signal Processing	3	1	3	4	ECE 202

Course Objective:

- Introduce students to methods of discrete-time signals and systems representation and analysis
- Introduce design methods and realization structures of discrete-time systems.
- Introduce signal processing applications using DFTs
- Introduce spectral analysis using DFTs
- Introduce FFT algorithms.
- Introduce FIR and IIR filter design techniques.
- Introduce 2D transformations.
- DSP applications
- Introduce simulation using MATLAB.

UNIT - I

Introduction to digital signal processing, Discrete time signals and sequences, linear shift invariant systems, Stability and causality, Frequency domain representation of discrete time signals and systems.

UNIT - II

Discrete Fourier series: Properties, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, Linear convolution of sequences using DFT, Computation of DFT, Fast Fourier transforms (FFT)- Radix 2 decimation in time and decimation in frequency FFT algorithms, For a composite number N , Goertzel algorithm and Chirp-Z algorithm, Inverse FFT

UNIT - III

Applications of Z-transforms, Solution of difference equations of digital filters, system function, state space analysis of digital system, Stability criterion, Frequency response of stable systems, Realization of digital filters- direct, Canonic, linear phase structure, Cascade, lattice and parallel forms.

UNIT - IV

IIR digital filters: Analog filters approximations, Butterworth and Chebyshev. Design of IIR digital filters from analog filters, Step and impulse invariance techniques, Bilinear transformation methods, Spectral transformations.

UNIT - V

FIR digital filters: Characteristics of FIR digital filters, Frequency response, design of FIR digital filters, Comparison of IIR and FIR filters.

Applications of FFT in spectral analysis and linear filtering, Introduction to DSP hardware, Applications of DSP.

References:

1. Digital Signal Processing- Oppenheim and Schaffer, PHI
2. Digital Signal Processing- W.D.Stanley
3. Digital filters analysis and design-A.Antoniou, TMH
4. Digital Signal Processing-S.K.Mitra, TMH.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 308	VLSI Design	3	1	0	3	ECE 206

Course Objectives:

- To have a recent method to IC design and their effects
- To use CAD tools to link the design and fabrication methods
- To analyze and minimize the power dissipation, delay and area.
- To have a optimized memory size

UNIT-I

Introduction:VLSI Technology, trends, Moore's law.

MOS Technology:Difference between MOS and BJTs, Basic MOS transistor characteristics,types of MOS transistor and their operation, nMOS and CMOS inverters, different inverter circuits, transmission gates. Determination of pull up and pull down ratios, latch up in CMOS, BiCMOS inverter.

UNIT-II

MOS layers, Design rules and layout,Basic Circuit Concepts: Sheet resistance, sheet resistance NMOS inverter, area, capacitance of layers, standard unit of capacitance, CG area capacitance calculation, delay unit, inverter delays driving large capacitive loads, cascaded inverters as drivers, super buffers.

UNIT-III

Logic Design:

Combinational circuit design: gate(restoring) logic, two-input nMOS and CMOS NAND gates, NOR gates, other forms of CMOS logics, Pseudo nMOS, dynamic CMOS, C2MOS and n-pCMOS logics, realization of Boolean functions with above logics.

UNIT-IV

Sequential Circuit Design: Clocked logic, simple flip-flops, realization of shift registers, subsystem design process, 4-bit Barrel shifter.

UNIT-IV

Three-transistor dynamic RAM cell, one-transistor dynamic memory cell, pseudo-static RAM/register cell, 4-transistor dynamic and six-transistor static CMOS memory cell.

Delay and Power Calculation: NMOS inverter delay, CMOS inverter delay, Power estimation.

References:

1. Basic VLSI Design Douglas-A. Pucknell and Kamran Eshraghian, 3rd Edn, PHI.

2. Introduction to nMOS and CMOS VLSI System Design -Amar Mukherjee, , PHI.
3. Principles of CMOS VLSI Design -Neil H. E. Waste, Kamran Eshraghian, 2nd Edition,Pearson Education Asia.
4. Modern VLSI design-Wayne Wolf, , Pearson Education.
5. Fundamentals of modern VLSI devices,Yuan Taun Tak H Ning,Cambridge Press

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 401	Digital Communication Systems	3	0	3	4	ECE 302/ ECE 306

Course Objectives

- Introduce Pulse modulation techniques used to represent digital data
- Introduce Line coding techniques used in telephony.
- Introduce different modulation techniques used for data communication.
- Study the ISI effect.
- Introduce Optimum Receiver for Data Communications

Unit I

Introduction: Some signal and their spectra, elements of digital communication systems and block diagram description of digital communications system.

Unit-II

Sampling, quantization (uniform and non-uniform), quantization noise, pulse code modulation (PCM), signal to quantization noise ratio of a PCM system, Differential pulse code modulation (DPCM), Delta modulation system (DM), Adaptive delta modulation (ADM), Time division multiplexing, Digital multiplexer – T1 carrier system.

Unit III

Communication through band limited linear filter channel: Introduction, Line coding techniques, NRZ and RZ, Differential, Bi-Phase, Power Spectra, Inter Symbol Interference (ISI) and its cures, Nyquist criterion for distortion-less base band binary transmission, Ideal solution for zero ISI, raised cosine spectrum, correlative coding, Eye pattern, Equalizers.

Unit IV

Digital carrier modulation and demodulation: Introduction, Amplitude shift keying (ASK), BASK generation, coherent detector, non-coherent detector, Quadri-phase PSK (QPSK), QPSK generation, QPSK coherent detector, M – Ary schemes, differential phase shift keying (DPSK), frequency shift keying (FSK), noise performance – Error analysis for AWGN channel, power spectra.

Unit V

Optimum Receiver for Data Communications: Introduction, characterization of fading multi-path channels, channel correlation functions and power spectra, diversity techniques for fading multi-path channels.

References

1. An introduction to analog and digital communications; By Simon Haykin
2. Digital Communications by Simon Haykin
3. Digital Communications by Proakis

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 405	**Industrial Electronics**	3	-	3	4	ECE 204

UNIT - I

Thyristors-SCR-BJT-power MOSFET-Power IGBT and their characteristics, Basic theory and operation of SCR - static characteristics - Two-transistor analogy- Ratings of SCRs- Dynamic characteristics of SCR during turn ON and OFF. Triggering methods- gate triggering, SCR protection schemes.

UNIT - II

Single phase converters: Half wave, Mid point, Half-controlled and fully controlled bridge converters with resistive and R-L loads, Effect of freewheeling, Active and reactive power inputs to the converters with and without free wheeling diode.

UNIT – III

DC-to-DC Switch Mode Converters: Introduction – Control of DC-DC converters – step-down (buck) converter – step-up (Boost) converter – Buck-Boost converter – Cuk DC-DC converter – Full-bridge DC-DC converter – DC-DC converter comparison.

DC-DC converters with electrical isolation

UNIT - IV

Inverters: Basic series inverter, Single phase VSI – Half bridge and full bridge inverter – performance parameters – Three phase bridge VSI – 120^{o} and 180^{o} mode of operation - voltage control techniques, PWM inverters – different types of PWM techniques used in inverters – harmonic elimination schemes - Mc - Murray inverter, Mc-Murray-Bedford inverters – Single phase and three phase CSI. Parallel inverter,

UNIT - V

AC voltage controllers – types – applications.

Reference Books

1. Power Electronics-C.W.Lander,Mc-Graw Hill
2. Power Electronics: Principles and Applications- J.Vithayathil,Mc-Graw Hill
3. An introduction to Thyristors and their applications-M.Ramamoorthy, East-west Press Pvt. Ltd.
4. Power Electronics: Circuits, devices and applications- M.H.Rashid, PHI
5. Power electronics: Converter, applications and design, N.Mohan, T.M.Undeland and W.P.Robbins, John Wiley and Sons.
6. Power Electronics converters, R.Bausiere and G.Seguier, Springer-Verlag.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 402	Microwave and Satellite Communication	3	1	3	4	ECE 301

Course Objective

- Gain knowledge and understanding of the working principles of different types of waveguides
- Understand and use the basic microwave devices and systems (both classical and modern)
- Appreciate the use of microwave devices and systems that they come across in their carriers and daily life

Unit-I

Wave guide analysis: solution to the wave equations and boundary conditions – rectangular and circular waveguides, various modes of operation of wave propagation inside the wave guide.

Unit-II

Microwave components; Tees, circulators, directional couplers, attenuators, phase shelters S-parameter analysis of microwave components. Ferrite microwave devices.

Unit-III

Microwave sources; Klystron – amplifier and oscillator, magnetron, TWT, microwave. Semiconductor devices: Gunn, PIN Varactor Diode, parametric amplifiers, low noise microwave amplifiers, IMPATT and TRAPATT.

Unit IV

Introduction to microwave and integrated circuits. Active and Passive components.

Microstrip lines; Slot and Coupled lines; design of power dividers and combiners, directional couplers, hybrid couplers, filters.

Unit - V

Satellite Communication: Physical media and link components: Microwave bands for satellite communication – satellite microwave link calculation – earth station components – parabolic dish antennas.

Modulation schemes used in satellite links: FDMA, TDMA, packet switching schemes, spread spectrum techniques, CDMA systems.

Satellite Systems: Satellite classes, satellite orbits, launching of a satellite and their monitoring.

References

1. *Leo Young and H Sobol Ed. Advances in Microwaves, Vol 2, Academic Press inc., 1974*
2. *B Bhat and S Koul, Stripline-like transmission lines for MICs, John Wiley, 1989*
3. *Y K Ishii, Handbook of Microwave Technology, Vol 1, Academic Press, 1995.*
4. *R E Colin, Foundations of Microwave Engineering. Mc Graw Hill 2nd Ed. 1992*
5. *D M Pozar, Microwave Engineering, John Wiley, 1996*

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 404	**Fiber Optic Communications**	3	0	3	4	Nil

Course Objective

- The Course provides a basic understanding of the nature of light, its propagation through different media and methods of analysis of optical transmission.
- It introduces functional concepts of optical fibers and their applications in communications.
- It also introduces optical sources and detectors used in optical fiber communications.
- Introduction Fiber optic systems: Propagation of light in an optical fiber; ray model and wave model; Modal propagation in fiber.

Types of fiber; step index, graded index, single mode

Signal distortion in an optical fiber; attenuation, dispersion.

Optical sources; LEDs and lasers; introduction to a few common lasers like Ruby, He-Ne etc.

Photo-detectors and optic links

Fiber optic link design; Power and rise-time budget, SNR and BER calculations.

Introduction to coherent optical communication WDM systems; devices for coherent optical communication like directional coupler etc; introduction to high speed long distance fiber optic links and non-linear fiber optics; Pulse confinement optical amplifiers etc; Multi-Gb/s fibre optic links.

References

1. G Keiserr, Optical Fiber Communication, McGraw Hill 2nd Edition

S E Miller and I P Kamine (eds), Optical Fiber Communication II, Academic

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE -406	Radio & Telephony system	3	-	-	3	-

Objectives

- Introduce basics of telephone switching.
- Introduce signaling schemes in telephony.
- Introduce traffic management.
- Introduce digital telephony.
- Introduce facsimile.

Telephones - field, commercial telephone and its circuits - Telephone switching systems, step by step, crossbar, electronic Switching - Digital switching, space and time switches - Control of switching system, FDM /PCM signaling, Digital PABX. Telecommunication traffic, mathematical modeling of lost call and queuing system Facsimile.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 501	**Wireless and Mobile Communications**	3	0	0	3	-

Course Objective:

- Wireless and Mobile Communications, extends basic principles of communications systems and their associated performance into the world of wireless and mobile communications.
- The course will provide a good understanding of fundamental problems and counter-measure techniques in digital communications over wireless mobile channels.
- The course will serve students as background for an advanced study in wireless communications

Introduction to mobile communication. Cellular mobile telephone architecture overview.

Cellular radio system design – Frequency assignments, frequency reuse channels. Concept of cell splitting. Handover in cellular systems. Handoff algorithms.

Multiple access schemes in mobile communications – TDMA, FDMA, CDMA. Random multiple access schemes. Performance analysis issues. MAC layer scheduling and connection admission in mobile communication. Interference suppression and power control.

Tele-traffic modeling and Queuing theoretic analysis of cellular mobile networks. Resource allocation and mobility management.

Practical cellular mobile systems – AMPS and GSM system architecture overview. Call management and system operation. CDMA based cellular system. Wireless in local loop – DECT and CDMA WLL.

References

1. Mobile Cellular Telecommunications Systems, WCY Lee, McGraw Hill
2. Mobile Communications Design Fundamentals, WCY Lee, Prentice Hall
3. Mobile Radio Communications, Raymond Steele

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 503	**Broadband Communications**	3	-	0	3	-

Unit – I

Introduction to Broadband Telecommunication: Telecommunication Networks: Switching Technology, Signaling Technology - Routing and Control Signaling:Packet Communication Technology, Basic Architecture Model of ISDN.

Unit – II

Broadband Subscriber Network: Introduction to Subscriber Lines and Loop: Twisted pair based Bandwidth Subscriber Network: Modulation Techniques for DSL.Optical Subscriber Network and wireless communication

Unit – III

Synchronous Digital Transmission: Introduction to PDH, SONET, and SDH. Frame Structure and Synchronous Multiplexing Tributary Mapping; for Synchronous Transmission. OSI model-end systems, intermediate node

Unit – IV

ISDN and Frame Relay: ISDN interface and function. ISDN layers and services: Frame Relay-Protocol Architecture.

Unit – V

BISDN and ATM Technology: BISDN Conception, Services; Characteristic; BISDN Architectural Model. User Network Interface; BISDN Protocol reference Model. ATM-Concept; ATM Overview; Virtual Channels/Paths and ATM Cells.

References

1. Broadband Telecommunications Technology: Byeong Gi Lee, Minho Kang, Jonghee Lee; Artech House.
2. ISDN and Broadband ISDN with Frame Relay and ATM: William Stallings; Pearson Education, Asia.
3. Data and Computer Communications: William Stallings; Pearson Education, Asia.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 505	**Telecommunication Networks**	3	0	0	3	-

Course Objective:

- To inspect and summarize the major features of the today's most popular telecommunication networks as well as the forthcoming ones
- To get oneself familiar to the related standardization work established by ITU (International Telecommunications Union), ETSI (European Telecommunications Standards Institute) and various other worldwide standardization bodies.

Introduction to computer communications networks and layered architecture. Overview Packet switching and Fast packet switching.

Point to point protocols and links, ARQ retransmission strategies. Selective repeat ARQ. HDLC, SDLC, LAPD. Queuing modes in communications networks.

Multi-access Communication and multiple access protocols; ALOHA, slotted ALOHA, CSMD/CD. Local area networks; Ethernet, Token Ring and FDDI, Design and analysis.

Internetworking issues; Bridges, Routers and Switched networks. Routing and Flow control algorithms in data networks.

References

1. *R G Gallager and D Berisekas, Data Networks, PHI, 1992.*
2. *J F Hayes, Modelling and Analysis of Computer Communication Networks, Plenum Publishing Corporation, New York, 19984*
3. *W Stallings, Data and Computer Communications, PHI, 1997,*
4. *R Rom and M Sidi; Multiple Across Protocols, Springer Verlag, 1990.*
5. *M DePrycker, ATM-solutions for broadband ISDN, Prentice Hall USA, 1995.*

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 509	**Mini Project**	0	0	3	1	-

The students will be assigned to carry out the design and implementation of hardware project. The student can choose or instructor can assign project on any topic which they have studied. This work starts from the beginning of the semester. The students have to present the work they have done to the committee nominated by the department to evaluate the work for grading.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 504	**Final Project**	**0**	**0**	**12**	**4**	**-**

Project assignments on specific areas of specialization are given to groups/individuals. At the end of the semester the students are requested to submit a report about the work performed and they have to present it to a committee formed by the department for evaluation of the work done.

ELECTIVE – I

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 507	**Micro Electronics**	3	0	0	3	-

Unit I

Microelectronics Industry – Overview:Electronic Industry - Microelectronic Industry - Summary - References

Unit II

Semiconductor Material:Types of Material - Atomic structure - Silicon crystal - Current flow in semiconductors - GaAs

Unit III

Semiconductor Devices and Technology Trends

PN junction Diode - Bipolar Junction Transistor - Metal Oxide Semiconductor Transistor (MOSFET) - IC technology Trends and Markets

Unit IV

Semiconductor Products

Overview - Semiconductor memories - Standard Logic - Microprocessors - ASICs - Intellectual Property - Analog ICs

Unit V

Semiconductor Manufacturing

Overview - Crystal growth and Wafer Fabrication - Contamination Control - Overview of Wafer Processing - IC Manufacturing Cost Trends - Economics of IC Fabrication - Oxidation - Photolithography - Etching - Doping - Thin Film Deposition - Metalization - CMOS Process Flow

References

1. Principles of Microelectronics- Sadra Smith,
2. Basic VLSI Design- Douglas A. Pucknell and Kamran Eshraghian, 3rd Edition, PHI.
3. Principles of CMOS VLSI Design- NEIL H.E. Weste and Kamran Eshraghian

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 507A	**Stochastic Signal Processing**	**3**	**0**	**0**	**3**	**-**

Review of probability theory and random variables; Transformation (function) of random variables, conditional expectation;

Sequence of random variables; convergence of sequences of random variables. Stochastic processes; wide sense stationary processes, orthogonal increment processes, Wiener process, and the Poisson process, KL expansion.

Ergodicity, Mean Square continuity, mean square derivative and mean square internal of stochastic processes.

Stochastic systems; response of linear dynamic systems (eg of space or ARMA systems) to stochastic inputs; Lyapunov equations; correlation function; power spectral density function; introduction to linear least square estimation, Wilener filtering and Kalman filtering.

References

1. A Papoulis, Probablility, Random Variables are Stochastic Processes, Mc Graw Hill
2. A Larson and B O Schubert, Stochastic Processes, Vol. I And II, Holden-Day
3. B W Gardener Stochastic Processes, McGraw Hill

ELECTIVE - II

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 502	**Radar Systems**	3	0	0	3	-

Radar Theory, different types of radars, radar signal analysis for range accuracy and resolution. Radar signal detection and estimation techniques, clutter and noise suppression, propagation characteristics over land and sea. Electronic counter measure.

References

1. M I Skoinik, Introduction to Radar Systems, McGraw Hill 1980
2. D K Barton, Modern Radar Systems Analysis, Artech House, 1988
3. B Edde, Radar, Principles, Technology, Applications, Prentice Hall, 1993

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 502A	**Solid State Microwave Devices and Applications**	**3**	**0**	**0**	**3**	**-**

Amplifiers – Microwave semiconductor devices and models; power gain equations, stability, impedance matching, constant gain and noise figure circles; small signal, low noise, high power and broadband amplifier designs.

Oscillators – one port, two port, YIG dielectric and Gunn-diode oscillators.

Two terminal microwave devices and circuits.

PIN diodes and uses as switches, phase shifters and limiters.

Varactor diodes, IMPATT and TRAPATT devices, transferred electron devices.

Microwave BJTs. GaAs FETs, low noise and power GaAs FETs and their applications. Microwave mixers.

References

1. Microwave Circuit Analysis and Amplifier Design, S.Y. Liao, Prentice Hall
2. Microwave Circuit Design, using Linear and Non-Linear Techniques, G.D. Vendelin, John Wiley

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 502B	Logic design with VHDL	3	0	0	3	-

Course objectives:

- To learn and understand the Hardware Description Language and synthesis
- To study and practice the Computer aided Design methods for digital system design

Unit - I

Introduction to VHDL

Introduction - The scope and application of VHDL - design flow - synthesis - benefits - tool and technology - independence - the VHDL world - Design Entities - The basic VHDL language constructs - Files and Libraries - The proper organization and use of VHDL source files and libraries - the compilation procedure – Processes - The process statement and its consequences for simulation and modeling - Sequential Statements - If, case and loop statements - synthesis of combinational logic and transparent latches -

Unit – II

Further VHDL: FSM Synthesis - Finite state machine synthesis - VHDL coding styles for FSMs - state encoding - unreachable states - one hot encoding - More on Types - Making best use of integers and arrays - modeling memories - More on Design Entities - Parameterising designs for re-use - concurrent coding styles - using assertions to report

UNIT-III

TEXTIO and Test Benches: Reading and writing text files - checking expected results - initializing memories – calling 'C' functions from VHDL - gate level simulation - VITAL - hierarchical configurations - PLD and ASIC Design Flow Exercise - Physical design - gate level simulation - back annotation - device programming - Project Management –

References

1. The Designer's Guide to VHDL, Ashenden, The Morgan Kaufmann Series in Systems on Silicon
2. The VHDL Golden Reference Guide, Doulos (See www.doulos.com.)
3. J. Bhasker, A VHDL Primer, Pearson Education.
4. Charles H. Roth, Digital System Design using VHDL, PWS, 1998.

Computer Science and Engineering Specialization

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 101	**Principles of Computing**	3	0	3	4	Nil

Course Objectives:

- To enable the students to understand what is a computer, how to use a computer and to know the different terminologies.
- To enable the students to understand concepts operating system
- To enable the students to understand the concepts of files, directories, coding
- To enable the students to use Internet and make use of office package

Unit - I

Basic Concepts: Keyboard and monitors; multi-user operating systems; Accounts; Logging in and out; passwords; command prompts; command options and arguments; the job of the shell; basic commands: man, cal, ping, echo

Unit – II

Files, Directories and Permissions: What is a file? File name, viewing contents of a text file, creating and deleting files, directory, structure, adding and removing directories. Permissions: Different classes (owner, group, all); viewing the permission of a file and directory. Command: touch, ls, rm, mkdir, rmdir, cd, pwd, chmod

Unit - III

Computer Hardware and Relationship to OS: Introduction to Processor, memory, hard disk, floppy disk, keyboard, monitor, bits, bytes and hexa. What is an OS? Purpose; Modern OS; Proprietary Vs Open OSs.

Unit - IV

Text Representation, Coding and Editing: ASCII characters – how numbers are interpreted; Unicode and multibyte representations; Text editors. Difference between file in buffer and disk.Commands: nano, cat, split, hextype, sort

Unit – V

Text Based Email: What is email; importance; address, message; How email are sent and received; how is mail stored; Communication between the servers: SMTP, POP3 and IMAP; SPAM; troubleshooting email deliveries.

Unit – VI

Internet/Intranet: What is internet? Importance. What is URL, HTML. Web browser; Internet and intranet.

Unit – VII

Word Processors and Applications:

Word processor – Database – Spreadsheet – Presentation

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 102	**Programming in C**	3	1	3	4	CSE 101

Course Objectives:

- To enable the students to understand what is a programming language and to introduce the concepts of C programming
- To enable the students to write C programs for various applications using the different features of C language

UNIT – I

Types, Operators and Expressions - Variable Names - Data Types and Sizes -Constants - Declarations -Arithmetic Operators -Relational and Logical Operators -Type Conversions -Increment and Decrement Operators -Bit wise Operators -Assignment Operators and Expressions -Conditional Expressions -Precedence and Order of Evaluation

UNIT – II

Control Flow -Statements and Blocks -if-else -else-if -switch –Loops: while and for loops - do-while -break and continue -goto and labels.

UNIT – III

Functions and Program Structure -Basics of Functions -Functions Returning Non-integers-External Variables -Scope Rules -Header Files -Static Variables -Register Variables -Block Structure -Initialization -Recursion -The C Preprocessor -File Inclusion -Macro Substitution -Conditional Inclusion

UNIT – IV

Pointers and Arrays -Pointers and Addresses -Pointers and Function Arguments -Pointers and Arrays -Address Arithmetic -Character Pointers and Functions -Pointer -Arrays; Pointers to Pointers -Multi-dimensional Arrays -Initialization of Pointer Arrays -Pointers vs. Multi-dimensional Arrays - Command-line Arguments -Pointers to Functions -Complicated Declarations

UNIT-V

Structures -Basics of Structures --Structures and Functions -Arrays of Structures -Pointers to Structures -Self-referential Structures -Table Lookup -typedef -unions -Bit--fields

UNIT-VI

Input and Output -Standard Input and Output -Formatted Output - printf -Variable-length -Argument Lists -Formatted Input - Scanf -File Access -Error Handling - Stderr and Exit - Line Input and Output -Miscellaneous Functions -String Operations -Character Class -Testing and Conversion -Ungetc -Command Execution -Storage Management -Mathematical Functions.

Reference Books

1.The C-Programming Language- Kerninghan and others

2.Programming in ANSI C- E.Balaguruswamy

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 201	Object Oriented Programming with C++	3	0	3	4	CSE 102

Course Objectives:

- To enable the students to understand what is Object Oriented programming language and to introduce the concepts of C++ programming
- To enable the students to write C++ programs for various applications using the different features of C++ language

Unit - I

Introduction: Introduction to OOP: Characteristics of OOP. Differences between POP and OOP. C++ programming language - Structure, I/O Statements, Control statements, manipulators.

Unit - II

Functions in C++ : Functions - Prototype -Function call: by reference and by value - Function return: by value and by reference - Inline function - friend function - overloading function

Unit - III

Classes and Objects: Class specification - specifying member function - nesting member function - private member function - arrays within class - Object creation - memory allocation - arrays of objects - objects as function arguments - return of objects - Constructors - types - constructor with default arguments - Dynamic initialization of objects

Unit - IV

Polymorphism and Inheritance: Operator overloading - overloading unary - binary operators -Data Conversion - Inheritance - types of inheritance - virtual base class - constructors in derived class

Unit – V

Pointers, Files, Templates and Exception Handling: Pointers to Objects - this pointer - pointers to derived classes - File Operations. Templates - function and class templates - overloading member function templates - Exception handling mechanisms

References

1. Robert Lafore, Object Oriented Programming with C++
2. Balagurusamy, Object Oriented Programming with C++

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 202	**Computer Organization & Architecture**	3	0	0	3	ECE 203 / ECE 205

Course Objectives:

- To enable the students to understand the organization of computer system
- To enable the students to understand the various components used in computer system, their functions
- To design systems for a specific requirement

Unit - I

Overview of Computer Organization Functional blocks - Data representation - Fixed and Floating and Decimal arithmetic - Design exercise of an Arithmetic unit - Conventional and Microprogram concepts - Control unit design consideration - Instruction cycle - CPU design exercise.

Unit - II

Memory and I/O Devices Semiconductor memory and its organization - Memory hierarchy, Cache and Virtual Memory. Programmed I/O - Interrupts - DMA - channels - IO Processors - Peripheral Devices and their characteristics - Bus Structures - Types of Buses.

Unit - III

Processor Design, ALU Design and Microprogramming Processor Design & Microprogramming: Design process, Data path Implementation, Control Unit, Machine exceptions, Microprogramming. Arithmetic Unit: Fixed Point arithmetic, Floating point arithmetic, ALU design.

Unit - IV

Theory of Parallelism Theory of Parallelism - Evolution of Computer Architecture - Flynn's Classification - Parallel/Vector Computers - Multiprocessors and Multi-computers: UMA Model, NUMA Model, COMA Model - Architecture of Vector Super Computer

Unit - V

Multiprocessors - Introduction - Multi-processors connected by a single bus -Multi-processors connected by a network - Clusters -Network Topologies -Evolution Vs Revolution in Computer Architecture

References

1. V.C. Hamacher, Computer Organization, McGraw Hill
2. J.P.Hayes, Computer Architecture and Organization, McGraw Hill
3. J.L. Hennessy, D.A. Patterson, Computer Organization and Design, Morgan Kaufmann

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 301	**Microprocessors**	3	0	3	4	ECE 206

Course Objectives:

- To enable the students to understand concepts of Assembly language programming using 8085 Microprocessor
- To enable the students to understand the organization of 8085 Microprocessor
- To enable the students to understand the principles behind interfacing components to a Microprocessor

Unit - I

Introduction: Microprocessor Architecture – Memory – Input/output – Micro computer system. 8085 microprocessor unit – Data flow from memory to MPU – Microprocessor functional block diagram.

Unit – II

Programming 8085:

Data transfer - Arithmetic operations – Logical operations – Branching – looping – counting – Indexing.

Unit – III

16-bit Arithmetic instructions – Arithmetic operations related to memory – Rotate and compare instructions. Counters and Delays – Stacks and Subroutines.

Unit – IV

BCD arithmetic – 16 bit Data operations.

Interrupts – 80-85 Interrupts – Vectored Interrupts.

Unit - V

Interfacing Peripherals: 8155 Multipurpose programmable device, 8255A PPI, 8254 Timer, 8257 DMA controller, 8259A Interrupt controller, 8279 KB and Display Interface.

References

1. Microprocessors: 8085 Architecture, Programming and Interfacing, Ramesh S. Goankar
2. Microprocessors, D.V. Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 303	**Data Structures**	3	0	3	4	CSE 201

Course Objectives:

- To enable the students to understand what is a data structure and to introduce different data structures
- To enable the students to understand the importance and use of data structures
- To enable the students to write programs for the implementation of different data structures

Unit - I

Introduction: Review of Functions, Structures & Pointers in C language. Data Structures - Definition, Types of Data Structures

Unit - II

Stack: Introduction, Operations on Stack, Algorithms, and Applications of Stack: Function calls, Recursion, Expression Evaluation, Array Implementation.

Unit III

Queue and List: Queue: Definition, Operations on Queue, Algorithms, Dequeue - Array Implementation. Linear Linked List - Operations on Linked list, Algorithms, Implementation of Stack & Queue using Linked List - Doubly Linked List - Operations - Algorithms.

Unit - IV

Trees: Trees - Definitions - Binary Tree - Representation of Binary Tree. Applications of tree.

Unit – V

Sorting and Searching Techniques: **Sorting Techniques** - Insertion sort, Bubble sort, Shell sort, Quick sort, Heap sort - Algorithms and Implementation.

Searching Techniques - Linear search, Binary Search, Binary Search Tree - Algorithms and Implementation. Hashing - Collision Avoidance - Open Addressing Hashing - Algorithms and Implementation.

Reference Books

1.Tremblay and Sorenson, Data Structures and Algorithms, McGraw Hill

2.Robert Kruse, Data Structures and Program Design using C, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 305	**Data Communications**	3	0	0	3	-

Course Objectives:

- To enable the students to understand concepts of communication, devices used for communication and various techniques used for communication
- To understand the OSI reference model useful for communication

Unit I

Introduction Communication Model - Data Communications - Data Communications Networking - Protocols and Protocol Architectures - Standards

Data Transmission Concepts and Terminologies - Analog and Digital Transmissions - Transmission Impairments

Transmission Media Guided and Wireless Transmissions.

Unit II

Data Encoding Digital data, Digital Signals - Digital data, Analog Signals - Analog Data, Digital Signals - Analog Data, Analog Signals - Spread Spectrum.

Data Communication Interface Asynchronous and Synchronous Transmission - Line Configurations - Interfacing.

Unit III

Data Link Control Flow Control - Error Detection - Error Control - HDLC - Other Data Link Control Protocols. **Multiplexing** FDM, Synchronous TDM, Statistical TDM

Unit IV

Circuit Switching Switched Networks - Circuit Switching Networks - Switching Concepts - Routing in Circuit Switching - Control Signaling.

Packet Switching Packet Switching Principles - Routing - Congestion Control - X.25 **Frame Relay** Protocol Architecture - Frame Relay Call Control - User Data Transfer - Network Function - Congestion Control

Unit V

Types of Networks - LAN - MAN - WAN **Local Area Network** LAN Architecture - LAN Topologies - Wireless LAN - ALOHA: Pure and Slotted ALOHA - CSMA - CSMA/CD - Collision Free - Token Ring and FDDI - Bridges - Routers

References

1. William Stallings, Data and Computer Communications, Prentice Hall
2. Andrew Tanenbaum, Computer Networks, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 307	Systems Analysis and Design	3	1	0	3	-

Course Objectives:

- To enable the students to understand concepts of system, its life cycle and system analyst
- To enable the students to understand the different stages in system development like analysis and design

Unit - I

Systems Concepts, System Development Life Cycle & the Role of Systems Analyst Introduction - Definition of System - Characteristics of a System - Elements of a System - Types of System. System Development Life Cycle - Considerations for Candidates Systems -Definition of Systems Analyst -Multifaceted Role of Systems Analyst

Unit - II

Systems Analysis, Initial Investigation & Information Gathering Introduction - Bases for Planning in Systems Analysis -Initial Investigation -What kinds of Information do we need? - Origination of Information - Information Gathering Tools

Unit - III

Feasibility Study and the Process and Stages of System Design System Performance Definition - Feasibility Study - Feasibility Consideration Steps in Feasibility Analysis - Feasibility Report - Oral Presentation. The process of Design - Design Methodologies - Major Development Activities

Unit - IV

Input - Output Forms, File Organization and Database Design Introduction - Forms - Input forms - Output forms - File Structure - File Organization - Database Design

Unit - V

System Testing and Quality Assurance, Security and Disaster/Recovery

Introduction - Why System Testing? - What do we test for? - The Test Plan System Security - Disaster / Recovery Planning **Project Management, Hardware & Software Selection:** Introduction - Project management, The computer Industry - Procedure for Hardware and Software selection

References

1. M. Awad, Systems Analysis and Design

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 309	**Database Management Systems**	3	0	3	4	-

Course Objectives:

- To enable the students to understand concepts, terminologies and requirements for database
- To enable the students to design and implement database system

Unit - I

Database Basic Terminology: Database and Database Properties, Database Management Systems, Characteristics of Database Systems, Uses of Database Systems, Data Models, DBMS Architecture, Data Independence, Database Languages and Interfaces, Database System Environment

Unit - II

The E-R Model: Introduction, Entities, Attributes, Domain of Attributes, Relationships, Conventions for Drawing E-R Diagram, Generalization, Specialization, Aggregation and Association

Unit - III

Data Models: Hierarchical Data Model - Network Data Model - Relational Data Model: Relation, Properties of Relations, Relational Model Notations, Relational Constraints, Relational Operations and Dealing with Constraint Violations, Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus, Codd's Rules for RDBMS

Unit - IV

Database Normalization: Introduction, Full and Partial Functional Dependencies, Transitive Dependency, Properties of Functional Dependencies, Multi Valued Dependency, Properties of MVD, Join Dependency, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form

Unit - V

Structured Query Language: Data Definition Language - Create Table, Alter Table, Drop Table, Describe, Create View, Drop View, Create Index, Drop Index. **Data Manipulation Language**: Inserting, Deleting, and Updating Data, Single Table Queries, Multi-Table Queries, Sub-Queries. **Transaction Control Language**: Begin, Rollback and Commit Transaction, Transaction with Save Points.

References

1. Elmasri and Navathe, Database System Concepts,

2.Henry Korth, Database Management Systems

3. C.J. Date, Data Base System Concepts Vol I and Vol II

4.Johnson, Data Base Design and Programming

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 302	Design and Analysis of Algorithms	3	0	3	4	CSE 303

Course Objectives:

- To enable the students to understand different techniques used to develop algorithms and its implementation for a stated problems
- To enable the students to analyze algorithm for its efficiency

Unit I

Analysis of Algorithms: Space and Time complexity - Asymptotic notations - Performance measurement.

Unit II

Divide and Conquer Technique: Divide and Conquer – Technique - Towers of Hanoi problem - Quick sort, merge sort - solving recurrence relations.

Unit III

Greedy Method: Greedy Method - Greedy method - Optimization problems - 0/1 Knapsack problem - Topological sorting - Single source shortest paths - Minimum cost spanning trees.

Unit IV

Dynamic Programming: Dynamic Programming - Method - 0/1 Knapsack problem - Matrix multiplication chains - All pairs shortest path.

Unit V

Backtracking and Branch and Bound Technique: Backtracking - Method - Traveling salesman problem - 8 Queens problem - Branch and bound method.

Unit VI

Text Processing: Text alignment: left, right, justify. Pattern Matching: linear, sub-linear pattern matching. Text Encryption and Decryption. Compression Techniques.

References

1. Aho, Hopcroft and Ullman, Design and Analysis of Algorithms, Prentice Hall
2. Sartaj Sahni, Data Structures, Algorithms and Applications in C++,McGraw Hill

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 304	**Software Engineering**	3	0	0	3	CSE 307

Course Objectives:

- To enable the students to understand concepts of software engineering used for system development
- To enable the students to understand the concepts and importance of analysis, cost & time estimation, design, implementation, testing, validation, and post implementation during system development

Unit - I

Requirements Engineering: Introduction - Computer based Systems Engineering - Systems and their environment, procurement, systems engineering process, architecture and modeling - Requirements Engineering - Requirement engineering process, software requirements document, validation of requirements, Evolution of requirements. Requirement Analysis - viewpoint oriented analysis, method based analysis, system contexts, social and organizational factors. System models - data flow models, semantic data models, object models, data dictionaries.

Unit - II

Software Design: Design process, design strategies, system structuring, modular decomposition, object oriented design, function oriented design, data flow design, User interface design, design principles.

Unit - III

Verification and Validation: Testing process, test plan and test strategies - defect testing, black box testing, structural testing, interface testing, static verification, program inspections, static analysis tools.

Unit - IV

Management Issues: Project Management, management activities, project planning, project scheduling, managing people, project staffing, group working, working environments.

Unit - V

Cost Estimation and Quality Assurance - Software cost estimation - Estimation techniques. Quality Assurance - Software standards, Documentation standards.

Unit - VI

Software Maintenance: Enhancing Maintainability during Development, Managerial Aspects of Software Maintenance, Configuration Management, Source Code Metrics.

Software Re-Engineering: Source Code Translation, Reverse Engineering, Data Re-engineering.

References

1. Ian Sommerville, Software Engineering, Addison Wesley
2. Roger S. Pressman, Software Engineering - A Practitioner's Approach, McGraw Hill

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 306	**Computer Networks**	3	0	3	4	CSE 305

Course Objectives:

- To enable the students to understand concepts and functions of different protocols at network, transport layer
- To enable the students to understand concepts of security: Encryption and decryption techniques.
- To enable students to configure network systems

Unit - I

IP Addressing: Introduction - Classes of IP Address - Special Address:Loop back Address, Unicast, Multicast and Broadcast Address -Subnetting and Supernetting - Delivery and Routing of IP Address - Routing Methods - Routing Table - Routing Module - IP Protocol - Datagram Format – Fragmentation - Checksum in IP Packets - IP Design.

ARP: ARP Packet Format, Operations. RARP: RARP Packet Format

UNIT - II

ICMP and IGMP: Internet Control Message Protocol – Introduction - Types of Messages - Message Format - Error Report – Query - ICMP Design. Internet Group Management Protocol – Multicasting - Types of Messages - Operations of IGMP in a single network - Operations of IGMP in an Internet - Changing IP Addresses to Physical Addresses - IGMP Design.

UNIT - III

User Datagram Protocol (UDP) - Process to Process Communication - Port Numbers - User Datagram - UDP Operations - Flow and Error Control - Encapsulation and Decapsulation – Queueing - Multiplexing and Demultiplexing - UDP Design.

UNIT - IV

Transmission Control Protocol (TCP) - Process to Process Communication - TCP Services – Segment - Flow and Error Control - Error Detection and Correction - TCP Timers – Connection - TCP Operations - TCP Design.

UNIT – V

Netware Protocols – IPX and SPX . DECnet. Appletalk. ISNA (IBM Systems Network Architecture) Protocols.

UNIT – VI

Network Security - Authentication - Digital Signatures.

References

a. *Andrew S. Tanenbaum, Computer Networks*

b. *William Stallings, Computer Networks*

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 308	**Computer Graphics**	3	0	3	4	CSE 201

Course Objectives:

- To enable the students to understand the different algorithms and its implementation for developing graphical applications
- To enable the students to understand transformation techniques and its implementations

Unit I

Introduction Graphics systems- Output primitives- Raster Scan Display system - Random Scan display processor. Input devices for operator interaction - Image scanners - Graphical Output devices

Unit II

Graphics Algorithms Raster Graphics Algorithms - Lines - circles - polygons - ellipse - pattern filling - character generation. Windows and Clipping - Line clipping.

Unit III

Geometrical Transformation Two-dimensional transformations - Homogeneous coordinates - composition of 2D transformations - Windows to View port Transformation

Unit IV

3D Graphics and Representation of Curves and Surfaces Interactive input methods - Three-dimensional concepts - 3D transformation techniques - viewing in 3D - Hidden surface and Hidden line removal algorithms. Polygon Meshes - Parametric Cubic Curves - Parametric Bi-cubic surfaces - Quadratic Surfaces

Unit V

Interaction Techniques, Dialog design, User Interface Design

Interaction Hardware - Basic Interaction tasks - Composite Interaction tasks - Form and Content of User - Computer dialogues - User Interface styles - Important design considerations - Modes and Syntax - Visual Design - the Design methodologies

References

1. Donald Hearn and Pauline Baker, Computer Graphics, Prentice Hall
2. James Foley, Andries Van Dam, Steven K Feiner, John Hughes, Computer Graphics, Addison Wesley

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 401	**Advanced Microprocessors**	3	0	3	4	CSE 301

Course Objectives:

- To enable the students to understand concepts of Assembly language programming using 8086 Microprocessor
- To enable the students to understand the organization of 8086, 80286, 386, 486 and Pentium based Processors
- To enable the students to understand the principles behind interfacing components to a Processor
- To enable the students to understand the Instruction sets of 8086, 286, 386, 486 and Pentium processors and to develop programs for various applications

Unit - I

8086/8088 Microprocessors: Architecture of 8086/8088 Microprocessor - Segmentation and Memory addressing in 8086/8088.

Unit - II

Assembly Language Programming: Assembly Language Programming: Data Transfer, Arithmetic and Logical Instructions - Addressing Modes - Assemblers. String Instructions - Machine Control Instructions - Macros and Conditional Assembly.

Unit - III

Hardware Features of 8086/8088 and Memory Interfacing: Features of 8086/8088 - Pin details - Clock generator - Bus buffering - Latching and Timing diagrams - Ready and wait states - Min/Max modes. Memory Interfacing - Memory: Address decoding - 8/16 bit memory interfacing.

Unit - IV

Interrupts and I/O Interfacing: Interrupts - Interrupts and its processing. 8259A PIC. I/O Interfacing - Simple I/O interfaces - Address decoding - 8255 and 8254 devices and its operation modes. ADC and DAC.

Unit - V

The 80186/286 Microprocessors The 80186 Microprocessor: Internal Architecture. Instruction Set. The 80286 Microprocessor, Introduction, Internal Architecture, Data Types, Addressing Modes, Memory Management, Protection.

Assembly Language Program Syntax, Statement Format, Data Types & variables, Operators, Directives, Writing COM programs, Program Logic and Control, Screen &

Keyboard, Processing, String Operations, Processing Binary Data, Processing ASCII and BCD Data, Table Processing, Subprograms.

Unit - VI

The 80386/486 Microprocessors The 80386 Microprocessor: Introduction, Internal Architecture, Memory Organization & Segmentation, Data Types, Registers, Addressing Modes, 80386 Modes, Instruction Set, The 80486 Microprocessor: Introduction, Internal Architecture.

References

1. Doughlas V Hall, Microprocessors and its Interfacing
   Barrey B. Brey, The Intel Microprocessor 8086/8088, 80186, 80286, 80386, 80486, Pentium and Pentium Pro-Processor - Architecture, Programming and Interfacing, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 403	**Computational Methods**	2	1	2	3	SC 202

Course Objectives:

- To acquaint the fundamental computational methods to solve scientific and engineering problem.

Number System and Numerical Error Analysis; Solution of Nonlinear Equations; Review Matrices; System of Linear Equations; Solution of Systems of Nonlinear Equations; Interpolation and Approximation; Numerical Differential and Integration; Numerical Solutions of Differential Equations

References:

1. Ralston A. and P. Rabinowitz: A First Course in Numerical Analysis, 2nd ed, McGraw Hill, New York, 1987
2. Conte S.D. and Carl de Boor: Elementary Numerical Analysis An Algorithm Approach, 3rd ed, McGraw Hill Int. Student ed, 1981
3. Jain M.K., S.R.K. Iyenger and R.K. Jain: Numerical Methods for Scientific and Engineering Computation, 2nd ed, Wiley Eastern Ltd., 1985

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 405	**Systems Programming**	3	0	3	4	CSE 301

Course Objectives:

- To enable the students to understand the concepts of Systems programming
- To enable the students to concepts of design and implementation of Assembler, Editors, Linkers and Loaders

Unit - I

Machine Structure - Evolution of the Components of a Programming system-Evolution of Operating systems - Operating System - User View points on Functions-Batch Control Language - Facilities

Unit - II

Machine Structure, Machine Language and Assembly language - General Machine structure - memory - register - instructions - special features - machine language - long way, no looping - address modification using instructions as data - Address modification using index registers - looping - assembly language-

Unit - III

Assemblers - general design procedure - design of assembler - statement of problem - data structure - format of databases - algorithms - look for modularity - table processing - sorting

Unit - IV

Macro language and the macro processor - macroinstructions - features of a macro facility - arguments - expressions - calls - defining macros - implementation - single pass algorithm

Unit - V

Loaders - loader schemes - compile and go - general loader scheme - absolute loaders - subroutine linkages - relocating loaders - direct linking loaders - design of an absolute loader - design of a direct linking loader

Unit - VI

Compilers -recognizing basic elements - syntactic units and interpreting - statement of problem - intermediate form - storage allocation - code generation -

Unit - VII

LEX and YACC

References

1. John J. Donovan, Systems Programming, Prentice Hall
2. Bach, Systems Programming

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 407	**Micro-Controllers**	3	0	3	4	CSE 301

Course Objectives:

- To enable the students to understand concepts of Assembly language programming using 8051/8096 Micro-controller
- To enable the students to understand the organization and Instruction sets of 8051/8096 Micro-controller
- To enable the students to understand the principles behind interfacing components to a Micro-controller

Unit - I

Microprocessors and Micro-Controllers

Introduction - Microprocessors Vs Micro controllers - Development of Micro Controllers (4,8,16,32 bit)

Unit - II

Micro controller 8051

Architecture - Pin configurations - Ports and Circuits - Extended Memory - Serial data I/O - Interrupts. **8051 Instruction Sets** Moving Data - Arithmetic - Logical - Jump and Call - Programming Examples.

Unit - III

8051 Micro controller Design

8051 Micro Controller Design Specifications - Micro Controller Design - Testing - Timing routines - Look up tables for 8051 - Serial Data Transmission

Applications Keyboard - Display - Pulse Measurement - ADC and DAC.

Serial Data Communications - Network configurations - 8051 Communication Modes - Simple Programs

Unit - IV

8096 Micro Controller (16 bit) - Architecture - Pin Configurations

Unit - V

Instruction Set of 8096 - Programming Examples.

Comparison of 8051 and 8096

References

1. Micro-Controllers, M. Ayala

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 409	System Simulation and Modeling	3	0	3	4	-

Course Objectives:

- To enable the students to understand concepts and importance of simulation and modeling
- Introduce languages used for simulation
- To enable the students to understand the principles behind simulation
- To develop models for different cases

Unit - I

Introduction

System models- System studies - System simulation - Continuous system simulation - System dynamics. Probability concepts - Arrival of pattern & service times.

Unit - II

Random Number Generation and Random Varieties

Random Numbers - Role of random numbers in simulation - pseudo random number generation techniques.

Random Varieties - Generation - Inverse transformation technique - Direct transformation - Acceptance Rejection technique.

Unit – III

Queuing Models

Characteristics of Queuing Systems -Queuing Notations - Long-Run Measures of Performance of Queuing Systems - Steady state behavior of Infinite-Population Markovian Models -Steady state behavior of Finite-Population Models

Unit - IV

Simulation Languages

Simulation Languages - Introduction to GPSS & SIMSCRIPT.

Unit - V

Input Modeling

Data collection - Distribution - Estimation of Parameters - Goodness of fit tests - Chi Square test - Effect of Covariance and correlation of quantity of data.

Unit - **VI**

Verification and Validation of Models

Verification and Validation of models - Guidelines for verification of models - face validity - validation of model assumptions - validation of input-output transforms - use of historical data - Evaluation of Simulation experiments

References

1. Jerry Banks, John Carson and Barry Nelson, Discrete Event System Simulation, Prentice Hall
2. Geoffrey Gordon, System Simulation, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 402	**Operating Systems**	3	1	0	3	CSE 405

Course Objectives:

- To enable the students to understand concepts used in the design and implementation of different operating systems
- To enable the students to understand the concepts of deadlock and its avoidance

UNIT - I

Introduction

Operating System: Batch Operating System, Time Sharing Systems, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems.

Operating System Concepts: Processes, Memory, Files, I/O, System Calls, The Shell.

Operating System Structures: Monolithic Systems, Layered Systems, Virtual Machines, Client-Server Model

Unit - II

Process Management

Process Model: Operation on Processes, Co-operating Processes - Threads - Inter-process Communication.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, Priority, Round Robin, SRT, Multilevel Queue, Multilevel Feedback Queues, Two Level

Unit - III

Memory Management

Introduction - Address Binding - Dynamic Loading -Dynamic Linking -Overlays: Logical versus Physical Address Space.

Swapping -Contiguous Allocation - Single Partition -Multiple Partition -Internal and External Fragmentation

Re-locatable Partitioned Memory Management - Paging: Simple Paging, Multilevel Paging, Inverted Page Table, Shared Pages, Demand Paging.

Page Replacement Algorithms: FIFO, Optimal, Not Recently Used, Second Chance, Clock, Least Recently Used.

Segmentation - Segmentation with Paging

UNIT - IV

File System Management

File: File Naming, File Structure, File Types, File Access - File Attributes, File Operations.

Directory: Directory Structure - Single Level, Two Level, Hierarchical, Graph, Directory Operations.

File System Implementation: File System Structure, File Allocation Methods, Contiguous, Linked List, Indexed Directory Implementation: Linear List, Hash Table.

Free-Space Management: Bit Vector, Linked List, Grouping, Counting, Recovery - Bad Block Management - Consistency Checking - Backup and Restore - File System Security

Unit - V

I/O Management I/O Hardware: Device Controllers, Polling, Interrupts, DMA

Disks: Disk Scheduling Algorithms - FCFS, SSTF, SCAN, C-SCAN - LOOK

Disk Management: Formatting, Boot Block, Bad Blocks, Swap-Space Management - Clocks - Hardware - Software - Terminals

Hardware - Memory Mapped Terminals - Input Software - Output Software

Unit - VI

Deadlocks

Resources - Deadlocks: Condition for Deadlocks, Deadlock Modeling - Deadlock Detection: Detection with one Resource of each type, Detection with multiple Resources of each type - Deadlock Recovery: Process Termination, Preemption, Rollback, Killing Processes - Deadlock Prevention: Mutual Exclusion, Hold and Wait, No preemption, Circular Wait

Deadlock Avoidance - Safe Sate, Resource-Allocation Graph Algorithm, Banker's Algorithm

References

1. A. Tanenbaum, Modern Operating Systems, Prentice Hall
2. Peterson, Operating Systems Concepts, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 404	**Compiler Design**	3	0	3	4	CSE 405

Course Objectives:

- To enable the students to understand concepts used in the design and implementation of different compilers

Unit - I

Introduction to Compilers and Lexical Analysis: Introduction to Compilers - Phases of a Compiler - Grouping of Phases. Lexical analysis - Role of Lexical Analyser - Specification of tokens - Recognition of tokens. Finite Automata: NFA and DFA – Constructing NFA from a Regular expression – Constructing DFA from Regular expression – Minimizing number of states.

Unit - II

Syntax Analysis: Syntax Analysis - Parser - Role of Parser - Context free grammars - Grammar - Regular Expressions Vs Context Free Grammars -Verifying the language generated by a Grammar - Eliminating Ambiguity -Eliminating Left Recursion -Left Factoring. Top Down Parser - Bottom Up parser - Operator Precedence Parser - LR parser: LR, SLR and canonical LR parsing.

Unit - III

Syntax Directed Translation: Syntax Directed Translation Schemes - Implementation of Syntax Directed – translators - Intermediate Code - Postfix Notation - Parse Trees and Syntax Trees - Three Address Codes – Quadruples – Triples - Translation of Assignment – Statements –Boolean expressions - Statements that Alter the Flow of Control - Postfix Translations - Translation with a Top-Down Parser

Unit - IV

Run Time Environments: Storage allocation Strategies - Parameter Passing - Symbol tables - Dynamic storage allocation.

Unit - V

Code Generation and Code Optimisation: Intermediate Code Generation - Intermediate Languages - Assignment Statements - Boolean Expressions - Case statements - Code Generation - Design of Code Generator - Basic Blocks and flow graphs - Register Allocation and assignment - DAG - Error detection and Error recovery. Introduction to code optimisation - Principle - Optimisation of basic blocks - loops in flow graphs.

References

1. Alfred V Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers - Principles. Techniques and Tools. Addison Wesley
2. Dhamdhere, Compiler Design and Construction

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 406	**Artificial Intelligence and Expert Systems**	3	0	0	3	-

Course Objectives:

- To enable the students to understand concepts used in the design and implementation of Artificial Intelligence and Expert Systems

Unit - I

Introduction

Introduction - AI - Predicate Calculus and Inference rules - State space search.

Unit - II

Heuristic Search

Algorithms - Admissibility - Monotonicity - Complexity issues - Control and Implementation of state space search - recursion based search - pattern directed search - production systems - predicate calculus

Unit - III

Knowledge based Systems

Knowledge - Rule based systems - Reasoning - case based reasoning - Reasoning with uncertain or incomplete information - uncertainity - Knowledge Representation.

Unit - IV

AI Languages - LISP and Prolog.

Unit - V

Expert Systems

Expert Systems - Introduction - Structure of Expert System - Benefits - Limitations of Expert system - Types of Expert system - Methods of knowledge acquisition - machine learning - Intelligent agents - selecting appropriate knowledge.

References

1. E. Rich and Knight, Artificial Intelligence Tata McGraw Hill
2. G.F. Luger and W.A. Stubblefield, Artificial Intelligence - Structures and Strategies for Complex Problem Solving, Addison Wesley

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 501	PC Hardware Troubleshooting	3	0	3	4	CSE 401

Unit - I

Inside a PC: Components - SMPS, Motherboard, Drives, Expansion slots - Opening and Closing System - Tips for working inside a PC.

Monitor - CRT, CRT Drive Board, Raster Drive Board, Onscreen Basic Controls, Advanced Controls, Disassembly and Reassembly.

BUS Structures ISA Bus - 8/16 bit Bus - Signals Problems when mixing 8 and 16 bit Bus - EISA Bus - Signals - Configuring - SCSI Bus - Signals - Troubleshooting.

Unit - II

Operating System and Boot Process PC Hierarchy - Hardware - BIOS & OS - Applications - MS-DOS - IO.SYS - MSDOS.SYS - IO.SYS and MSDOS.SYS variations under WIN'95 - Adjusting MSDOS.SYS - COMMAND.COM - Boot Process: Bootstrap, Core Test, POST, Finding and Loading OS, Establishing Environment, Warm and Cold Booting

Unit - III

System Trouble Shooting: CPU Identification and Troubleshooting - Basic CPU - Modern CPU Concepts - Intel CPUs - 86/88, 186, 286, 386, 486, Pentium, Pentium-Pro, MMX - CPU Over clocking - Troubleshooting CPU Problems.

Drive Adapter References: ST-506 - features & architectures - ESDI - features & architectures - IDE - features & architectures - EIDE - features & architectures - Formatting & Troubleshooting a driver adapter

Unit - IV

Memory Troubleshooting: Memory Organization - Signals - Add on memory devices - Memory layout - Memory installation and options - Recycling older memory devices & troubleshooting - Memory Managers - Protecting the configuration - Optimizations for config.sys - Optimizing the Autoexec.bat - Mix and match - Adjusting memory environment for DOS under WIN'95 - Troubleshooting HIMEM/EMM386

Devices Troubleshooting: Keyboard and Mouse - Interfaces - Correcting Keyboard/Mouse Problems - Cleaning and Maintenance - Troubleshooting.

Printers - Understanding the Writing Mechanisms of EP Printer - EP printer cartridge - Troubleshooting EP Printer

System Board: Understanding types of System Boards - Troubleshooting the System Boards

Ports: Understanding the Ports - Troubleshooting the Port Problems

UNIT - V

System Up gradation: Up grading the Peripherals - Adding BIOS - Enhancing the Drive Performance

Preventive Maintenance: Data Protection - Cleaning - External and Internal Check - Drive Check - Preventive Maintenance and Troubleshooting.

System Assembly Procedures - Case and Power Supply Assembly - Assembling Main board - Set upping Hard drive - Set upping Mouse and Multi-media

References

1. A+ Certification Book

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 503	Cryptography and Network Security	3	0	3	4	CSE 306

Unit - I

Introduction - Attacks - Security services - Model of Inter-network security- Conventional Encryption Model - Stenography - Classical Encryption Techniques - Simplified DES - Block Cipher Principles - Data Encryption Standards - Differential and Linear Encrypt Analysis - Algorithms - Triple DES - International Data Encryption Algorithm - Random number generation.

Unit - II

Public Key Cryptography - Principles - RSA algorithm - Key management - Number theory - Prime and relatively prime numbers - modular arithmetic - Fermat's and Euler's theorem - testing for primality - Euclid's algorithm - Chinese remainder theorem - message authentication and hashing - authentication requirements - authentication functions - message authentication codes - Digital Signatures - authentication protocols - Digital Signature Standards

Unit - III

Authentication applications - Electronic mail security - Pretty Good Privacy - IP security - IP security Architecture - Authentication header - Encapsulating Security Payload - Combining Security Associations - Key management

Unit - IV

Web security - Web security requirements - Secure Socket layer and Transport layer security - secure electronic transaction - Intruders - Viruses - Fire walls - Fire wall design principles - Trusted systems.

References

1. Richard E Smith, Internet Cryptography, Addison Wesley
2. Chapnew D and Zwicky, Building Internet Firewalls, O'Reilly
3. Chris Brenton, Mastering Network Security, BPB Publications

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 505	Neural Networks and Fuzzy Logic	3	0	0	3	-

Course objectives:

- To understand basic Artificial neural network and architecture.
- To study the human intelligence, brain and neurons, implement the same using hardware and software methods
- To understand the fuzzy mathematics and apply this theory to understand the vague or fuzzy system into non-fuzzy system
- To apply the Fuzzy system on to artificial neural network to make system adaptive and intelligent

Unit - I

Basics and Functional Units of ANN

Characteristics - Model of a neuron - basic learning laws - stability and convergence.

Unit - II

Feed Forward, Feedback and Competitive Learning

Analysis of pattern Association Networks, Analysis of Pattern classification Network - Analysis of Pattern mapping Network - Stochastic networks - simulated annealing - Boltzman machine - components of competitive learning - Analysis of feedback layer for different output functions - Analysis of pattern clustering networks - analysis of feature mapping network.

Unit - III

Architectures and Applications of ANN

Associative memory pattern mapping - ART- temporal patterns - pattern variability - Neo-cognitron - Application areas.

Unit - IV

Fuzzy Sets

Applications - Fuzzy relations - types of binary fuzzy relations - fuzzy relation equations - fuzzy measures - fuzzy integrals - measures of fuzziness - fuzzy arithmetic.

Unit - V

Fuzzy logic

Linguistic variables - Approximate reasoning - Basic concepts of integrating fuzzy systems and Neural networks - equivalence of fuzzy inference systems and Neural networks.

References

1. Bart Kosko, Neural Networks and Fuzzy Systems, Prentice Hall
2. Yegnanarayana, Neural Networks and Fuzzy Systems, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 509	**Mini Project**	0	0	2	1	-

Course Objectives:

- To enable the students to perform analysis, design and implementation of a Hardware or a software system

The students will be assigned to carryout the design and implementation of hardware/software project. The instructor will assign or the student can choose/select his project on any topic, which they have studied. This work starts from the beginning of the semester, after completion of this project; the students should submit the report to the department. The students have to present the work they have done to the committee nominated by the department to evaluate the work for grading.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 504	**Final Project**	0	0	12	4	-

Project assignments on specific areas of specialization are given to groups/individual. At the end of the semester project is evaluated.

ELECTIVE - I

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 408	**Real Time Systems**	3	0	0	3	-

Course Objectives:

- To enable the students to perform analysis, design and implementation of a Real Time system

Unit - I

Introduction to Real Time Systems: Structure of Real Time systems - characteristics of Real Time Systems - performance measures - estimation of program run-times.

Unit - II

Task Assignment of Scheduling: Uni-processor scheduling algorithms - Task assignment - Mode changes - Fault Tolerance scheduling

Unit - III

Real Time Communication: Network topologies and architecture issues - protocol contention based - token based - stop and go Multi hop - polled bus - hierarchical - round robin - deadline based - fault tolerant routing.

Unit - IV

Real Time Databases: Comparison of Real time and General purpose databases - transaction priorities - transaction aborts - concurrency issues - Databases for Real time systems.

Unit - V

Programming languages and Tools: Desired language characteristics - Data typing - control structures - hierarchical decomposition - packages - run time error handling - overloading and generics - multitasking - timing specification.

References

1. C.M. Krishna and Kang. G. Shin, Real Time Systems, International Editions
2. Philip A. Laplante, Real Time System Design and Analysis - An Engineers Handbook, IEEE Press, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 408A	**Distributed Systems**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the principles and concepts in the design and implementation of distributed system

Unit - I

Hardware Infrastructure: Broadband Transmission Facilities - OSI standards - LAN - WAN - Network management -Network Security - Cluster Computers

Unit - II

Software Architectures: Client-Server Architectures - Design methodologies - Intranets and Groupwares - Hardware and Software for Intranet - Groupware and Features - Network as a computer - The Internet - IP addressing - Internet Security - Open Systems - Concepts and reality

Unit - III

Operating Systems Issues: Distributed Operating Systems - Transparency - Inter Process Communication - Client Server Model - Remote Procedure Call - Group Communications - Threads - Systems Models - Process Synchronization - Deadlocks - Solutions - Load Balancing - Distributed File Systems - Distributed Shared Memory Systems - Micro Kernels

Unit - IV

Fundamental Distributed Computing Aspects: Theoretical Foundations - Logical clocks - Vector clocks - Global State Termination - Correctness - Election Algorithms - Termination Detection - Fault Tolerance - Missing Token - Consensus Algorithms - Byzantine - Consensus - Interactive Consistency

Unit - V

Managing Distributed Data: Distributed Databases - Distributed Transparency - Distributed Database Design - Query Transition - Query Optimization - Concurrency Control - Object Oriented Databases - Strategic Considerations - Applications of Object Oriented Databases

References

1. Sape Mulleuder, Distributed Systems, Addison Wesley
2. Albert Flieshman, Distributed Systems, Software Design and Implementation, Springer-Verlag

ELECTIVE - I

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
ECE 507	Micro-Electronics	3	0	0	3	-

Refer the ECE Specialization listings for the Course Description

ELECTIVE – II

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 507	**Embedded Systems**	3	0	0	3	-

Course Objectives:

- To enable the students to perform principles and concepts in designing and implementation of Embedded system

Unit - I

Overview and Introduction to Embedded Computing: Overview of 8086, 8051 and 8096 micro-controllers – Embedding computing applications – challenges in embedded computing system design process - formalisms for system design.

Unit - II

Architectures Computer architecture taxonomy – ARM processor– typical embedded system architecture.

Unit - III

Embedded Computing Platforms and Operating Systems: CPU bus – memory devices – I/O devices – component interfacing – designing with microprocessors – development and debugging – multiple tasks and multiple processes - context switching – operating systems – scheduling policies – IPC mechanism – Evaluating operating system performance.

Unit - IV

Hardware Acceleration and Networks: CPUs and accelerators – Accelerated system design – distributed embedded architectures – Networks for embedded systems – Network based design – Internet embedded systems

Unit - V

System Design Techniques: Temperature control system – traffic control system – PID controller –Simple digital filter – telephone PBX – Ink Jet Printer – PDA

References

1. Wayne Wolf, Computers as Components - Principles of Embedded Computing System Design, Morgan & Kaufmann
2. Jonathan W. Valvano, Embedded Microcomputer Systems - Real Time Interfacing, Thomson Asia Pvt. Ltd

Steve Heath, Embedded System Design, Newness Publications

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 507A	**Design using HDLs**	3	0	0	3	-

Course Objectives:

- To enable the students to understand about HDLs and able to design and implement systems using HDLs

Unit I

VHDL - Development Language for Advanced PLDs

Brief Overview of FPGA - Field Programmable Gate Arrays

Introduction to VHDL: VHDL uses - Design Methodology - Simulation.

Unit II

VHDL Structure

Entity - Architecture - Signal Assignments: Data Types, Arrays - Process - Variable assignments.

VHDL Operators: Assignment , logical, arithmetic

If-then-else, for loop, when-else, functions, sensitivity list.

Unit III

VHDL Models

Structure - behavioral - data flow - example VHDL listings

Unit IV

Verilog Hardware Descriptive Language

Introduction and syntax rules - modules - data types - arrays, parameters, strings - operators - conditional and looping statements.

Systems tasks and compiler directives - assignment operators and procedures - time delays - functions and tasks

References

1. Roth, Digital Design Using VHDL
2. Palnitkar, Verilog - A Synthesis Premier

ELECTIVE - II

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 507B	Software Testing and Validation	3	0	0	3	-

Course Objectives:

- To enable the students to understand the importance of software testing and validation
- To understand the different techniques in software testing and validation

Unit - I

Software Testing Technique: Fundamentals – Test case design – static and dynamic testing – white box testing – basis path testing – control structure testing – black box testing – testing for specialized environments, architectures and applications.

Unit - II

Testing Methods: Verification testing – validation testing – integration testing – controlling validation costs – system testing – tasks deliverables & chronology – Software testing tools and measurement

Unit - III

Object Oriented Testing: Testing OOA, OOD models – Object Oriented testing strategies

Clean Room Software Engineering – Design and Test – component based software engineering – classifying and retrieving components – Re-Engineering – Reverse Engineering – Restructuring – Forward Engineering

Unit - IV

Software Metrics: Software quality - ISO certification - Quality factors - measurement principles - metric for design model - metrics for source code - metrics for testing and maintenance - Object oriented metrics - operation oriented metrics - debugging

Unit - V

Quality Management: Software Engineering Environments - Platform services - framework services - Quality Management - Software Cost Estimation – Process Improvement. Case Studies.

References

1. Edward Kit, Software Testing in the Real World Improving the Process. Addison Wesley
2. Roger Pressman, Software Engineering - A Practitioner's Approach, McGraw Hill

ELECTIVE – III

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 502	**Image Processing**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts and techniques in Image Processing

Unit - I

Image Representation

Introduction-Image-elements of digital image processing-types of images-digitizing-characteristics of image digitizer-types of digitizer-image digitizing components-cameras-scanner-film scanning - Image model - Sampling and Quantization - Relationship between pixels - image geometry.

Unit - II

Fourier Transform

Overview of Fourier transform - DFT - FFT.

Unit - III

Spatial Domain and Frequency Domain methods

Enhancement by point processing - Enhancement in the frequency domain - spatial filtering

Unit - IV

Edge Detection

Edge linking and boundary detection - thresholding - use of motion in segmentation - region oriented segmentation.

Unit - V

Image Compression

Fundamentals of Image compression - Image compression models - elements of information theory - Error free compression - Lossy compression

References

1. Rafel C. Gonzalez and Richard E. Woods, Digital Image Processing, Addison Wesley
2. Anil K. Jain, Fundamentals of Digital Image Processing

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 502A	**Performance Evaluation of Computer Systems**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the techniques in evaluating the performance of computer systems

Unit I

Introduction: Introduction to Performance Evaluation - Metrics - workload - problem of workload characterization - representative ness of a workload model -Test work load - workload model implementation techniques - measurement - Hardware and software monitors

Unit II

Queuing Network Modeling: Overview - modeling cycle - understanding the objective of the study - workload characterization - sensitivity analysis - sources of insight - fundamental laws - queuing network model inputs and outputs

Bounds of Performance: Asymptotic bounds - using asymptotic bounds - balanced system bounds - models with one job class - workload representation - solution techniques

Unit IV

Memory: System with known average multiprogramming level - memory constraints - swapping - Disk I/O - channel in NON - RPS I/O subsystems - channel contention in RPS I/O subsystem - additional path elements - multipathing - other architectural characteristics - processors

Unit V

Parameterization: Existing systems - Evolving systems - proposed system - Simulation - Analysis of Simulation results - Simulation of general and extended queuing networks - Response time distributions - LAN - Models - Link performance - Transaction response - Link throughput - Multiplexed link capacity - Ethernet, Token ring performance analysis

References

1. Edward D.Lazawska, John Zahirja, Scott Graham, Kenneth Sevick, Quantitative System Performance - Computer System analysis with queuing network models, Prentice Hall

2. Michael F. Mories and Paul F. Roth, Tools and Techniques, Computer Performance Evaluation, VAn Nostrand, New York

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 502B	**Pattern Recognition**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts and techniques in Pattern Recognition

Unit I

Introduction

Machine perception - classification model - Bayes decision theory - Two category classification - minimum error rate classification - Discriminant functions and decision surfaces - Bayesian decision theory.

Unit II

Parameter estimation and Supervised Learning

Maximum likelihood estimation - Bayes classifier - learning the mean of a Normal density - estimating the error rate.

Unit III

Non Parametric Techniques

Density estimation - Nearest neighbor - K-nearest neighbor rule - estimation - Fisher's Linear discriminant function - multiple discriminant function.

Unit IV

Linear Discriminant function

Linear discriminant functions and decision surfaces - generalized discriminant functions. Unsupervised Learning and Clustering - Mixture density and identifiability - Maximum likelihood estimates - unsupervised Bayesian learning - Clustering - criterion function for clustering - clustering and dimensionally reduction.

Unit V

Neural Pattern Recognition

Introduction to ANN - Neural pattern associators and matrix approaches - Neural network based pattern associators - matrix approaches and examples.

References

1. Richard O. Duda and Peter E. Hart, Pattern Recognition
2. Robber J. Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches, John Wiley and Sons, Newyork.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
CSE 508	**Computer Communication Networking**	**3**	**0**	**0**	**3**	**-**

UNIT-I

Introduction: The uses of computer network, Network structure, Network Architecture, The OSI reference model, The TCP/IP reference model, Services, network standardization, example networks.

UNIT-II

The Physical Layer: Transmission and switching

Frequency and time division multiplexing, circuit switching, Packet 8 switching, Hybrid switching, ISDN, ISDN System Architecture, The digital PBX, ISDN Interface, ISDN signaling, Perspective on ISDN, terminal handling, Polling, multiplexing versus concentration

UNIT-III

The medium access sub-layer, the local metropolitan area networks, the ALOHA protocols, LAN Protocols, IEEE standard 802 for LAN, Packet radio networks

UNIT-IV

The network layer design issue, Routine algorithms, Congestion control algorithms, Internet working, Network layer in the internet and ATM networks

UNIT-V

The transport layer, transport service, protocols, internet support protocol (TCP and UDP)

References:

1. Computer Networks- Tanenbaum PHI- 3rd Edition
2. Computer Communication Network Technologies: Michael A Gallo and Hancock, Thomson Publication , 2003 edition
3. Computer Networks, protocols, standards and interfaces
4. Data and Computer Communications- W.Stallings- PHI
5. Network for computer scientists and Engineers: Youn Zhen, Oxford press, 2002

Information Technology Specialization

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 202	Programming Languages and Paradigms	3	0	0	3	CSE 201

Course Objectives:

- To enable the students to understand concepts used in the design and implementation of different programming languages

Unit - I

Introduction

Study of principles and major concepts in various programming paradigms like imperative, functional, object oriented and logic programming.

Unit - II

Imperative Programming

Location, reference and expressions, assignment and control, data types, blocks, procedures and modules.

Unit - III

Object Oriented Programming

Classes and Objects - Abstraction and Encapsulation - Inheritance - Software reuse.

Unit - IV

Functional and Logic Programming

Functions as first class objects - higher order functions - polymorphic data types - type checking and type inferencing - Lambda calculus. Programming with Horn clauses, Unification - SLD resolution - Backtracking, Cuts

Unit - V

Concurrent Programming

Processes - Synchronization primitives - safety and liveness properties.

Illustration of above concepts using representative languages like ADA, C++, Java, Haskell, Prolog.

References

1. Ravi Sethi, Programming Languages - Concepts and Principles, Addison Wesley
2. T.W. Pratt, M.V. Zelkowitz, Programming Languages: Design and Implementation, Prentice Hall.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 204	**Web Design and Development**	3	0	3	4	-

Course Objectives:

- To enable the students to understand concepts, terminologies and requirements for Web based systems
- To enable the students to design and implement Web systems using different tools

Unit - I

Planning and Installing a website: Anatomy of a Web Presentation: The Web presentation, The Web site, Web pages, Home pages, Content of the web pages, Organizing and Navigating the web pages. Installing Your Own Web Server, Using an Internet Service Provider's Web Server with a Standard Account, Using a Commercial Online Service's Web Server with a Standard Account, Getting a Phantom Domain, Software for publishing the web page, Servers for Unix, Servers for Windows.

Unit - II

Creating Web Documents with HTML: Document Structure, Basic Tags, Lists, Hyperlinks and Bookmarks, Images and Image Maps, Marquees, Tables, Frames, Audio and Video.

Unit - III

Creating Websites with Microsoft FrontPage: FrontPage Client, Front Page Explorer, FrontPage Editor, FrontPage Personal Server and Components, Installation and Configuration, Limitations, FrontPage Server Extensions, FrontPage Utility Programs, FrontPage TCP/IP Test, FrontPage Server Administrator, FrontPage Publishing Wizard, FrontPage Software Developer's Kit

Unit - IV

Creating Websites with Netscape Navigator Gold: Netscape Gold as a Visual Editor, Visual Editing and Hard Coding, Creating a New Web Page, Document Editing, The Toolbars, Adding Links to the Page, Adding Images to a Web Page, Using Templates and the Page Wizard, The Web Page Starter Site, Interactive Table Design

Unit - V

Creating Web Sites with Macromedia's Backstage Desktop Studio: Backstage Designer Plus, Backstage Manager, Backstage Objects, Backstage Object Server, Creating a Backstage Site, Creating the Backstage Home Page, Designing in WYSIWYG, Adding Hypertext Links, Using Backstage's Objects Library, Creating Forms with Backstage, Inserting a Form Object Creating Discussion Groups with Backstage, Adding Plug-ins, Java Applets, and ActiveX.Using PowerApplets to Jazz up Pages, Animator, Banners, Bullets, Charts, Image map, Icons, using xRes SE for Dynamic Images in Backstage.

References

1. Raymond Greenlaw , Ellen Hepp -- Introduction to Internet for Engineers, McGrawHill
2. Berkeley OA, Hahn Harely --The Internet: Complete Reference, Osborne McGrawHill
3. Dick Oliver -- Netscape Unleashed, SAMS Publication

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 302	**Advanced Database Programming**	3	0	3	4	CSE 309

Course Objectives:

- To enable the students to understand concepts, terminologies and features of PL/SQL language
- To enable the students to design and implement sophisticated database system

Unit - I

Fundamentals of PL/SQL

Character Set, Lexical Units, Delimiters, Identifiers, Literals, Comments, Datatypes, User-Defined Subtypes, Datatype Conversion, Variable and Constant Declarations, Naming Conventions, Synonyms, Scope and Visibility, Assignments, Boolean Values, Database Values, Expressions and Comparisons, Operator and Operator Precedence, Handling Nulls, Built-In Functions, PL/SQL Blocks Structure.

Unit - II

Control Structures

Conditional Control: IF, IF-THEN, IF-THEN-ELSE, IF-THEN-ELSIF Statements.

Iterative Control: LOOP, EXIT, EXIT-WHEN, WHILE-LOOP, FOR-LOOP Statements

Sequential Control: GOTO, NULL Statements.

Unit - III

Collections and Records

Collection: Nested Tables, Nested Tables versus Index-by Tables, Varrays, Varrays versus Nested Tables, Defining and Declaring Collections, Initializing and Referencing Collections, Assigning and Comparing Collections, Comparing Whole Collections, Manipulating Collections, Using Collection Methods, Applying Methods to Collection Parameters, Avoiding Collection Exceptions, Taking Advantage of Bulk Binds, Using the FORALL Statement, Using the BULK COLLECT Clause, Using FORALL and BULK COLLECT Together, Using Host Arrays.

Records: Defining and Declaring Records, Initializing and Referencing Records, Assigning and Comparing Records, Manipulating Records

Unit - IV

Interactions with Oracle, Exception and Error Handling

SQL Support: Data Manipulation, Transaction Control, SQL Functions, SQL Pseudo-columns, SQL Operators.

Cursors: Explicit Cursors, Implicit Cursors, Packaging Cursors, Using Cursor FOR Loops, Using Cursor Variables, Using Cursor Attributes,

Processing Transactions: How Transactions Guard Your Database, Using COMMIT, Using ROLLBACK, Using SAVEPOINT, Implicit Rollbacks, Ending Transactions, Using SET TRANSACTION, Using Autonomous Transactions

Exception and Error Handling: Overview, Advantages of Exceptions, Predefined Exceptions, User-Defined Exceptions, Raising Exceptions, How Exceptions Propagate, Handling Raised Exceptions, Continuing after an Exception Is Raised, Retrying a Transaction, Using Locator Variables

Unit - V

Subprograms and Packages

Subprograms: Advantages of Subprograms, Understanding Procedures, Understanding Functions, Declaring Subprograms, Packaging Subprograms, Actual versus Formal Parameters, Positional versus Named Notation, Specifying Parameter Modes, Using the NOCOPY Compiler Hint, Restrictions on NOCOPY, Using Parameter Defaults, Understanding Parameter Aliasing, Using Overloading, How Calls Are Resolved, Invoker Rights versus Definer Rights, Understanding and Using Recursion, Calling External Routines.

Packages: Advantages of Packages, The Package Spec, The Package Body, Private versus Public Items, Overloading Packaged Subprograms, Package STANDARD, Product-specific Packages.

References

1. Oracle 8i Complete Reference, Oracle Press
2. Code, Relational Database Management Systems
3. Fundamentals of Oracle, Oracle Press
4. C.J. Date, Data Base System Concepts Vol I and Vol II

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 401	**Management Information Systems**	3	0	0	3	IT 302

Course Objectives:

- To enable the students to understand concepts, terminologies and requirements for the Management of Information Systems
- To enable the students to know how to Manage Information systems

Unit - I

Introduction: Challenge of applying IT successfully - Phases in Building and Maintaining systems - IT based Innovations in every business function - Progress in processing data - Concepts of understanding systems - need for frameworks and models - Five perspectives of Viewing a Work System - Process Modeling - Architectural Characteristics of a Business Process

Unit - II

Business Applications: Internet and Business - Interactive Marketing - Business Value of Internet - Customer value and the Internet - Fundamentals of Electronic Commerce - Business to Consumer Commerce and Business to Business Commerce - Electronic Payments and Security - Intranets and Extranets in Business -

Unit - III

Information Systems: Information systems for Business - Marketing - Manufacturing - Human Resource - Accounting and Financial Information systems - Transaction Processing Systems - Data Entry - Batch and Real Time Processing - Data Base Maintenance - Document and Report Generation - Inquiry Processing

Unit - IV

Business Applications: Information systems for managerial decision support - Decision Support System - Examples of DSS - Executive Information Systems - AI techniques in Business - Neural Networks and Fuzzy Logic, Genetic Algorithms, Virtual Reality - Expert Systems and Applications - Information systems for strategic Advantage - Strategic roles of Information Systems. Reengineering Business Process - Improving

Business Quality - Becoming and agile competitor - Challenges of Strategic Information Systems

Unit - V

Planning, Building and Managing Information Systems: Information Systems Planning - Process of Planning - Project Planning issues - System analysis revisited - Building and Maintaining Information Systems - Traditional Systems Life Cycle - Prototypes - Information system security and control - Threats - Factors that Increase the Risks - Methods for Minimizing Risks.

References

1. Laudon and Laudon, Management Information System: Organization & Technology, Prentice Hall
2. James O'Brien, Management Information Systems, Tata McGraw Hill

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 403	**Rapid Application Development**	3	0	3	4	IT 302

Course Objectives:

- To enable the students to understand concepts, terminologies and tools useful for developing Applications
- To enable the students to design and implement Information systems using different Rapid Application Development tools

Rapid Application Development: Introduction - Principles Behind RAD - Problems Addressed by RAD - RAD Goals - RAD Quality - RAD Properties - RAD Cost - Characteristics of RAD - When RAD works and when doesn't? Rapid Development - RAD Usage - RAD Essentials - RAD Project Structure - RAD – Business Analysis - RAD – Interactive Development - RAD – incremental Development - Advantages of RAD - Disadvantages of RAD - RAD Tools.

User Interface: User Interface Styles: Direct Manipulation, Menus, Forms, Command Language, Dialog Boxes, User Interface Design Guidelines.

Forms: Form Properties & Methods - VB Standard Controls: Label, Text Box, Command Button, Check Box, Option Button, Frame, Combo Box, List Box, Picture Box, Image, Hscroll Bar, Vscroll Bar, Timer, Shape, Line, Form-Fill-in Design Guidelines.

File Processing: Reading - Writing - Appending - Working with Directories and Paths

Database Programming: Data Bound Controls: The Data Control, DB List, DB Combo. Data Grid - ADO Data Control - ActiveX Data Objects - ADO and Data Environment Designer.

Menus: Types of Menus: Single Menus, Binary Menus, Multiple Item Menus, Multiple Selection Menus, Pull-down Menus, Popup Menus, Scrolling and Two Dimensional Menus, Icon Menus or Toolbars, Linear Sequence Menus, Multiple Menus, Tree-structured Menus, Menu Design Guidelines

Dialog Boxes : Dialog Boxes, Dialog Boxes Design Guidelines, Advanced Controls, Slider, Cool Bar, Status Bar, Rich Text Box, DTPicker, List View, Chart Control, Month View, Progress Bar, Sys Info, Multimedia, Animation

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 405	**Object Oriented System Design**	3	0	3	4	IT 302

Course Objectives:

- To enable the students to understand concepts, terminologies and requirements for Object Oriented system
- To enable the students to design and implement Object Oriented system

Unit - I

Object Oriented Design Fundamentals

Object Model – Classes and Objects – Complexity – Classification – Notation – Process – Pragmatics – Binary and Entity relationship – Object types – Object state – OOSD life cycle.

Unit - II

Object Oriented Analysis – Conceptual model – Behavior – class – analysis patterns – overview – diagrams – aggregation

Unit - III

Object Oriented Design Methods

UML - diagrams - collaboration - Sequence - Class - Design patterns and frameworks - comparison with other design methods

Unit - IV

Management Object Oriented Development

Managing Analysis and Design - Evaluation Testing - Coding - Maintenance – Metrics

Unit - V

Case Studies in Object Oriented Development Design of Foundation Class Libraries - Object Oriented Databases - Client/Server Computing - Middleware.

References

1. Craig Larman, Applying UML and Patterns, Addison Wesley
2. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison Wesley
3. Ali Bahrami, Object Oriented System Development, McGraw Hill International Edition

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 402	**Object Oriented Database Design**	3	0	3	4	IT 405

Course Objectives:

- To enable the students to understand concepts, terminologies and requirements for Object Oriented database system
- To enable the students to design and implement Object Oriented database system

Unit - I

Relational Data Bases

Relational Models - Querying - Storage Structures - Query Processing - Normalization

Unit - II

Object Oriented Data Bases

Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence - Transaction - Concurrency - Recovery - Database Administration

Unit - III

Emerging Systems

Enhanced Data Models - Client Server Model - Data Warehousing and Data Mining - Web Data Bases - Mobile Data Bases

Unit - IV

Current Issues

Rules - Knowledge Bases - Active and Deductive Data Bases - Distributed Databases and Parallel Data Bases

Unit - V

Data Base Design Issues

Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues

References

1. Gary W. Hanson and James V. Hanson, Database Management and Design, Prentice Hall
2. Alex Benson, Stephen Smith and Kurt Threaling, Building Data Mining Applications for CRM, Tata McGraw Hill
3. R. Elmasri and S.B. Navathe, Fundamentals of Database Design, Addison Wesley

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 404	**System Administration**	3	0	3	4	CSE 306

Course Objectives:

- To enable the students to understand concepts, terminologies and requirements for administration of Network, Web and Database systems

Introduction - Overview of NTOS - Networking Hardware Tools - Protocols - Novell, NT, UNIX (Server/Workstation) OS installation - Settings.

Network Administration - Maintaining Check list , Server Maintenance - Security Measures - Device management - Backup Procedures

Print Series in Networking - Trouble Shooting - Database Management - Power Management

Internet-Netnews-Telnet – ftp

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 406	**Principles of User Interface Design**	3	0	3	4	IT 403

Course Objectives:

- To enable the students to understand concepts, terminologies, techniques and requirements for making a system user friendly
- To enable the students to design and implement user friendly systems

Unit - I

Human Factors, Theories, Principles and Guidelines: Introduction - Goals of User-Interface design - Motivations for Human factors in design - Goals for our profession - Object Action Interface model - Principles - Guidelines for data entry - Balance of Automation and Human Control.

Unit - II

Management Issues: Management Issues - Organizational design to support usability - Pillars of design - development methodologies - Ethnographic observation - Social Impact statement for Early design - Tests - Evaluation during active use.

Unit - III

Tools, Environment and Menus: Tools, Environment and Menus - Introduction - Specification methods - Interface building tools - Direct manipulation and virtual environments - Visual thinking - Home automation - Remote direct manipulation - virtual environments menu - Item presentation sequence - Menu layout, Form fill in, Dialog boxes, command and Natural languages.

Unit - IV

Interaction Devices, Response Times and Styles and Manuals: Interaction Devices, Response times, styles and Manuals - Interaction devices - Keyboards and pointing devices - Digitization - Image and Video displays - printers - Variability presentation styles - Display design - Preparation of printed manuals - preparation of online facilities.

Unit - V

Multiple Windows, Computer Supported Cooperative Work, Information Search and WWW: Multiple - Windows, Computer supported cooperative work, Information search - Multiple window strategies - Individual window design - Multiple window design - coordination by tightly coupled windows - Image browsing and tightly coupled windows - personal role management and classic windows. Computer supported cooperative work - introduction - asynchronous interaction - different time and place - Information search and visualization - Database query and phrase search in textual documents - multimedia document search. Hypermedia and WWW - Hypertext and Hypermedia - www - Object action interface model for Web site design.

References

1. Ben Shnelderman, Designing the User Interface, Addison Wesley
2. Eberts, User Interface Design, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 501	Data Warehousing and Mining	3	0	3	4	IT 402

Course Objectives:

- To enable the students to understand concepts, terminologies and requirements for Warehousing and Mining

Unit - I

Introduction: Data Warehousing – OLAP and Data Mining – Decision tree learning: construction, performance, tree pruning methods, missing values – Instance Based Learning – K-nearest neighbor algorithm – Similarity indexing.

Unit - II

Bayesian Learning Bayesian Learning – Support vector machines - Neural Networks

Unit - III

Meta Learning Meta Learning - Bagging – Automatic Information Extraction – Rule Based Methods – Evaluating methods – Choosing different models

Unit - IV

Clustering Clustering – Methods of clustering – Ways of scaling clustering methods – EM algorithm. Semi-Supervised and Active Learning, Mining – Basic framework and algorithms -temporal mining.

Unit - V

Ware Housing

Warehousing – Data Warehousing – Web Warehousing – Data cleaning – Reduplication - Data Marts – Multidimensional Data Bases (OLAP) – Integrating OLAP and Mining.

References

1. Alex Berson, Stephen Smith, Data Warehousing, Data Mining and OLAP, McGraw Hill
2. Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kauffmann's Publishers
3. Tom Mitchell, Machine Learning, Tata McGraw Hill

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 503	Client Server Computing	3	0	0	3	IT 404

Course Objectives:

- To enable the students to concepts and techniques in Client-Server computing

Unit - I

Introduction

Client - Server Computing - Concepts - Building Blocks - State of the Client-Server Infrastructure - Components - Middleware building blocks - current state.

Unit - II

Middleware

NOS: Creating the single system image - The transparent illusion - Peer to Peer communications - Remote Procedure Calls - Messaging and Queuing - Stack Middleware - TCP/IP sockets - Netware - Net Bios - Named Pipes - DFS, threads.

Unit - III

SQL Database Services

Fundamentals - Database Servers - Functions - Stored Procedures - Triggers and Rules - SQL Middleware and Federated Databases.

SQL, API, Open SQL Gateways, Data Warehouses concepts OLTP

Information Warehouses.

Unit - IV

Client - Server Transaction Processing

Transactions - ACID properties - Transaction models - Transaction Processing Monitors - Transaction Management Standards - TP Lite - Origins and Concepts - TP -Lite Vs TP Heavy.

Client Server Groupware - Concepts and Importance of Groupware - Components of Groupware.

References

1. Robert Orfal, Essential Client - Server Survival Guide, John Wiley
2. Linthicelm: David Linthicelm;s Guide to Client - Server and Intranet Development, John Wiley
3. Visual Basic 6 Client Server Computing How To -- BPB and Tech Media Publications

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 507	**Mini Project**	0	0	3	1	-

The students will be assigned to carryout the design and implementation of hardware/software project. The instructor will assign or the student can choose/select his project on any topic, which they have studied. This work starts from the beginning of the semester, after completion of this project,, the students should submit the report to the department. The students have to present the work they have done to the committee nominated by the department to evaluate the work for grading.

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 502	**Multimedia Systems**	3	0	3	4	-

Course Objectives:

- To enable the students to understand the concepts, implementation of multi-media systems

Unit - I
Introduction
Multimedia Applications - System Architecture - Objects of Multimedia systems - Multimedia databases.

Unit - II
Compression and File Formats
Types of Compression - Image compression - CCITT - JPEG - Video image compression - MPEG - DVI technology - Audio compression - RTF format - TIFF file format - MIDI - JPEG DIB - TWAIN

Unit - III

Input - Output Technologies

Traditional devices - Pen input - Video display systems - scanners - digital audio - video images and animation

Unit - IV
Storage and Retrieval
Magnetic Media - RAID - Optical media - CD ROM - WORM - Juke Box - Cache management

Unit - V
Application Design
Application classes - Types of Systems - Virtual Reality Design- components - Databases - Authoring systems - Hyper media - User Interface design - Display - Playback issues - Hypermedia linking and embedding

References

1. Andleigh PK and Thakar K, Multimedia Systems Design, Prentice Hall
2. Vaughan T, Multimedia, Tata McGraw Hill
3. Koegel Buford JKF, Multimedia Systems, Addison Wesley Longman

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 506	**Final Project**	0	0	12	4	-

Project assignments on specific areas of specialization are given to groups/individual. At the end of the semester project is evaluated.

ELECTIVE – I

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 408	**Natural Language Processing**	3	0	0	3	-

Course Objectives:

- To enable the students to understand concepts of Natural Language Processing

Unit - I

Introduction

Goals of Natural Language Processing and Computational Linguistics.

Finite State Automata and Transducers - Morphology

Unit - II

Parsing

Context Free Grammars - Generalized Phrase Structure Grammar - Earley Parsing Algorithm.

Unit - III

Transformational Grammar

Transformational Grammar - Computational Models - Knowledge Representation

Unit - IV

Semantics

Interpretation - Time - Tense and Lexical Semantics

Unit - V

Machine Translation

Machine Translation - Natural Language Interfaces - Natural Language Generation

References

1. Allen James, Natural Language Understanding, Benjamin/Cumming
2. Grosz, Sparck-Jones Webber, Readings in Natural Language Processing, Morgan Kaufmann

ELECTIVE – I

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 408A	Data Compression Techniques	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts and various algorithms used for Data Compression

Unit - I

Introduction Compression techniques - Mathematical model and coding - Huffman coding - Non Binary Huffman Coding - Adaptive Huffman Coding - Goloumb, Rice and Tunstall codes - Applications of Huffman Coding - Arithmetic coding - Applications of Arithmetic coding - Compression

Unit - II

Dictionary Based Compression State Adaptive Dictionaries - Israeli roots - ARC - Predictive coding - The Burrows Wheeler transform - CISC - JPEG - LS - Multi resolution approaches - Facsimile Encoding - Dynamic Markov Compression - Sliding Windows Compression - LZ 77 and LZ 78, LZW

Unit - III

Quantization Introduction distortion - criteria - Information theory - Rate Distortion Theory - Scalar Quantization - Uniform, Adaptive, Non Uniform, Entropy Coded - Vector Quantization - Linde Buzogray Algorithm - Tree Structure - Structured Vector Quantization

Unit - IV

Differential Coding Basic Algorithm - Adaptive DPCM - Delta Modulation - Speech Coding - Companding - Transform coding - Application to Image and Audio Compression - Sun band coding - Filter banks - Application to Speech, Audio and Image

Unit - V

Wavelet Based Compression Implementation - Image Compression - JPEG - Video Compression: Motion compensation - Video Signal representation - Algorithm for Video Conferencing and Video Phones - Asymmetric Application - Packet Video - Fractal Image Compression.

References

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann
2. Mark Nelson, The Data Compression Book, BPB Publications

ELECTIVE – I

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 408B	**Mobile Computing**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts of mobile computing

Unit I

Introduction

Introduction – Wireless transmission – Medium Access Control – Multiple Access Control – Telecommunication Systems – Satellite system – Digital audio and video broadcasting.

Unit II

Introduction to Wireless LAN

Introduction to Wireless LAN – Infrared Vs Radio transmission – Adhoc Networks – IEEE 802.11 – HIPERLAN – BLUETOOTH

Unit III

Mobile Network Layers

Mobile IP – IP packet delivery – Tunneling – DHCP – Mobile transport layer – Traditional TCP – Indirect TCP – Snooping TCP – Mobile TCP

Unit IV

Wireless Application Protocol

Origin of WAP – Overview of WAP architecture – components of WAP Standard – Network Infrastructure services supporting WAP clients – WAP architecture design principles.

Unit V

Implementing WAP Services

Overview of Wireless Mark Up Language (WML) - WML basics - Events, task, bindings, variable controls - Application security - WML script overview

References

1. John Schiller, Mobile Communications, Addison Wesley
2. Sandeep Singhal, The Wireless Application Protocol, Addison Wesley

Roy Blake, Wireless Communication Technology, Delmar Thomson Learning

ELECTIVE – II

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 505A	**Software Project Management**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts, techniques and importance of software project Management

Unit - I

Software Management Renaissance: Conventional Software Management: Waterfall model - Conventional Software management Performance. Evolution of Software Economics: Software Economics - Pragmatic Software Cost Estimation. Improving Software Economics: Reducing Software Product Size - Improving Software Processes - Improving Team Effectiveness - Improving Automation through Software Environments - Achieving Required Quality - Old and New Way: Principles of Conventional Software Engineering - Principles of Software Management.

Unit - II

Software Management Process: Life Cycle Phases: Engineering and Production Stages - Inspection Phase - Elaboration Phase - Construction Phase - Transition Phase - Artifacts of the Process: Artifact sets - Management Artifacts - Engineering Artifacts - Pragmatic Artifacts - Workflows of the Process: Software Process Workflow - Iteration Workflow - Checklist of the Process - Periodic Status Assessment.

Unit - III

Software Management Disciplines: Iterative Process Planning: Work Breakdown structures - Planning - Cost and Schedule Estimation - Iteration Planning Process - Pragmatic Planning - Project Planning and Responsibilities: Line of Business Organization - Project Organization - Evolution of Organization - Process Automation: Automation building blocks - Project Environment

Unit - IV

Project Control: The Seven core metrics - Management Indication - Quality Indicators - Life Cycle Expectations -Pragmatic Software Metrics.

Unit - V

Modern Software Management: Modern Project Profiles: Continuous Integration - Early Risk Resolution - Team Work - Top TEN Software Management Principles - Next

Generation Software Economics: Next Generation Cost Models - Modern Software Economics. Case Studies

References

1. Walker Royce, Software Project Management: A Unified Frame Work, Addison Wesley
2. Sommerville, Software Engineering, Addison Wesley

ELECTIVE – II

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 505B	**Geographical Information Science**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts and principles in GIS

Unit - I

Introduction - Systems, Science and Study - Applications

Unit - II

Principles - Geo Referencing - Nature of Geographical Data - Uncertainty

Unit - III

GIS Software - Geographic Data Modeling - GIS Data Collection - Visualization and User Interaction.

Unit - IV

GIS database design - GIS data queries - Geographic Query and Analysis.

Impact on society of GIS by means of Geographical Information Cycle - Geographical attributes - Methods and techniques to realize the Geo-info cycle.

Unit - V

Introduction to GPS - Uses of GPS - Interpreting and extracting spatial information from maps.

Introduction to map project and coordinate systems - usage of maps- compass for cross country navigation and orientation.

References

1. Paul A. Longley, Michael F. Goodchild and David J. Magurie, Geographic Information Systems and Science

ELECTIVE – III

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 504	**Distributed Databases**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts, techniques in implementing Distributed Databases

Unit - I

Principles of Distributed Data Bases: Introduction - Levels of Distribution - Transparency - Architecture - Data Fragmentation - Applications - Integrity Constraints - Distributed Data Base Design - Fragmentation - Translation of Transparent Queries to Fragment Queries - Distributed Grouping and Aggregate Function Evaluation - Parametric Queries.

Unit - II

Query Processing: Query Decomposition and Optimization - Query Processing Problem - Characterization of Query processors - Layers of Query Processing - Query Decomposition - Localization of Distributed Data - Query Optimization - Centralized Query Optimization - Join Ordering in Fragment Queries.

Unit - III

Parallel Data Base Systems and Distributed Object Data Base Management Systems: Database Servers - Parallel Architecture - Parallel DBMS Techniques - Parallel Execution Problems - Parallel Execution for Hierarchical Architecture - Object Distribution Design - Object Management - Object Query Processing - Transaction Management

Unit - IV

Distribution Transaction Management, Concurrency Control and Reliability of Databases: A Framework for Transaction Management - Supporting Atomicity - Concurrency Control and Architectural Aspects of Distributed Transactions - Foundation of Distributed Concurrency Control - Distributed Deadlocks

Unit - V

SDDI, Heterogeneous and Homogeneous Database Systems: Architecture – Concurrency Control - Execution of Queries - Reliability and Transaction Commitment of SDDI - Architecture, Queries, View Management, Protocols, Transaction Management, Terminal Management of R* - DDM, INGRES, POREL, SIRIUS DELTA - Homogeneous DDS - MULTIBASE, DDTS, Heterogeneous SIRIUS DELTA.

References

1. Stefano Ceri and Giusepped Pelagatti, Distributed Databases Principles and Systems, Tata McGrawHill
2. M. Tamer Ozsu amd Patrick Valduriez, Principles of Distributed Database Systems, Prentice Hall
3. Clement Yu and Weiyi Meng, Principles of Database Query Processing for Advanced Applications, The Morgan Kaufmann

ELECTIVE – III

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 504A	**Decision Support Systems**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts, techniques in Decision Support System

Unit – I

Managers and Decision Making - Managerial Decision Making and Informative System 0 Managers and Computerized Support 0 Need for Computerized Decision Support Technologies - Framework for Decision Support Systems - Group Decision Systems - Executive Information Systems - Evolution and Attributes of Computerized Decision Aids. Introduction and Definitions of Systems, Models, Evaluation - Modeling Process.

Unit - II

DSS Configurations - Characteristics - Capabilities - Components of DSS - User - DSS Hardware - Distinguishing DSS from Science and MIS - Classification of DSS.

Unit - III

Data Warehosuing - Access and Analysis - Nature and Source of data - Data Collections and Data Problems - Data Base Management Systems in DSS - Database Organization and Structure .

OLAP - Data Access and Mining - Querying and Analysis - Data Visualization and Multidimensionality - Intelligent Database and Data Mining.

Unit – IV

Modeling of MSS - Static and Dynamic Models - Treating Certainty - Uncertainty and Risks - Influence Diagrams - MSS Modeling in Spreadsheets - Decision Analysis of a Few Alternatives - Optimization - Heuristic Programming.

Unit - V

Visual Modeling and Simulation - Model Base Management - Knowledge Based DSS and AI Concepts and Definitions - AI Vs Natural Intelligence - Difference between AI and Conventional Computing - Knowledge Based DSS.

DSS Construction - DSS Development Process - Group DSS - Goal of GDSS - Technology of GDSS - Construction of GDSS and Determination of its Sucess.

References

1. Efrain Turban and Jay E. Aronson, Decision Support Systems and Intelligent Systems, Prentice Hall
2. Sprague R.J. and H.J. Watson, Decision Support Systems, Prentice Hall

Course Number	Course Title	Lecture	Tutorial	Practice	Credit	Pre-Requisite
IT 504B	**Active Server Pages**	3	0	0	3	-

Course Objectives:

- To enable the students to understand the concepts and techniques in designing and implementing Active Server Pages

Unit - I

Active Server Pages Introduction, Creating ASP Pages, Adding Script Commands, Mixing HTML and Script Commands.

Unit - II

Working with Scripting Languages Setting the primary scripting language, Setting the language for the page, Using Scripting language on the server, Using variables and constants, variable scopes, giving variables session or application scope, Procedures: Defining and calling, using components and objects, using collections.

Unit - III

Built-in ASP Objects Application, Object Context, Request, Response, Server and Session.

Unit - IV

Installable Components for ASP Ad Rotator, Browser Capabilities, Database Access, Content Linking, File Access Components, Tools, Status, MyInfo, Counters, Content Rotator, Page Counter, Permission Checker.

Unit - V

@Directives - @Codepage, @Enablesessionstate, @Language, @LCID, @Transaction.

Writing ASP Scripts - Sending Content to the Browser, Sending Scripts to the Browser, Including Files, Working with HTML Forms, Accessing a Database

References

1. Active Server Pages Unleashed -- BPB and Tech Media Publications
2. Teach Yourself Active Server Pages in 21 Days -- BPB and Tech Media Publications
3. Mastering ASP 3.0 -- BPB and Tech Media Publications
4. Visual Basic Developers Guide to ASP and IIS -- BPB and Tech Media Publications