



INSTITUTE VISION

"To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society"

INSTITUTE MISSION

"To continuously strive for the overall development of students, educating them in a state of the art infrastructure, by retaining the best practices, people and inspire them to imbibe real time problem solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals"

DEPARTMENTAL VISION

"To be the centre of excellence in providing education in the field of Electronics and Communication Engineering to produce technically competent and socially responsible engineering graduates."

DEPARTMENTAL MISSION

"Educating students to prepare them for professional competencies in the broader areas of the Electronics and Communication Engineering field by inculcating analytical skills, research abilities and encouraging culture of continuous learning for solving real time problems using modern tool".



PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1:

Acquire core competence in Applied Science, Mathematics, and Electronics and Communication Engineering fundamentals to excel in professional carrier and higher study.

PEO2:

Design, Demonstrate and Analyze the Electronic Systems which are useful to society.

PEO3:

Maintain Professional and Ethical values, Employability skills, Multidisciplinary approach and an Ability to realize Engineering issues to broader social contest by engaging in lifelong learning.

PROGRAM OUTCOMES(POs):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



STUDENT HELP DESK

Sr.No.	Name of the Faculty	Activities
1	Prof. S. B. Akkole	GATE / Preplacement Coaching
		ED Lab Incharge
		Students Mentor
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		Participation in Funded Projects
2	Dr. R. R. Maggavi	GATE / Preplacement Coaching
		CN Lab Incharge
		Students Mentor
		Module Coordinator
		Research Center Coordinator
		Dept. NAAC Criteria Sub COordinator
		NBA Criteria Coordinator
Innovations Club Coordinator		
3	Prof. S. S. Malaj	GATE / Preplacement Coaching
		Adv.Comm. Lab Incharge
		Students Mentor
		Dept. NAAC Criteria Sub COordinator
		NBA Criteria Coordinator
		NIRF Coordinator
Conference Coordinator		
04	Prof. S. S. Kamate	GATE / Preplacement Coaching
		VLSI Lab Incharge
		Students Mentor
		Module Coordinator
		IEEE Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		Project Coordinator
05	Porf. D. M. Kumbhar	GATE / Preplacement Coaching
		AC Lab Incharge
		Students Mentor
		Dept. Association Coordinator
		Class Teacher
		IIC Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		AICTE Activity Coordinator
Dept. ED Cell Coordinator		



Sr.No.	Name of the Faculty	Activities
06	Prof. S. S. Patil	GATE / Preplacement Coaching
		ARM & ES Lab Incharge
		Students Mentor
		Class Teacher
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Admission Coordinator
		Module Coordinator
07	Prof. D. B. Madihalli	GATE / Preplacement Coaching
		DSD Lab Incharge
		Students Mentor
		NBA Coordinator
		News & Publicity Coordinator
		NBA Criteria Coordinator
		Website Coordinator
		VTU LIC Coordinator
08	Prof. P. V. Patil	GATE / Preplacement Coaching
		HDL Lab Incharge
		Students Mentor
		NBA Criteria Coordinator
		T&P Cell Coordinator
		Alumni Coordinator
09	Prof. S. S. Itannavar	GATE / Preplacement Coaching
		DSP Lab Incharge
		Students Mentor
		EMS/ IA Coordinator
		News Letter / Technical Magazine
		ISTE Coordinator
		AICTE Coordinator
10	Prof. B. P. Khot	GATE / Preplacement Coaching
		MC Lab Incharge
		Students Mentor
		Dept. Time Table Coordinator & Meeting Coordinator
		Class Teacher
		NBA Criteria Coordinator
		AICTE Activity Coordinator



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FACULTY POSITION

S.N.	Category	No. in position	Average experience
1	Teaching faculty.	10	15.76Y
2	Technical supporting staff.	03	21.02Y
3	Helper staff	02	20.50Y

MAJOR LABORATORIES

S. N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested in Lakhs	S. N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested in Lakhs
1	Digital Electronics Lab	71	1.54	5	VLSI Lab	71	35.51
2	Analog Electronics (ED & I) Lab	92	8.24	6	Project Lab	95	--
3	Advanced Commn & Commn + LIC Lab	92	20.50	7	Research/E-Yantra/DSP & C.N.Lab	71	16.49
4	HDL/MC / EMD Lab	71	19.57	8	Power Electronics Lab	--	4.86
Total Investment In The Department						Rs. 95.31 Lacs	

FACULTY DETAILS

TEACHING FACULTY

S.N.	Name and Designation	Qualification	Specialization	Professional Membership	Teaching Exp.	Contact No.
1	Dr. R. R. Maggavi	Ph.D	E&C	LMISTE	17Y.05M	9480275583
2	Sri S B Akkole	M.Tech.	Communication	LMISTE	27Y.03M	9480422508
3	Smt.S.S.Kamate	M.Tech	Digital Electronics	LMISTE	19Y.00M	9008696825
4	Smt. S. S. Malaj	M.E.	E & TC	LMISTE	24Y.07M	9731795803
5	Sri. D.M. Kumbhar	M.Tech	Electronics	LMISTE	17Y.10M	09373609880
6	Sri. Sachin .S. Patil	M.Tech	VLSI & Embedded	LMISTE	17Y.08M	9448102010
7	Sri .D.B. Madihalli	M.Tech	Industrial Electronics	LMISTE	14Y.07M	9902854324
8	Sri.P.V.Patil	M.Tech	VLSI & Embedded	LMISTE	9Y.04M	9731104059
9	Sri.S.S.Itannavar	M.Tech	DSP	LMISTE	8Y.11M	9964299498
10	Smt. B. P. Khot	M.Tech	Microelectronics & Control Systems	LMISTE	5Y.11M	9964019501

TECHNICAL SUPPORTING STAFF

S.N.	Name	Qualification	Experience (in years)
1.	Sri. P. S. Desai	DEC	21Y-.07M
2.	Sri. V. V. Guruwodeyar	DEC	30Y-02 M
3.	Sri.M.A.Attar	DEC	11Y-09M



ACADEMIC CALENDER

	S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU Belagavi. Recognized Under Section 2(f) of UGC Act, 1956. Accredited at 'A' Grade by NAAC, Programmes Accredited by NBA: CSE, ECE, EEE& ME.	IQAC File I-11 2021-22 (Odd) Rev: 00
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CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2021-22 (ODD)

Date	Events																																																																																																																																																																																																																																																																				
01-10-2021	Commencement of V/VII Semester Classes	<table border="1"> <tr><td colspan="7">October-2021</td></tr> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td></tr> <tr><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> <tr><td>31</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>2-Gandhi Jayanthi, 6-Mahalaya Amavasya 14-Mahanavami, Ayudhapooja 15-Vijayadashami 20-Valmiki Jayanthi, Eid-Milad</p> <table border="1"> <tr><td colspan="7">November-2021</td></tr> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr> <tr><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr> <tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td></tr> <tr><td>28</td><td>29</td><td>30</td><td></td><td></td><td></td><td></td></tr> </table> <p>1-Kannada Rajyotsava, 3-Naraka Chaturdashi 5-Balipadyami Deepavalli 22-kanakadasa Jayanti</p> <table border="1"> <tr><td colspan="7">December-2021</td></tr> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td></tr> <tr><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td></tr> <tr><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td></td></tr> </table> <p>25-Christmas</p> <table border="1"> <tr><td colspan="7">January-2022</td></tr> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr> <tr><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td></tr> <tr><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td></tr> <tr><td>30</td><td>31</td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>14-Makar Sankranti, 26-Republic Day</p> <table border="1"> <tr><td colspan="7">February-2022</td></tr> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td></tr> <tr><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td></tr> <tr><td>27</td><td>28</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	October-2021							S	M	T	W	T	F	S						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							November-2021							S	M	T	W	T	F	S		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					December-2021							S	M	T	W	T	F	S				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		January-2022							S	M	T	W	T	F	S							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						February-2022							S	M	T	W	T	F	S			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
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02-10-2021	Gandhi Jayanthi & Swachh Bharat Abhiyan																																																																																																																																																																																																																																																																				
18-10-2021	Commencement of III Semester Classes																																																																																																																																																																																																																																																																				
01-11-2021	Kannad Rajyotsava																																																																																																																																																																																																																																																																				
20-11-2021	Awareness Program on NEP																																																																																																																																																																																																																																																																				
25-11-2021 to 27-11-2021	First Internal Assessment for III/V/VII Semester																																																																																																																																																																																																																																																																				
29-11-2021	Feedback-I on Teaching-Learning																																																																																																																																																																																																																																																																				
01-12-2021	Display of 1 st Internal Assessment Marks and submission of Feedback-I to office																																																																																																																																																																																																																																																																				
02-12-2021 to 04-12-2021	EDP Activities/ Green Club Activities																																																																																																																																																																																																																																																																				
11-12-2021	Awareness Program on NEP																																																																																																																																																																																																																																																																				
27-12-2021 to 29-12-2021	Second Internal Assessment for III/V/VII Semester																																																																																																																																																																																																																																																																				
30-12-2021	Feedback-II on Teaching-Learning																																																																																																																																																																																																																																																																				
03-01-2022	Display of 2 nd Internal Assessment Marks and submission of Feedback-II to office																																																																																																																																																																																																																																																																				
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13-01-2022	Blood Donation Camp																																																																																																																																																																																																																																																																				
24-01-2022 to 25-01-2022	Lab Internal Assessment for V/VII Semester																																																																																																																																																																																																																																																																				
27-01-2022 to 29-01-2022	Third Internal Assessment for V/VII Semester																																																																																																																																																																																																																																																																				
31-01-2022	Display of Final Marks of V/VII Semester																																																																																																																																																																																																																																																																				
31-01-2022	Last working day of V/VII Semester																																																																																																																																																																																																																																																																				
10-02-2022 to 12-02-2022	Third Internal Assessment for III Semester																																																																																																																																																																																																																																																																				
14-02-2022 to 15-02-2022	Lab Internal Assessment for III Semester																																																																																																																																																																																																																																																																				
17-02-2022	Display of Final Marks of III Semester																																																																																																																																																																																																																																																																				
19-02-2022	Last working day of III Semester																																																																																																																																																																																																																																																																				
01-02-2022 to 10-02-2022	Practical Examinations for V/VII Semester																																																																																																																																																																																																																																																																				
11-02-2022 to 25-03-2022	Theory Examinations for V/ VII Semester																																																																																																																																																																																																																																																																				
21-02-2022 to 04-03-2022	Practical Examinations for III Semester																																																																																																																																																																																																																																																																				
07-03-2022 to 25-03-2022	Theory Examinations for III Semester																																																																																																																																																																																																																																																																				

01/10/2021
 Dr. B. V. Madiggond
 IQAC Coordinator

01/10/21
 Dr. S. C. Kamate
 Principal



Subject Title	COMPUTER NETWORKS		
Subject Code	18EC71	CIE Marks	40
Number of Lecture Hrs/ Week	03	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS – 03			
FACULTY DETAILS:			
Name: Dr. Raghavendra R. Maggavi	Designation: Associate Professor	Experience: 16 Yrs	
No. of times course taught: 00		Specialization: Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	I/II/IV	Analog communication/Principles of communication systems
02	Electronics & Communication Engineering	III	Digital Electronics

2.0 Course Objectives

1. Understand the layering architecture of OSI reference model and TCP/IP protocol suite.
2. Understand the protocols associated with each layer.
3. Learn the different networking architectures and their representations.
4. Learn the functions and services associated with each layer.

3.0 Course Outcomes

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

	Course Outcome	RBT Level	POs
C401.1	Understand the concepts of networking thoroughly	L2	PO1 to PO12
C401.2	Describe various networking architectures	L2	PO1 to PO12
C401.3	Identify the protocols and services of different layers.	L2	PO1 to PO12
C401.4	Distinguish the basic network configurations and standards associated with each network	L2	PO1 to PO12
C401.5	Analyze a simple network and measurement of its parameters.	L2	PO1 to PO12
Total Hours of instruction			40

4.0 Course Content

Module-1	RBT Level
Introduction: Data communication: Components, Data representation, Data flow, Networks: Network criteria, Physical Structures, Network types: LAN, WAN, Switching, The Internet. (1.1, 1.2, 1.3 (1.3.1 to 1.3.4 of Text)). Network Models: Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, Description of layers, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model: OSI Versus TCP/IP. (2.1, 2.2, 2.3 of Text)	L1, L2



Module-2	
<p>Data-Link Layer: Introduction: Nodes and Links, Services, Two Categories of link, Sublayers, Link Layer addressing: Types of addresses, ARP. Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol, Piggybacking. (9.1, 9.2(9.2.1, 9.2.2), 11.1, 11.2 of Text)</p> <p>Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. (12.1 of Text).</p> <p>Wired and Wireless LANs: Ethernet Protocol, Standard Ethernet. Introduction to wireless LAN: Architectural Comparison, Characteristics, Access Control. (13.1, 13.2(13.2.1 to 13.2.5), 15.1 of Text)</p>	L1, L2,L3
Module-3	
<p>Network Layer: Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services, Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution, Forwarding of IP Packets: Based on destination Address and Label. (18.1, 18.2, 18.4, 18.5.1, 18.5.2 of Text)</p> <p>Network Layer Protocols: Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security of IPv4 Datagrams. (19.1 of Text).</p> <p>Unicast Routing: Introduction, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vector routing. (20.1, 20.2 of Text)</p>	L1, L2,L3
Module-4	
<p>Transport Layer: Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, Transport Layer Protocols: Simple protocol, Stop and wait protocol, Go-BackN Protocol, Selective repeat protocol. (23.1, 23.2.1, 23.2.2, 23.2.3, 23.2.4 of Text)</p> <p>Transport-Layer Protocols in the Internet: User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, Connection, State Transition diagram, Windows in TCP, Flow control, Error control, TCP congestion control. (24.2, 24.3.1, 24.3.2, 24.3.3, 24.3.4, 24.3.5, 24.3.6, 24.3.7, 24.3.8, 24.3.9 of Text)</p>	L1, L2, L3
Module-5	
<p>Application Layer: Introduction: providing services, Application-layer paradigms, Standard Client –Server Protocols: World wide web, Hyper Text Transfer Protocol, FTP: Two connections, Control Connection, Data Connection, Electronic Mail: Architecture, Web Based Mail, Telnet: Local versus remote logging. Domain Name system: Name space, DNS in internet, Resolution, DNS Messages, Registrars, DDNS, security of DNS. (25.1, 26.1, 26.2, 26.3, 26.4, 26.6 of Text)</p>	L1, L2

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Computer communication network based projects.
02	Higher	Computer communication networks 1&2	OSI model architecture, algorithms of data link layer programs. Routing algorithms.

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Computer communication network-based components.
02	OSI Model creation for analysis.
03	Development of a software application.

7.0 Gap Analysis and Mitigation

SL. No	Delivery Type	Details
01	Tutorial	Topic: Lettering, Line, Methods of dimensioning
02	NPTEL	Programming and Applications



8.0 Books Used and Recommended to Students

Text Books

1. Forouzan, “Data Communications and Networking” , 5th Edition, McGraw Hill, 2013, ISBN: 1-25-906475-3.

Reference Books

1. James J Kurose, Keith W Ross, Computer Networks, , Pearson Education.
2. Wayarles Tomasi, Introduction to Data Communication and Networking, Pearson Education.
3. Andrew Tanenbaum, “Computer networks”, Prentice Hall.
4. William Stallings, “Data and computer communications”, Prentice Hall

Additional Study material & e-Books

1. <https://lecturenotes.in/subject/609/computer-communication-network-ccn>
2. <http://freecomputerbooks.com/networkComputerBooks.html>

9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References

- 1) <https://vtu.ac.in>
- 2) <http://www.bookspare.com/engineering-vtu>
- 3) <http://www.rejinpaul.com/2014/10/vtu-ece-notes-vtu-ece-1st-2nd-3rd-4th-5th-6th-7th-8th-semester-lecture-notes-download-link.html><http://www.vlab.co.in/>
- 4) https://www.youtube.com/results?search_query=microprocessor

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE	http://ieeexplore.ieee.org/Xplore/home.jsp
2	PC World	http://www.pcworld.com/article/146957/components/article.html

11.0 Examination Note

Scheme of Evaluation for Internal Assessment (40 Marks)

- Class work, Assignment, Technical quiz: 10 Marks.
- Internal Assessment test Average of all three Tests 30marks.

SCHEME OF EXAMINATION:

- The question paper will have ten questions.
- Each full question consists of 20marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module.

12.0 Course Delivery Plan

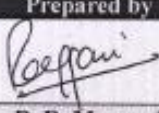
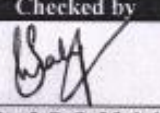


Module	Lecture No.	Content of Lecturer	% of Portion
Module- 1 Introduction & Network Models	1	Data communication: Components, Data representation, Data flow	20
	2	Networks: Network criteria, Physical Structures	
	3	Network types: LAN, WAN, Switching, The Internet.	
	4	Protocol Layering: Scenarios, Principles, Logical Connections	
	5	TCP/IP Protocol Suite: Layered Architecture	
	6	Layers in TCP/IP suite, Description of layers	



	7	Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing	
	8	The OSI Model: OSI Versus TCP/IP.	
Module- 2 Data-Link Layer, Media Access Control & Wired and Wireless LANs	9	Introduction: Nodes and Links, Services, Two Categories of link, Sublayers	20
	10	Link Layer addressing: Types of addresses, ARP. Data Link Control (DLC) services	
	11	Framing, Flow and Error Control, Data Link Layer Protocols	
	12	Simple Protocol, Stop and Wait protocol, Piggybacking	
	13	Random Access: ALOHA, CSMA	
	14	CSMA/CD, CSMA/CA	
	15	Ethernet Protocol, Standard Ethernet. Introduction to wireless LAN	
	16	Architectural Comparison, Characteristics, Access Control.	
Module -3 Network Layer, Network Layer Protocols & Unicast Routing	17	Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services	20
	18	Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses	
	19	Address Space, Classful Addressing, Classless Addressing, DHCP	
	20	Forwarding of IP Packets: Based on destination Address and Label.	
	21	Internet Protocol (IP): Datagram Format	
	22	Fragmentation, Options, Security of IPv4 Datagrams	
	23	Introduction, Routing Algorithms: Distance Vector Routing	
	24	Link State Routing, Path vector routing	
Module -4 Transport Layer, Transport-Layer Protocols in the Internet	25	Introduction: Transport Layer Services	20
	26	Connectionless and Connection oriented Protocols	
	27	Transport Layer Protocols: Simple protocol, Stop and wait protocol	
	28	Go-BackN Protocol, Selective repeat protocol.	
	29	User Datagram Protocol: User Datagram, UDP Services, UDP Applications	
	30	Transmission Control Protocol: TCP Services	
	31	TCP Features, Segment, Connection, State Transition diagram	
	32	Windows in TCP, Flow control, Error control, TCP congestion control.	
Module 5: Application Layer	33	Introduction: providing services, Application-layer paradigms	20
	34	Standard Client – Server Protocols	
	35	World wide web, Hyper Text Transfer Protocol	
	36	FTP: Two connections, Control Connection	
	37	Data Connection, Electronic Mail: Architecture	
	38	Web Based Mail, Telnet: Local versus remote logging. Domain Name system	
	39	Name space, DNS in internet, Resolution, DNS Messages, Registrars	
	40	DDNS, security of DNS	

13.0 University Result

Examination	FCD	FC	SC	% Passing
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Prepared by  R. R. Muggavi	Checked by  Prof. S. S. Malaj	 HOD	 Principal
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Subject Title	VLSI Design		
Subject Code	18EC72	IA Marks	40
Number of Lecture Hrs / Week	03 L	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
FACULTY DETAILS:			
Name: Prof. S S Kamate	Designation: Asst. Professor	Experience: 19 yrs	
No. of times course taught: 08		Specialization: Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	III	Analog Electronic Circuits
02	ECE	III	Digital Electronics

2.0 Course Objectives

1. Impart knowledge of MOS transistor theory and CMOS technologies.
2. Learn the operation principles and analysis of inverter circuits.
3. Design Combinational, sequential and dynamic logic circuits as per the requirements.
4. Infer the operation of Semiconductors Memory circuits.
5. Demonstrate the concepts of CMOS testing.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and analyze.

	Course Outcome	Cognitive Level	POs
C402.1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling.	U	PO1, PO2, PO10 PO12
C402.2	Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects.	U	PO1, PO2, PO10 PO12
C402.3	Demonstrate ability to design Combinational, sequential and dynamic logic circuits as per the requirements	U	PO1, PO2, PO10 PO12
C402.4	Interpret Memory elements along with timing considerations.	U	PO1, PO2, PO10 PO12
C402.5	Interpret testing and testability issues in VLSI Design	U	PO1, PO2, PO10 PO12
Total Hours of instruction			40



4.0 Course Content

Course Content:

Module	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1: Introduction: A Brief History, MOS Transistors, CMOS Logic (1.1 to 1.4 of TEXT2) MOS Transistor Theory: Introduction, Long-channel I-V Characteristics, Non-ideal I-V Effects, DC Transfer Characteristics (2.1, 2.2, 2.4 and 2.5 of TEXT2).	08 Hours	L1, L2
Module 2: Fabrication: CMOS Fabrication and Layout, VLSI Design Flow, Introduction, CMOS Technologies, Layout Design Rules, (1.5 and 3.1 to 3.3 of TEXT2). MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitances (3.5 to 3.6 of TEXT1)	08 Hours	L1, L2
Module 3: Delay: Introduction, Transient Response, RC Delay Model, Linear Delay Model, Logical Efforts of Paths (4.1 to 4.5 of TEXT2, except sub-sections 4.3.7, 4.4.5, 4.4.6, 4.5.5 and 4.5.6). Combinational Circuit Design: Introduction, Circuit families (9.1 to 9.2 of TEXT2, except subsection 9.2.4).	08 Hours	L1, L2, L3
Module 4: Sequential Circuit Design: Introduction, Circuit Design for Latches and Flip-Flops (10.1 and 10.3.1 to 10.3.4 of TEXT2) Dynamic Logic Circuits: Introduction, Basic Principles of Pass Transistor Circuits, Synchronous Dynamic Circuit Techniques, Dynamic CMOS Circuit Techniques (9.1, 9.2, 9.4 to 9.5 of TEXT1)	08 Hours	L1, L2, L3
Module 5: Semiconductor Memories: Introduction, Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM), (10.1 to 10.3 of TEXT1) Testing and Verification: Introduction, Logic Verification Principles, Manufacturing Test Principles, Design for testability (15.1, 15.3, 15.5 15.6.1 to 15.6.3 of TEXT 2).	08 Hours	L1, L2

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VII	VLSI Lab	VLSI Design of Circuits
02	VIII	Projects on VLSI	Projects and Research

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Analyze different types of VLSI Designs
02	Design of different types of VLSI chips

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: VLSI Lab
02	NPTEL	Demonstration and Application



8.0 Books Used and Recommended to Students

Text Books

1. “CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill.
2. “CMOS VLSI Design- A Circuits and Systems Perspective”- Neil H. E. Weste, and David Money Harris 4th Edition, Pearson Education.

Reference Books

1. Adel Sedra and K. C. Smith, “Microelectronics Circuits Theory and Applications”, 6th or 7th Edition, Oxford University Press, International Version, 2009.
2. Douglas A Pucknell & Kamran Eshragian, “Basic VLSI Design”, PHI 3rd Edition, (original Edition – 1994).
3. Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, TMH, 2007.

Additional Study material & e-Books

3. VTU on line notes.

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

- 01) <https://nptel.co.in>
- 02) <http://m.noteboy.in/vtuflies>
- 03) https://www.edx.org/school/iitbombayx?utm_source=bing&utm_medium=cpc&utm_term=iit-bombay&utm_campaign=partner-iit-bombay

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	IEEE Xplorer	http://iee.com
2	International Journal of Science and Technology	http://www.sciencedirect.com/science/journal/00207683
3	Journal of Communication Engineering	http://iee.com

11.0 Examination Note

Internal Assessment: 40 Marks

Three IA will be conducted and average of best of two will be accounted.

Scheme of Evaluation for Internal Assessment (40 Marks)

(a) Internal Assessment test in the same pattern as of the main examination. (50 marks.)

SCHEME OF EXAMINATION:

Two questions to be set from the syllabus covered.

Student has to answer one part from each question.

Question 1 or 2 1x25 = 25Marks

Question 3 or 4 1x25 = 25Marks

Total = 50Marks reduced to 30 Marks

Total CIE marks = 30 from IA + 10 from Assignment or quiz.

INSTRUCTION FOR VLSI Design (18EC72) EXAMINATION

1. Four full questions will be given which consists of a,b,c,d sub sections.
2. Students have to answer either Q :1 or 2 and Q: 3 or 4 completely.



12.0 Course Delivery Plan

Course Delivery Plan:

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Introduction: A Brief History of MOS transistors	20
	2	MOS Transistors	
	3	CMOS Logic	
	4	Introduction MOS Transistor Theory	
	5	Long-channel I-V Characteristics	
	6	Non-ideal I -V Effects	
	7	DC Transfer Characteristics	
	8	Cont'd...	
2	9	Introduction to CMOS Fabrication	20
	10	Introduction to CMOS Fabrication and Layout	
	11	Cont'd...	
	12	Cont'd...	
	13	VLSI Design Flow	
	14	Introduction CMOS Technologies	
	15	Layout Design Rules	
	16	MOSFET Scaling	
	17	Small-Geometry Effects	
	18	MOSFET Capacitances	
3	19	Introduction to Transient Response	60
	20	RC Delay Model	
	23	Linear Delay Model	
	24	Logical Efforts of Paths	
	25	Introduction to Combinational Circuit Design Circuit families	
	26	Cont'd...	
	27	Circuit families	
4	28	Introduction to Sequential Circuit Design	80
	29	Circuit Design for Latches	
	30	Circuit Design and Flip-Flops	
	31	Cont'd...	
	32	Introduction to Dynamic Logic Circuits	
	33	Cont'd...	
	34	Basic Principles of Pass Transistor Circuits	
	35	Cont'd...	
5	36	Introduction to Semiconductor Memories	100
	37	Introduction to Dynamic Random Access Memory (DRAM) and	
	38	Cont'd...	
	39	Static Random Access Memory (SRAM)	
	40	Introduction to Testing and Verification	
	41	Logic Verification Principles	
	42	Manufacturing Test Principles	
	43	Design for testability	
	44	Cont'd...	



13.0

QUESTION BANK

MODULE -1

1. What is Moore's first law? Discuss about evaluation of integrated circuit technology.
2. Compare between different families with respect to speed and power.
3. Draw & explain basic n-MOS enhancement mode transistor action.
4. Draw & explain basic n-MOS depletion mode transistor action.
5. Draw & explain basic p-MOS enhancement mode transistor action.
6. Explain CMOS logic.
7. Explain Long-channel I-V Characteristics.
8. Explain Non-ideal I-V Effects.
9. Explain DC Transfer characteristics

MODULE -2

1. Explain in detail n-MOS fabrication process.
2. Explain in detail p well-CMOS fabrication process.
3. Explain in detail n well-CMOS fabrication process.
4. Explain VLSI design flow.
5. Draw scaled n-MOS transistor for combined voltage & dimension model.
6. Find out scaling factors for all parameters given below –
gate area (A_g), gate capacitance per unit area (C_o), gate capacitance (C_g), parasitic capacitance (C_x), carrier density in channel (Q_{on}), channel resistance (R_{on}), gate delay (T_d), maximum operating frequency (f_o), saturation current (I_{dss}), current density (J), switching energy per gate (E_g), power dissipation per gate (P_g), power dissipation per unit area (P_a), speed power product (PT).
8. Find out scaling effect on each factor in each model that is combined voltage & dimensional model, constant field model & constant voltage model in tabular form

MODULE -3

1. What is transient response?
2. Explain transient response of an inverter.
3. Explain RC delay model
4. Explain Linear delay model.
5. Write a note on logical efforts and paths.
6. Explain combinational logic design.
7. Write a note on combinational logic families.

MODULE -4

1. What sequential circuit design.
2. Write a note on sequential circuit design.
3. Explain circuit design for latches.
4. Explain circuit design for flip-flops.
5. What is a pass transistor?
6. Explain basic principles of pass transistor logic.
7. Explain synchronous dynamic circuit techniques.
8. Explain dynamic circuit techniques.

MODULE-5

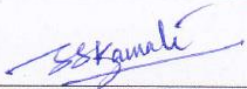



1. What are the different timing considerations?
2. Depending upon area requirement, power dissipation & volatility, discuss following memory elements –
i) Dynamic shift register cell ii) a 3- Transistor dynamic RAM cell iii) a I-transistor dynamic memory cell.



3. Draw & explain a pseudo static RAM cell.
5. Draw circuit diagram of 4-transistor dynamic shift register cell & explain read and write operation with sense amplifier.
6. Draw sense amplifier used in memory array, what it's required?
7. Draw circuit & stick diagram for 6-transistor static CMOS memory cell & explain read / write operation with sense amplifier.
8. Give a logical arrangement to implement JK-FF.
9. Explain how D-FF is formed?
10. Explain how you will design 4X4 bit register array by using pseudo static memory cell?
11. How you will develop selection & control logic for 4X4 bit register array?
12. What is testing?
13. Explain logic Verification Principles
14. Explain Manufacturing Test Principles.
15. Write a note on Design for testability.

15.0 University Result

Examination	FCD	FC	SC	% Passing
New Subject				

Prepared by	Checked by		
 Prof. S. S. KAMATE	 Prof. S.S.PATIL	 HOD	 Principal



Subject Title	Satellite Communication		
Subject Code	18EC732	IA Marks:	40
Number of Lecture Hrs / Week	03	Exam Marks:	60
Total Number of Lecture Hrs	40	Exam Hours:	03
FACULTY DETAILS:			
Name: Prof. S. B. Akkole	Designation: Asst. Professor	Experience: 27yrs	
No. of times course taught: 04		Specialization: Communication System	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	III	PCS
02	ECE	V	DC

2.0 Course Objectives

- Understand the basic principle of satellite orbits and trajectories.
- Study of electronic systems associated with a satellite and the earth station.
- Understand the various technologies associated with the satellite communication
- Focus on a communication satellite and the national satellite system.
- Study of satellite applications focusing various domains services such as remote sensing, weather forecasting and navigation

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and analyze.

	Course Outcome	RBT Level	POs
C403a.1	Describe the satellite orbits and its trajectories with the definitions of parameters	L1,L2,	PO1, ,3,4,5,12
C403a.2	Describe the electronic hardware systems associated with the satellite subsystem	L1,L2	PO1,2,3,4,5,12
C403a.3	Compute the satellite link parameters under various propagation conditions with the illustration of multiple access techniques.	L1,L2,L3	PO1,2,3,4,5,12
C403a.4	Describe the various applications of satellite with the focus on national satellite	L1,L2	PO1,2,3,4,5,12
C403a.5	To explain remote, navigational and communication satellites	L1,L2,L3	PO1,2,3,4,5,12
Total Hours of instruction		50	

4.0 Course Content

Course Content:

Module	Teaching Hours	Bloom's Taxonomy (RBT) level
Module-1 Satellite Orbits and Trajectories: Definition, Basic Principles, Orbital parameters, Injection velocity and satellite trajectory, Types of Satellite orbits, Orbital perturbations, Satellite stabilization, Orbital effects on satellite's performance, Eclipses, Look angles: Azimuth angle, Elevation angle	8 Hours	L1, L2



Module-2 Satellite subsystem: Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload. Earth Station: Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking.	8 Hours	L1, L2
Module-3 Multiple Access Techniques: Introduction, FDMA (No derivation), SCPC Systems, MCPC Systems, TDMA, CDMA, SDMA. Satellite Link Design Fundamentals: Transmission Equation, Satellite Link Parameters, Propagation considerations.	8 Hours	L1,L2,L3
Module-4 Communication Satellites: Introduction, Related Applications, Frequency Bands, Payloads, Satellite Vs. Terrestrial Networks, Satellite Telephony, Satellite Television, Satellite radio, Regional satellite Systems, national Satellite Systems.	8 Hours	L1,L2
Module-5 Remote Sensing Satellites: Classification of remote sensing systems, orbits, Payloads, Types of images: Image Classification, Interpretation, Applications. Weather Forecasting Satellites: Fundamentals, Images, Orbits, Payloads, Applications. Navigation Satellites: Development of Satellite Navigation Systems, GPS system, Applications.	8 Hours	L1,L2,L3

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VII	MMC	TDM/FDM Techniques
02	VII	M&A	Microwave Tubes and Antenna

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Satellite Orbits
02	Satellite multiple access schemes and applications.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Types of satellites
02	NPTEL	Multiple access system

8.0 Books Used and Recommended to Students

Text Books
Anil K. Maini, Varsha Agrawal, Satellite Communications, Wiley India Pvt. Ltd., 2015, ISBN: 978-81-265-2071-8.
Reference Books
1. Dennis Roddy, Satellite Communications, 4th Edition, McGraw- Hill International edition, 2006
2. Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd , 2017, ISBN: 978-81-265-0833-4

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
04) https://nptel.co.in



10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	Satellite communication	http://ieee.com
2	International Journal of Science and Technology	http://www.sciencedirect.com/science/journal
3	Journal of Communication Engineering	http://ieee.com

11.0 Examination Note

Internal Assessment: 40 Marks (30 marks for IA + 10 marks for assignment)
Three IA will be conducted and average of best of two will be accounted.

Scheme of Evaluation for Internal Assessment (30 Marks)

SCHEME OF EXAMINATION:

Two questions to be set from the syllabus covered.

Student has to answer any one each from each part.

Question 1 1x15 = 15Marks

Question 2 1x15 = 15Marks

Total = 30Marks

Each assignment carries 10 marks. Average of 10 marks for five models assignments will be considered.

INSTRUCTION FOR SATELLITE COMMUNICATION (15EC755) Semester End EXAMINATION

- Four full questions will be given which consists of a,b,c,d sub sections.
- Students have to answer either Q: 1 or 2 and Q 3 or 4 completely.

12.0 Course Delivery Plan

Course Delivery Plan:

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1		Satellite Orbits and Trajectories	20
	1	Definition and Basic Principles	
	2	Orbital parameters	
	3	Injection velocity and satellite trajectory	
	4	Types of Satellite orbits	
	5	Orbital perturbation	
	6	Satellite stabilization	
	7	Orbital effects on satellite's performance	
	8	Eclipses	
	9	Look angles: Azimuth angle Elevation angle	
2	10	Problems	40
		Satellite subsystem:	
	1	Power supply subsystem	
	2	Attitude and Orbit control	
	3	Tracking, Telemetry and command subsystem,	
	4	Payload	
	5	Earth Station: Types of earth station	
	6	Architecture	
	7	Design considerations and Testing,	
8	Earth station Hardware		
9	Satellite tracking.		



3		Multiple Access Techniques.	60
	1	Introduction	
	2	FDMA (No derivation)	
	3	SCPC Systems	
	4	MCPC Systems	
	5	TDMA	
	6	CDMA	
	7	SDMA	
	8	Satellite Link Design Fundamentals: Transmission Equation	
	9	Satellite Link Parameters	
	10	Propagation considerations	
4		Communication Satellites.	80
	1	Introduction	
	2	Related Applications	
	3	Frequency Bands	
	4	Payloads	
	5	Satellite Vs Terrestrial Networks	
	6	Satellite Telephony	
	7	Satellite Television	
	8	Satellite radio	
	9	Regional satellite Systems	
	10	National Satellite Systems	
5		Remote Sensing Satellites.	100
	1	Classification of remote sensing systems	
	2	orbits , Payloads and Types of images	
	3	Image Classification & Interpretation & Applications	
	4	Weather Forecasting Satellites: Fundamentals	
	5	Images and Orbits	
	6	Payloads and Applications	
	7	Navigation Satellites :Development of Satellite	
	8	Navigation Systems	
	9	GPS system	
	10	Applications	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Satellite Orbits and Trajectories	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Satellite subsystem and earth station	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list



3	Assignment 3: University Questions on Multiple Access Techniques and Sate link Design	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Printed expected.	Activity. solution	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4: University Questions on Communication Satellites	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Printed expected.	Activity. solution	Book 1, 2 of the reference list. Website of the Reference list
5	Assignment 5: University Questions on Remote Sensing Satellites.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Printed expected.	Activity. solution	Book 1, 2 of the reference list. Website of the Reference list

14.0

QUESTION BANK

Module-1

- 1) Define orbit and Trajectory
- 2) Explain Newton's law of gravitation
- 3) Define Newton's Second Law of motion
- 4) Explain Kepler's 3 laws of satellite motion.
- 5) Define Orbital Parameters of satellite.
- 6) Explain types of Satellite Orbits
- 7) Explain Three-axis or Body Stabilization
- 8) An Earth station is located at 300W longitude and 600N latitude. Determine the Earth Station's azimuth and elevation angles with respect to a geostationary satellite located at 500W longitude. The orbital radius is 42164 km. (Assume the radius of the Earth to be 6378km.)
- 9) Define Solar and Lunar eclipses
- 10) Define GEO, MEO and LEO satellites

Module-2

- 1) Explain different subsystems comprising a typical satellite.
- 2) Explain Power Supply Subsystem
- 3) With a neat diagram explain telemetry and tracking command system.
- 4) Explain payload.
- 5) Explain earth station hardware
- 6) Explain types of earth stations

Module-3

- 1) Explain Transponder Assignment Modes.
- 2) Explain Basic concept of FDMA with neat sketch.
- 3) Explain with block diagram of the MCPC/FDM system.
- 4) Explain Basic concept of TDMA with neat sketch.
- 5) A geostationary satellite has a round-trip propagation delay variation of 40 ns/s due to Station-keeping errors. If the time synchronization of OS-COMA signals from different Earth stations is not to exceed 20 % of the chip duration, determine the maximum allowable chip rate so that a station can make a correction once per satellite round - trip delay. Assume the satellite round-trip delay to be 280 ms
- 6) Explain TDMA frame structure.
- 7) Explain Basic block schematic arrangement of the DS-CDMA transmitter and receiver.
- 8) Derive an expression for Friis transmission equation

Module-4

- 1) Explain frequency Allocations for satellite services.
- 2) Explain advantages of satellite over terrestrial networks.



- 3) Explain Basic elements of a satellite communication system
- 4) Explain satellite point-to-point telephone networks.
- 5) Explain Typical satellite TV network.
- 6) Explain INSAT satellite.

UNIT-5

- 1) Classify remote sensing systems
- 2) Explain Optical remote sensing.
- 3) Explain various types of sensors on board remote sensing satellites.
- 4) Explain types of images.
- 5) Mention the applications of remote sensing satellites.
- 6) Explain weather satellite orbits.
- 7) Explain principle of operation of an altimeter.
- 8) Explain the principle of operation of Doppler effect based satellite navigation systems.

15.0 University Result

Examination	FCD	FC	SC	% Passing
JAN-2018	10	07	–	100
JAN-2019		11	31	100

Prepared by	Checked by		
Prof. S. B. Akkole	Prof. D. M. Kumbhar	HOD	Principal



Subject Title	DIGITAL IMAGE PROCESSING		
Subject Code	18EC733	IA Marks	40
Number of Lecture Hrs / Week	03	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03

Faculty Details:		
Name: Prof. B. P. Khot	Designation: Assistant Professor	Experience: 5.9 Years
No. of times course taught: 05	Specialization: Microelectronics and control systems	

1.0 Prerequisite Subjects:

Sr. No.	Branch	Semester	Subject
01	Electronics & Communication	III	Digital Electronics
02	Electronics & Communication	V	Digital signal Processing

2.0 Course Objectives

1. Understand the fundamentals of digital image processing.
2. Understand the image transform used in digital image processing.
3. Understand the image enhancement techniques used in digital image processing.
4. Understand the image restoration techniques and methods used in digital image processing.
5. Understand the Morphological Operations used in digital image processing.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

	Course Outcome	RBT Level	POs
C403B.1	Understand image formation and the role human visual system plays in perception of gray and color image data.	L1, L2	PO1-PO6, PO10-PO12
C403B.2	Apply image processing techniques in spatial domain.	L1, L2	PO1-PO6, PO10-PO12
C403B.3	Apply image processing techniques in frequency domain	L1, L2	PO1-PO6, PO10-PO12
C403B.4	Conduct independent study and analysis of Image Enhancement and restoration techniques.	L1, L2	PO1-PO6, PO10-PO12
C403B.5	Design and evaluate image analysis techniques	L1, L2	PO1-PO6, PO10-PO12
Total Hours of instruction		40	



4.0 Course Content

Module-1	RBT Level
<p>Digital Image Fundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition. [Text: Chapter 1 and Chapter 2: Sections 2.1 to 2.2, 2.6.2]</p> <p style="text-align: right;">10Hours</p>	L1, L2
Module-2	
<p>Image Enhancement in the Spatial Domain: Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations. Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. [Text:Chapter2:Sections 2.3 to 2.62,Chapter 3:Sections 3.2 to 3.6]</p> <p style="text-align: right;">10 Hours</p>	L1, L2
Module-3	
<p>Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering. Constrained Least Squares Filtering. [Text: Chapter 4: Sections 4.2, 4.5 to 4.10]</p> <p style="text-align: right;">10 Hours</p>	L1, L2
Module-4	
<p>Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position Invariant degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering. [Text: Chapter 5: Sections 5.2, to 5.9]</p> <p style="text-align: right;">10 Hours</p>	L1, L2
Module-5	
<p>Morphological Image Processing: Preliminaries, Erosion and Dilatation, Opening and Closing. Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing. [Text: Chapter 6: Sections 6.1 to 6.3, Chapter 9: Sections 9.1 to 9.3]</p> <p style="text-align: right;">10 Hours</p>	L1, L2

5.0 Relevance to future subjects

Sr. No.	Semester	Subject	Topics
01	VIII	Project work	Image Processing Projects

6.0 Relevance to Real World

Sr. No.	Real World Mapping
01	Machine vision (Robotics)
02	Medical image Processing
03	Video processing (TVs, monitors, displays)



7.0 Gap Analysis and Mitigation

Sr. No.	Delivery Type	Details
01	Tutorial	Topic: Image Transforms
02	NPTEL	Image Enhancement, Image Restoration

8.0 Books Used and Recommended to Students

Text Books
1. “Digital Image Processing”, Rafael C Gonzalez and Richard E. Woods, PHI 3rd Edition 2010.
Reference Books
1. “Digital Image Processing”- S.Jayaraman, S.Esakkirajan, T.Veerakumar, Tata McGraw Hill 2014.
2. “Fundamentals of Digital Image Processing” A. K. Jain, Pearson 2004.
3. Image processing analysis and Machine vision with Mind Tap by Milan Sonka and Roger Boile, Cengage Publications, 2018.

9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
1. http://www.nptelvideos.in/2012/12/digital-image-processing.html
2. http://nptel.ac.in/courses/106105032/
3. http://vtu.allsyllabus.com/ECE/sem_7/Digital_Image_Processing/index.php

10.0 Magazines/Journals Used and Recommended to Students

Sr. No.	Magazines/Journals	Website
1	Introduction of Digital Image Processing	http://textofvideo.nptel.ac.in/117105135/lec1.pdf
2	Digital image fundamentals	http://www.acfr.usyd.edu.au/courses/amme4710/Lectures/AMME4710-Chap2-DigitalImageFundamentals.pdf
3	Image enhancement	https://link.springer.com/content/pdf/10.1007%2F978-1-4471-2751-2_4.pdf
4	Image Enhancement	http://textofvideo.nptel.ac.in/117105079/lec17.pdf
5	Image Restoration - I	http://textofvideo.nptel.ac.in/117105079/lec22.pdf
6	Color Image Processing	http://textofvideo.nptel.ac.in/117105079/lec26.pdf
7	Fundamental Concepts & an Overview of the Wavelet Theory	http://web.iitd.ac.in/~sumeet/WaveletTutorial.pdf
8	Mathematical Morphology- III	http://textofvideo.nptel.ac.in/117105079/lec35.pdf
9	Image Segmentation	http://textofvideo.nptel.ac.in/117105079/lec29.pdf



11.0 Examination Note

Internal Assessment: 40 Marks

Theoretical aspects as well as relevant sketches should be drawn neatly.

Scheme of Evaluation for Internal Assessment (40 Marks)

(b) Internal Assessment test in the same pattern as that of the main examination

(All the three Internal Tests marks considered): **30**Marks.

(c) Assignments: **10** Marks

SCHEME OF EXAMINATION:

Question paper pattern:

Note: - The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 60.

1. The question paper will have **ten** full questions carrying equal marks.
2. Each full question consisting of **20** marks.
3. There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
4. Each full question will have sub question covering all the topics under a module.
5. The students will have to answer **five** full questions, selecting **one** full question from each module.

12.0 Course Delivery Plan

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Digital Image Fundamentals	20
	2	What is Digital Image Processing?	
	3	Origins of Digital Image Processing	
	4	Examples of fields that use DIP	
	5	Fundamental Steps in Digital Image Processing	
	6	Components of an Image Processing System.	
	7	Elements of Visual Perception.	
	8	Image Sensing and Acquisition.	
2	9	Image Enhancement in the Spatial Domain: Image Sampling and Quantization	20
	10	Some Basic Relationships Between Pixels, Linear and Nonlinear Operations	
	11	Some Basic Intensity Transformation Functions	
	12	Histogram Processing	
	13	Fundamentals of Spatial Filtering	
	14	Smoothing Spatial Filters	
	15	Image Smoothing Using Frequency Domain Filters	
	16	Sharpening Spatial Filters	
3	17	Frequency Domain: Preliminary Concepts	20
	18	Discrete Fourier Transform (DFT) of Two Variables	
	19	Image Smoothing	
	20	Properties of the 2-D DFT	
	21	Filtering in the Frequency Domain	
	22	Image Sharpening Using Frequency Domain Filters	
	23	Selective Filtering	
	24	Constrained Least Squares Filtering.	



4	25	Restoration: Noise models	20
	26	Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering	
	27	Restoration in the Presence of Noise Only using Frequency Domain Filtering	
	28	Linear, Position Invariant degradations	
	29	Estimating the Degradation Function	
	30	Inverse Filtering	
	31	Minimum Mean Square Error (Wiener) Filtering,	
	32	Constrained Least Squares Filtering.	
5	33	Morphological Image Processing	20
	34	Preliminaries	
	35	Erosion and Dilation	
	36	Opening and Closing	
	37	Color Image Processing	
	38	Color Fundamentals,	
	39	Color Models	
	40	Pseudo color Image Processing	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sr. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Band pass signal to equivalent low pass and Line codes.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Text Book 1, Reference book 1, 2 of the reference list. Website of the Reference list.
2	Assignment 2: University Questions on Detection and Estimation methods.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Text Book 1, Reference book 1, 2 of the reference list. Website of the Reference list.
3	Assignment 3: University Questions on digital modulation techniques.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	5	Individual Activity. Printed solution expected.	Text Book 1, Reference book 1, 2 of the reference list. Website of the Reference list.
4	Assignment 4: University Questions on ISI, Eye diagrams and equalizers.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	6	Individual Activity. Printed solution expected.	Text Book 1, Reference book 1 of the reference list. Website of the Reference list.
5	Assignment 5: University Questions on Spread spectrum modulation.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	6	Individual Activity. Printed solution expected.	Text Book 1, Reference book 1, 2 of the reference list. Website of the Reference list.



14.0

QUESTION BANK

Module 1: Digital image fundamentals

1. What is digital image processing?
2. Write a note on origins of digital image processing.
3. Explain the fundamental steps in digital image processing.
4. Explain the fields that use DIP.
5. Explain about visual perception
6. Briefly explain the components of an image processing system.
7. Explain image sensing and acquisition.

Module 2: Image Enhancement in the Spatial Domain :

1. Explain image sampling and quantization.
2. Explain some basic relationships between pixels.
3. Write a note on linear and nonlinear operations.
4. Write a note on basic intensity transformation functions.
5. Explain histogram processing.
6. Explain the fundamentals of spatial filtering.
7. Write a note on smoothing spatial filters
8. Write a note on sharpening spatial filters.

Module 3: Frequency Domain

1. Explain preliminary concepts of selective filtering.
2. Explain Discrete Fourier Transform (DFT) of two variables.
3. Explain properties of the 2-D DFT.
4. Explain filtering in the frequency domain.
5. Write a note on image sharpening using frequency domain filters.
6. Write a note on image smoothing using frequency domain filters.

Module 4: Restoration

1. Write a note on restoration process.
2. Explain noise models.
3. Explain restoration in the presence of noise only, using spatial filtering.
4. Write a note on restoration in the presence of noise only, using frequency domain filtering.
5. Write a note on linear degradations.
6. Explain position-invariant degradations.
7. Explain Minimum Mean Square Error (Wiener) filtering.
8. Explain constrained least squares filtering.





Module 5: Morphological Image Processing, Color Image Processing

1. Write a note on color fundamentals.
2. Write a note on color models.
3. Explain pseudo color image processing.
4. Explain multiresolution expansions in wavelet transform.
5. Write a note on erosion and dilation.
6. Write a note on opening and closing in morphological image processing.



15.0 University Result

Examination	FCD	FC	SC	% Passing
Dec.-2013/Jan-2014	37	04	01	100
Dec.-2014/Jan-2015	13	17	07	100
Dec.-2017/Jan-2018	21	10	04	100
Dec -2018/Jan-2019	31	15	09	100
Dec -2019/Jan-2020	28	09	06	100
Dec -2020/Jan-2021	25	10	00	100

Prepared by	Checked by		
			
Prof. B. P. Khot	Prof. S. S. Kamate	HOD	Principal



Subject Title	Multimedia Communication		
Subject Code	18EC743	CIE Marks	40
Number of Lecture Hrs / Week	03 L	SEE Marks	60
Total Number of Lecture Hrs	40 (08 Hours/Module)	Exam Hours	03
FACULTY DETAILS:			
Name: 1) Prof. S S Malaj 2) Prof. S S Itannavar	Designation: 1) Assistant Professor 2) Assistant Professor	Experience: 1) 24 yrs 2) 8.6 yrs	
No. of times course taught: 1) 01 2) 03		Specialization: 1) E&TC 2) Digital Signal Processing	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	IV	Signals and Systems
02	ECE	V	Digital Signal Processing
03	ECE	VI	Digital Communication

2.0 Course Objectives

This course will enable students to:

- Understand the importance of multimedia in today's online and offline information sources and repositories.
- Understand the how Text, Audio, Image and Video information can be represented digitally in a computer so that it can be processed, transmitted and stored efficiently.
- Understand the Multimedia Transport in Wireless Networks.
- Understand the Real-time multimedia network applications.
- Understand the Different network layer based application.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

	Course Outcome	Cognitive Level	POs
C312C.1	Understand basics of different multimedia networks and applications.	L2	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C312C.2	Understand different compression techniques to compress audio and video.	L2	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C312C.3	Describe multimedia Communication across Networks.	L2	PO1, PO2, PO3, PO4, PO6, PO8, PO11, PO12
C312C.4	Analyse different media types to represent them in digital form.	L2	PO1, PO2, PO3, PO4, PO6, PO8, PO11, PO12
C312C.5	Compress different types of text and images using different compression techniques and analyse DMS.	L2	PO1, PO2, PO3, PO6, PO8, PO11, PO12
Total Hours of instruction			40



4.0 Course Content

Course Content:

MODULE -1		RBT Level
Multimedia Communications: Introduction, Multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology. (Chap 1 of Text 1) 08 Hours		L1, L2
MODULE -2		
Information Representation: Introduction, Digitization principles, Text, Images, Audio and Video (Chap 2 of Text 1) 08 Hours		L1, L2
MODULE -3		
Text and image compression: Introduction, Compression principles, text compression, image Compression. (Chap 3 of Text 1)		L1, L2
Distributed multimedia systems: Introduction, main Features of a DMS, Resource management of DMS, Networking and Multimedia operating systems (Chap. 4 - Sections 4.1 to 4.5 of Text 2). 08 Hours		
MODULE -4		
Audio and video compression: Introduction, Audio compression, video compression, video compression principles, video compression. (Chap. 4 of Text 1). 08 Hours		L1, L2
MODULE -5		
Multimedia Information Networks: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol (Chap. 8 of Text 1). The Internet: Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8.(Chap. 9 of Text 1) 08 Hours		L1, L2

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project work	Design Communication system

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Multimedia Communication Technologies are digital tools that allow two or more people to communicate with one another.
02	These can be written, verbal, visual or audible communication



7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Multimedia Modulation Techniques, Networks, Transport Protocol.
02	NPTEL	ISI, Equalizers.

8.0 Books Used and Recommended to Students

Text Books
1. Fred Halsall, “Multimedia Communications”, Pearson education, 2001 ISBN - 9788131709948.
2. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, “Multimedia Communication Systems”, Pearson education, 2004. ISBN -9788120321458
Reference Books
1. Raifsteinmetz, Klara Nahrstedt, “Multimedia: Computing, Communications and Applications”, Pearson education, 2002. ISBN -978817758
Additional Study material & e-Books
4. NPTEL notes and Videos
5. VTU online notes.

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
3) www.citystudentsgroup.com
4) http://everythingvtu.wordpress.com
5) www.nptelvideos.in/

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	IEEE Transactions on Communication systems	ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=4547466
2	Digital Communications and Networks - Journal - Elsevier	www.journals.elsevier.com/digital-communications-and-networks/
3	International Journal of Digital Communication and Networks	ijdcn.co.in
	Journal of Communication - Wiley Online Library	onlinelibrary.wiley.com

11.0 Examination Note

Internal Assessment: 40 Marks

Three IA will be conducted and average of three will be accounted for 30 Marks.

Assignment is 10 Marks.

Total is 40 Marks

Scheme of Evaluation for Internal Assessment (50 Marks)

Four full questions will be given which consists of a, b as sub sections.

Students have to answer either Q: 1 or 2 and Q 3 or 4 completely.

Question 1 or 2 for 25 or 25Marks



Question 3 or 4 for 25 or 25Marks
Each IA will be conducted for 50 Marks.
Three IA will be conducted and average of three will be accounted for 30 Marks.
Assignment is 10 Marks
Total = 40Marks

Scheme of External Exam (60 Marks)

Ten questions to be set from the syllabus covered.
Each Module consists of two questions. Each question consists of a, b, c and d sub questions.
Student has to answer one full question from Each Module.
Each Module Consists of 20 Marks. Total 5 Modules=5*20=100 Marks
This 100 Marks results will be converted for 60 Marks.

12.0 Course Delivery Plan

Course Delivery Plan:

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Multimedia Communications: Introduction, Multimedia information representation.	20
	2	Multimedia information representation.	
	3	Multimedia networks	
	4	Multimedia networks	
	5	Multimedia applications	
	6	Multimedia applications	
	7	Application and networking terminology.	
	8	Application and networking terminology	
2	9	Introduction	20
	10	Digitization principles	
	11	Text representation	
	12	Text representation	
	13	Image representation	
	14	Image representation	
	15	Audio representation	
	16	Video representation	
3	17	Text and image compression: Introduction, Compression principles.	20
	18	Text compression	
	19	Image Compression.	
	20	Distributed multimedia systems: Introduction	
	21	Main Features of a DMS	
	22	Resource management of DMS	
	23	Networking and Multimedia operating systems	
	24	Networking and Multimedia operating systems	



4	25	Audio and video compression: Introduction	20
	26	Audio compression	
	27	Audio compression	
	28	Video compression	
	29	Video compression	
	30	Video compression principles.	
	31	Video compression	
	32	Video compression	
5	33	Multimedia Information Networks: Introduction	20
	34	LANs, Ethernet, Token ring	
	35	Bridges, FDDI High-speed LANs	
	36	LAN protocol	
	37	The Internet: Introduction, IP Datagrams	
	38	Fragmentation, IP Address	
	39	ARP and RARP	
	40	QoS Support, IPv8.	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Networks, media types and information representation.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Text Book 1, of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Text, Image, Audio, Video representation.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Text Book 1, of the reference list. Website of the Reference list
3	Assignment 3: University Questions on Text, Image, Compression.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	5	Individual Activity. Printed solution expected.	Text Book 2, of the reference list. Website of the Reference list
4	Assignment 4: University Questions on Audio, Video Compression.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	6	Individual Activity. Printed solution expected.	Text Book 1, of the reference list. Website of the Reference list
5	Assignment 5: University Questions on Multimedia Communication across networks.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	6	Individual Activity. Printed solution expected.	Text Book 2, of the reference list. Website of the Reference list



14.0 Assignment Questions

Assignment No	Questions	Marks
I	<ol style="list-style-type: none">1) The term “multimedia” composed of many media types. Explain them [06]. [Dec-08]2) Explain briefly the entertainment applications of multimedia [06]. [Dec-08]3) Mention different modes of multipoint conferencing. [Dec-09] [4]4) With the help of a diagram, describe the components of PSTN. [10][Jun10]5) Explain the working of CO packet switched network including routing table. [10] [Dec2010]	5marks for each
II	<ol style="list-style-type: none">1. Explain operational modes of communication channel.2. Explain interactive television application for both cable and satellite network.3. Mention different modes of multipoint conferencing.4. Explain 4:2:2 and QCIF digitization formats.5. Explain the principle of operation of a PCM speech codec with block diagram.	5marks for each
III	<ol style="list-style-type: none">1. Explain basic mode and dynamic mode of compression if image using GIF.2. Compare arithmetic coding and Huffman coding.3. Explain DPCM with encoder and decoder schematic.4. Explain ADPCM with block diagram5. Explain error tracking procedures of H.263, with neat diagrams.	5marks for each
IV	<ol style="list-style-type: none">1. Explain Root Bridge, designated cost, root path cost and root port, designated bridge and designated cost.2. Explain in detail LAN protocols and protocol framework.3. Explain how RARP is used to enable a diskless host to determine its own IP address from its local server.4. Explain IP datagram /packet format.5. Explain the operation of Internet with a neat diagram.	5marks for each
V	<ol style="list-style-type: none">1. Explain different types of token ring formats..2. Explain the general structure of FDDI High speed LAN..3. Explain with neat block diagram of LAN Protocol.4. Explain ARP and RARP usage and package format.5. Explain the architecture of Ipv8.	5marks for each

15.0 QUESTION BANK

1. The term “multimedia” composed of many media types. Explain them [06]. [Dec-08]
2. Explain briefly the entertainment applications of multimedia [06]. [Dec-08]
3. Mention different modes of multipoint conferencing. [Dec-09] [4]
4. With the help of a diagram, describe the components of PSTN. [10][Jun10]
5. Explain the working of CO packet switched network including routing table. [10] [Dec2010]
6. Explain operational modes of communication channel. [Dec 2010]



7. Explain speech only interpersonal application. [10][Dec - 2011]
8. Explain interactive television application for both cable and satellite network. [10][June-2012]
9. Explain briefly three types of text that are used to produce pages of documents. [06] [June 12 & Dec 09]
10. Derive the time to transmit a 640X480X8 image at 64 Kbps and 1.5 Mbps separately. [04][Dec 09]
11. Explain briefly MIDI standard and its associated messages. [08][June -2010]
12. Explain the principle of operation of a PCM speech codec with block diagram. [10] [Dec 2011]
13. Explain 4:2:2 and QCIF digitization formats.[10][June 2011]
14. Explain how an image produced by a scanner or digital camera is captured and stored within a computer memory? [08][Dec 2011]
15. Explain run length encoding compression. .[06] [June 12 & Dec 09]
16. Explain basic mode and dynamic mode of compression if image using GIF. [08] [June 2010]
17. Explain Huffman coding. [10][Dec 2010]
18. Explain JPEG encoder. [10][Dec - 2011]
19. Compare arithmetic coding and Huffman coding. [Dec-08] [06]
20. Explain features of TIFF. [08][June 2012]
21. Explain DPCM with encoder and decoder schematic. [08][June -2010]
22. Explain P x 64 standard used for video compression. . [10][Dec - 2011]
23. Explain ADPCM with block diagram.[08][June 2010/ Dec 11]
24. Explain H.261 video encoder. [10][June 2010 & June 12]
25. Explain video compression principles, with a neat diagram, explain B frame encoding.[08] [Dec 2011]
26. Explain error tracking procedures of H.263, with neat diagrams. .[10][June 2011]
27. Explain Root Bridge, designated cost, root path cost and root port, designated bridge and designated cost. [10][May / June 2010 & Dec 11].
28. Explain different types of token ring formats.
29. Explain the general structure of FDDI High speed LAN.
30. Explain with neat block diagram of LAN Protocol.
31. Explain ARP and RARP usage and package format.
32. Explain the architecture of Ipv8.

16.0 University Result

Examination	FCD	FC	SC	% Passing
July- 2018	11	08	12	100
July- 2017	--	--	--	--
July- 2016	--	--	--	--

Prepared by	Checked by		
Prof. S. S. Malaj & Prof. S. S. Itannavar	Prof. D. M. Kumbar	HOD	Principal



Subject Title	MACHINE LEARNING WITH PYTHON		
Subject Code	18EC745	CIE Marks	40
Number of Lecture Hrs /	03	SEE Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. P.V.PATIL	Designation: Asst. Professor	Experience: 10 years
No. of times course taught:01(including Present)	Specialization: Mtech –(VLSI Design & Embedded Systems)	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	VI	Python Application Programming

2.0 Course Objectives

The course objective is to make students of ECE branch of engineering to understand the fundamentals of Microwaves and Antennas for Communication Engineering Applications.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

	Course Outcome	RBT Level	PO's
CO404.1	Identify the problems in machine learning.	L1, L2	1,2,3,4,7,10
CO404.2	Select supervised, unsupervised or reinforcement learning for problem solving.	L1, L2	1,2,3,4,6
CO404.3	Apply theory of probability and statistics in machine learning	L1,L2,L3	1,2,3,4
CO404.4	Apply concept learning, ANN, Bayes classifier, k nearest neighbor	L1, L2, L3, L4	1,2,3,4,6
CO404.5	Perform statistical analysis of machine learning techniques.	L1, L2, L3	1,2,3,4,6
Total Hours of instruction		50	

4.0 Course Content

Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1	10	L1, L2
Introduction: well posed learning problems, designing learning System , perspective and issues in machine learning. Concept learning: concept learning task, concept learning as search, find-s algorithm, Version space, candidate elimination algorithm, inductive bias. Python libraries suitable for machine learning: numerical analysis and data exploration with Numpy arrays, and data visualization with mat plot lib Text book1, sections: 1.1 – 1.3, 2.1-2.5, 2.7		
Module -2	10	L1, L2
Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. Example program in Python Text Book1, Sections: 3.1-3.7		



Module-3	08	L1,L2L3
Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation algorithm. Example program in Python Text book 1, Sections: 4.1 – 4.6		
Module-4	10	L1, L2,L3,L4
Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm, Example program in Python. Text book 1, Sections: 6.1 – 6.6, 6.9, 6.11, 6.12		
Module-5	12	L1, L2,L3
Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning, Reinforcement Learning: Introduction, Learning Task, Q Learning Example program in Python. Text book 1, Sections: 5.1-5.6, 8.1-8.5, 13.1-13.3		

5.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Machine Learning

6.0 Books Used and Recommended to Students

Text Books
Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.
Reference Books
<ol style="list-style-type: none"> 1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics. 2. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press. 3. https://www.analyticsvidhya.com/blog/2015/04/comprehensive-guide-data-exploration-sas-using-pythonnumpy-scipy-matplotlib-pandas/ 4. https://www.oreilly.com/library/view/python-for-data/9781491957653/ch01.html

7.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
6) nptel.ac.in
7) VTU e-learning notes

8.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	Machine Learning using Python	www.ieee.org



9.0 Examination Note

Scheme of Evaluation for CIE (40 Marks)

Internal Assessment test will be done in the same pattern as that of the main examination.

Internal Assessment: 30 Marks

Assignment: 10 Marks

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.

The question paper will have ten questions.

- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

10.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	Well posed learning problems ,	20
	2	Designing learning System	
	3	Perspective and issues in machine learning.	
	4	Concept learning task	
	5	Concept learning as search find-s algorithm	
	6	Version space	
	7	Numerical analysis and data exploration with Numpy arrays	
	8	Data visualization with mat plot lib	
2	11	Decision tree representation	40
	12	Appropriate problems for decision tree learning	
	13	Basic decision tree learning algorithm	
	14	Hypothesis space search in decision tree learning	
	15	Inductive bias in decision tree learning	
	16	Issues in decision tree learning	
	17	Example program in Python	
3	21	Introduction	60
	22	Neural Network representation	
	23	Appropriate problems	
	24	Perceptrons	
	25	Back propagation algorithm	
	26	Example program in Python	
4	31	Introduction	80
	32	Bayes theorem and concept learning	
	33	ML and LS error hypothesis	
	34	ML for predicting probabilities	
	35	MDL principle	
	36	Naive Bayes classifier	
	37	Bayesian belief networks	
	38	EM algorithm	
39	Example program in Python		



5	41	Motivation, Estimating hypothesis accuracy	100
	42	Basics of sampling theorem	
	43	General approach for deriving confidence intervals	
	44	Difference in error of two hypothesis	
	45	Comparing learning algorithms.	
	46	Instance Based Learning: Introduction	
	47	K-nearest neighbor learning	
	48	Locally weighted regression	
	49	Cased-based reasoning	
	50	Numerical Problems	
	51	Reinforcement Learning: Introduction	
	52	Learning Task	
	53	Q Learning Example program in Python	

11.0

QUESTION BANK

Module – 1

1. Explain the Well posed learning problems.
2. Explain Designing learning System
3. Explain Perspective and issues in machine learning.
4. Explain the Concept learning task
5. Explain the Version space
6. Explain Numerical analysis and data exploration with Numpy arrays
7. Explain Data visualization with mat plot lib

Module-2

1. Explain the Decision tree representation.
2. What are Appropriate problems for decision tree learning
3. Explain the Basic decision tree learning algorithm
4. Explain Hypothesis space search in decision tree learning
5. Explain Inductive bias in decision tree learning
6. Explain Issues in decision tree learning

Module-3

1. Explain the Neural Network representation.
2. Explain Perceptrons
3. Explain Back propagation algorithm.
4. Explain program in Python.

Module-4

1. Explain the Bayes theorem and concept learning.
2. Explain ML and LS error hypothesis
3. Explain ML for predicting probabilities
4. Explain program in Python.
5. Explain MDL principle
6. Explain the Naive Bayes classifier
7. Explain the Bayesian belief networks
8. Explain the EM algorithm



Module-5

- 1.Explain the Motivation, Estimating hypothesis accuracy.
- 2.Explain Basics of sampling theorem
- 3.Explain General approach for deriving confidence intervals
- 4.Explain Difference in error of two hypothesis
- 5.Explain Comparing learning algorithms.
- 6.Explain the Linstance Based Learning
- 7.Explain the K-nearest neighbor learning
- 8.Explain the Locally weighted regression
- 9.Explain the Cased-based reasoning
10. Explain the Reinforcement Learning.
11. Explain the Learning Task.
12. Explain the Q Learning .

12.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
First Time Introduced								



Subject Title	PYTHON APPLICATION PROGRAMMING (OPEN ELECTIVE)		
Subject Code	18CS752	IA Marks	40
Number of Lecture Hrs / Week	03 L	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS – 03			

FACULTY DETAILS:

Name: Prof. C. R. Belavi	Designation: Asst. Professor	Experience: 13 Years
No. of times course taught: 01		Specialization: Computer Science and Engineering

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I/II	Programming in C and Data Structures

2.0 Course Objectives

Students should learn to:

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python
5. Build Web Services and introduction to Network and Database Programming in Python.

3.0 Course Outcomes

After studying this course, students will be able to

	Course Outcome	Cognitive Level	POs
C414.1	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.	L3	1, 2, 3, 8, 12
C414.2	Demonstrate proficiency in handling Strings and File Systems.	L2	1, 2, 3, 8, 12
C414.3	Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.	L3	1, 2, 3, 8, 12
C414.4	Interpret the concepts of Object-Oriented Programming as used in Python.	L2	1, 2, 3, 8, 12
C414.5	Develop exemplary applications related to Network Programming, Web Services and Databases in Python.	L3	1, 2, 3, 8, 12
Total Hours of instruction			40

4.0 Course Content

Module – 1

Why should you learn to write programs, Variables, expressions and statements, Conditional execution, Functions

8 Hours

Module – 2

Iteration, Strings, Files.

8 Hours

Module – 3

Lists, Dictionaries, Tuples, Regular Expressions

8 Hours

Module – 4

Classes and objects, Classes and functions, Classes and methods

8 Hours



Module – 5

8 Hours

Networked programs, Using Web Services, Using databases and SQL

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Academic Projects	Project Work

6.0 Relevance to Real World

Sl.No	Real World Mapping
01	Implementation of machine learning algorithms
02	Final year projects on analytics

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	YouTube Videos	Python Tutorials

8.0 Books Used and Recommended to Students

Text Books	
1.	Charles R. Severance, “Python for Everybody: Exploring Data Using Python 3”, 1 st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf) (Chapters 1 – 13, 15)
2.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2 nd Edition, Green Tea Press, 2015. (http://greentepress.com/thinkpython2/thinkpython2.pdf) (Chapters 15, 16, 17)
Reference Books	
1.	Charles Dierbach, "Introduction to Computer Science Using Python", 1 st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014
2.	Gowrishankar S, Veena A, “Introduction to Python Programming”, 1 st Edition, CRC Press/Taylor & Francis 2018, ISBN-13:978-08115394372
3.	Mark Lutz, “Programming Python”, 4 th Edition, O’Reilly Media, 2011. ISBN-13: 978-9350232873
4.	Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, “Data Structures and Algorithms in Python”, 1 st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176
5.	Reema Thareja, “Python Programming using problem solving approach”, Oxford university press, 2017, ISBN-13:978-0199480173
6.	Wesley J Chun, “Core Python Applications Programming”, 3 rd Edition, Pearson Education India, 2015.
Additional Study material & e-Books	
1.	Python Notes for Professionals, GoalKicker.com Free Programming books

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References	
1.	https://www.tutorialspoint.com/python/
2.	https://www.guru99.com/python-tutorials.html

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Python for Scientific Computing	http://ieeexplore.ieee.org/document/4160250/



11.0 Examination Note

Internal Assessment: 30+10=40 Marks

30 Marks - from Three Internal Assessment Test

10 Marks - from the Assignments

Scheme of Evaluation for Internal Assessment (30 Marks)

- Internal Assessment test in the same pattern as that of the main examination (Average of the three Tests): 30marks.
- Assignment marks for each module is 25. Average of 5 assignment marks will be taken and finally scale down to 10 marks.

Internal Assessment Question Paper Pattern (IA):

- Two main questions to be set from syllabus covered up to IA tests.
- Student has to answer two full main questions and each question carries 25 marks, Total test marks are 50
 - Q.No I or Q.No II = 25 Marks
 - Q.No III or Q.No IV = 25 Marks
 - Total = 50 Marks**

Question Paper Pattern and instructions for Main Exam

- The question paper will have ten questions
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Why should you learn to write programs	20
	2	Variables	
	3	Expressions and statements	
	4	Continued...	
	5	Conditional execution	
	6	Continued...	
	7	Functions	
	8	Continued...	
2	9	Iteration	20
	10	Continued...	
	11	Strings	
	12	Continued...	
	13	Continued...	
	14	Files	
	15	Continued...	
	16	Continued...	
3	17	Lists	20
	18	Continued...	
	19	Dictionaries	
	20	Continued...	
	21	Tuples	
	22	Continued...	
	23	Regular Expressions.	
	24	Continued...	



4	25	Classes and objects	20
	26	Continued...	
	27	Continued...	
	28	Classes and functions	
	29	Continued...	
	30	Continued...	
	31	Classes and methods	
5	32	Continued...	20
	33	Networked programs	
	34	Continued...	
	35	Continued...	
	36	Using Web Services	
	37	Continued...	
	38	Continued...	
	39	Using databases and SQL	
40	Continued...		

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Module 1	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Book 1
2	Assignment 2: University Questions on Module 2	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1
3	Assignment 3: University Questions on Module 3	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Book 1
4	Assignment 4: University Questions on Module 4	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity. Printed solution expected.	Book 2
5	Assignment 5: University Questions on Module 5	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity. Printed solution expected.	Book 1

14.0 QUESTION BANK

MODULE– 1

- What is wrong with the following code:


```
>>>print 'Hello world!'
File "<stdin>", line 1
print 'Hello world!'
^
SyntaxError: invalid syntax
>>>
```
- Write a program that uses input to prompt a user for their name and then welcomes them.
- Write a program to prompt the user for hours and rate per hour to compute gross pay.



- Write a program which prompts the user for a Celsius temperature, convert the temperature to Fahrenheit, and print out the converted temperature.
- Rewrite your pay computation to give the employee 1.5 times the hourly rate for hours worked above 40 hours.
- Rewrite your pay program using try and except so that your program handles non-numeric input gracefully by printing a message and exiting the program. The following shows two executions of the program:
Enter Hours: 20
Enter Rate: nine
Error, please enter numeric input

Enter Hours: forty
Error, please enter numeric input
- What is the purpose of the “def” keyword in Python?
- Rewrite your pay computation with time-and-a-half for overtime and create a function called computepay which takes two parameters (hours and rate).
- Rewrite the grade program from the previous chapter using a function called computegrade that takes a score as its parameter and returns a grade as a string.
Score Grade
> 0.9 A
> 0.8 B
> 0.7 C
> 0.6 D
<= 0.6 F

MODULE– 2

- Write a program which repeatedly reads numbers until the user enters “done”. Once “done” is entered, print out the total, count, and average of the numbers. If the user enters anything other than a number, detect their mistake using try and except and print an error message and skip to the next number.
- Write another program that prompts for a list of numbers as above and at the end prints out both the maximum and minimum of the numbers instead of the average.
- Write a while loop that starts at the last character in the string and works its way backwards to the first character in the string, printing each letter on a separate line, except backwards.
- Given that fruit is a string, what does fruit[:] mean?
- Take the following Python code that stores a string: str = 'X-DSPAM-Confidence:0.8475'
Use find and string slicing to extract the portion of the string after the colon character and then use the float function to convert the extracted string into a floating point number.
- Write a program to read through a file and print the contents of the file (line by line) all in upper case.
- Write a program to prompt for a file name, and then read through the file and look for lines of the form: X-DSPAM-Confidence:0.8475.
When you encounter a line that starts with “X-DSPAM-Confidence:” pull apart the line to extract the floating-point number on the line. Count these lines and then compute the total of the spam confidence values from these lines. When you reach the end of the file, print out the average spam confidence.
- Sometimes when programmers get bored or want to have a bit of fun, they add a harmless Easter Egg to their program. Modify the program that prompts the user for the file name so that it prints a funny message when the user types in the exact file name “nana boo boo”. The program should behave normally for all other files which exist and don't exist.

MODULE– 3

- Write a function called chop that takes a list and modifies it, removing the first and last elements, and returns None. Then write a function called middle that takes a list and returns a new list that contains all but the first and last elements.
- Figure out which line of the above program is still not properly guarded. See if you can construct a text file which causes the program to fail and then modify the program so that the line is properly guarded and test it to make sure it handles your new text file.
 - Rewrite the guardian code in the above example without two if statements. Instead, use a compound logical expression using the and logical operator with a single if statement.
 - Download a copy of the file from www.py4e.com/code3/romeo.txt Write a program to open the file romeo.txt and read it line by line. For each line, split the line into a list of words using the split function. For each word, check to see if the word is already in a list. If the word is not in the list, add it to the list. When the program completes, sort and print the resulting words in alphabetical order.



4. Rewrite the program that prompts the user for a list of numbers and prints out the maximum and minimum of the numbers at the end when the user enters “done”. Write the program to store the numbers the user enters in a list and use the max() and min() functions to compute the maximum and minimum numbers after the loop completes
5. Write a program that categorizes each mail message by which day of the week the commit was done. To do this look for lines that start with “From”, then look for the third word and keep a running count of each of the days of the week. At the end of the program print out the contents of your dictionary (order does not matter). Sample Line: From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008.
6. Write a program that reads a file and prints the letters in decreasing order of frequency. Your program should convert all the input to lower case and only count the letters a-z. Your program should not count spaces, digits, punctuation, or anything other than the letters a-z. Find text samples from several different languages and see how letter frequency varies between languages. Compare your results with the tables at wikipedia.org/wiki/Letter_frequencies.
7. Change the socket program socket1.py to prompt the user for the URL so it can read any web page. You can use split('/') to break the URL into its component parts so you can extract the host name for the socket connect call. Add error checking using try and except to handle the condition where the user enters an improperly formatted or non-existent URL.
8. Change your socket program so that it counts the number of characters it has received and stops displaying any text after it has shown 3000 characters. The program should retrieve the entire document and count the total number of characters and display the count of the number of characters at the end of the document.

MODULE– 4

1. Write a definition for a class named Circle with attributes center and radius, where center is a Point object and radius is a number. Instantiate a Circle object that represents a circle with its center at (150, 100) and radius 75. Write a function named point_in_circle that takes a Circle and a Point and returns True if the Point lies in or on the boundary of the circle. Write a function named rect_in_circle that takes a Circle and a Rectangle and returns True if the Rectangle lies entirely in or on the boundary of the circle. Write a function named rect_circle_overlap that takes a Circle and a Rectangle and returns True if any of the corners of the Rectangle fall inside the circle. Or as a more challenging version, return True if any part of the Rectangle falls inside the circle.
2. Write a function called draw_rect that takes a Turtle object and a Rectangle and uses the Turtle to draw the Rectangle. Write a function called draw_circle that takes a Turtle and a Circle and draws the Circle.
3. Write a function called mul_time that takes a Time object and a number and returns a new Time object that contains the product of the original Time and the number. Then use mul_time to write a function that takes a Time object that represents the finishing time in a race, and a number that represents the distance, and returns a Time object that represents the average pace (time per mile). The datetime module provides time objects that are similar to the Time objects in this chapter, but they provide a rich set of methods and operators. Read the documentation at [http:// docs.python.org/ 3/ library/ datetime.html](http://docs.python.org/3/library/datetime.html) . Use the datetime module to write a program that gets the current date and prints the day of the week. Write a program that takes a birthday as input and prints the user’s age and the number of days, hours, minutes and seconds until their next birthday. For two people born on different days, there is a day when one is twice as old as the other. That’s their Double Day. Write a program that takes two birthdays and computes their Double Day. For a little more challenge, write the more general version that computes the day when one person is n times older than the other.
4. This exercise is a cautionary tale about one of the most common, and difficult to find, errors in Python. Write a definition for a class named Kangaroo with the following methods: An __init__ method that initializes an attribute named pouch_contents to an empty list. A method named put_in_pouch that takes an object of any type and adds it to pouch_contents. A __str__ method that returns a string representation of the Kangaroo object and the contents of the pouch. Test your code by creating two Kangaroo objects, assigning them to variables named kanga and roo, and then adding roo to the contents of kanga’s pouch.

MODULE – 5


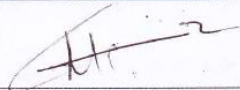


1. Change the socket program socket1.py to prompt the user for the URL so it can read any web page. You can use split('/') to break the URL into its component parts so you can extract the host name for the socket connect call. Add error checking using try and except to handle the condition where the user enters an improperly formatted or non-existent URL.
2. Change your socket program so that it counts the number of characters it has received and stops displaying any text after it has shown 3000 characters. The program should retrieve the entire document and count the total number of characters and display the count of the number of characters at the end of the document.



- Use urllib to replicate the previous exercise of (1) retrieving the document from a URL, (2) displaying up to 3000 characters, and (3) counting the overall number of characters in the document. Don't worry about the headers for this exercise, simply show the first 3000 characters of the document contents.
- Change the urlinks.py program to extract and count paragraph (p) tags from the retrieved HTML document and display the count of the paragraphs as the output of your program. Do not display the paragraph text, only count them. Test your program on several small web pages as well as some larger web pages.
- Change either the www.py4e.com/code3/geojson.py or www.py4e.com/code3/geoxml.py to print out the two-character country code from the retrieved data. Add error checking so your program does not traceback if the country code is not there. Once you have it working, search for "Atlantic Ocean" and make sure it can handle locations that are not in any country.

15.0 University Result

Examination	S+	S	A	B	C	D	E	F	%Passing
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by	Checked by		
			
Prof. C. R. Belavi	Prof. M. G. Huddar	HOD	Principal



Subject Title	ENERGY AND ENVIRONMENT		
Subject Code	18ME751	IA Marks	40
No of Lecture Hrs + Tutorial Hrs / Week	03	Exam Marks	60
Total No of Lecture + Tutorial Hrs	40	Exam Hours	03
			CREDITS – 03

FACULTY DETAILS:

Name: Dr. S.N.Topannavar	Designation: Professor	Experience: 23Years
No. of times course taught: 04Times (Similar)		Specialization: Thermal Power Engineering

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
1	Common to all	I/II	Chemistry
2	Common to all	I/II	Physics
3	Common to all	V	Environmental Studies

2.0 Course Objectives

1. To understand the fundamentals of energy sources, energy use, energy efficiency, and resulting environmental implications of various energy supplies.
2. To learn about methods of energy storage, energy management and economic analysis
3. To understand the causes and remedies related to social issues like global warming, ozone layer depletion, climate change etc.
4. To understand environment and its ecosystems.
5. To introduce various aspects of environmental pollution and its control. To introduce various acts related to prevention and control of pollution of water and air, forest protection act, wild life protection act etc.

3.0 Course Outcomes

The student, after successful completion of the course, will be able to

CO	Course Outcome	RBT level	POs
CO1	Summarize the basic concepts of energy, its distribution and general Scenario.	L1	1,6,7,8,9,10,11,12
CO2	Explain different energy storage systems, energy management, audit and economic analysis.	L2	1,2,3,6,7,8,9,10,11,12
CO3	Summarize the environment eco system and its need for awareness.	L1	1,6,7,8,10,12
CO4	Identify the various types of environment pollution and their effects.	L1	1,6,7,8,10,12
CO5	Discuss the social issues of the environment with associated acts.	L2	1,6,7,8,10,12
Total Hours of instruction			40



4.0 Course Content

Module-1: Basic Introduction to Energy: Energy and power, forms of energy, primary energy sources, energy flows, world energy production and consumption, Key energy trends in India: Demand, Electricity, Access to modern energy, Energy production and trade, Factors affecting India's energy development: Economy and demographics Policy and institutional framework, Energy prices and affordability, Social and environmental aspects, Investment. (8 Hours)

Module-2: Energy storage systems: Thermal energy storage methods, Energy saving, Thermal energy storage systems Energy Management: Principles of Energy Management, Energy demand estimation, Energy pricing Energy Audit: Purpose, Methodology with respect to process Industries, Characteristic method employed in Certain Energy Intensive Industries. (8 Hours)

Module-3: Environment: Introduction, Multidisciplinary nature of environmental studies- Definition, scope and importance, Need for public awareness. Ecosystem: Concept, Energy flow, Structure and function of an ecosystem. Food chains, food webs and ecological pyramids, Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems, Ecological succession.

Module-4: Environmental Pollution: Definition, Cause, effects and control measures of - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards, Solid waste Management, Disaster management Role of an individual in prevention of pollution, Pollution case studies. (8 Hours)

Module-5: Social Issues and the Environment: Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation. Group assignments: Assignments related to e-waste management; Municipal solid waste management; Air pollution control systems; Water treatment systems; Wastewater treatment plants; Solar heating systems; Solar power plants; Thermal power plants; Hydroelectric power plants; Bio-fuels; Environmental status assessments; Energy status assessments etc. (8 Hours)

5.0 Relevance to future subjects/Career

SL. No	Semester	Subject	Topics / Relevance
01	VII & VIII	Project Phase-1 & Phase-2	All modules
02	After graduation	Energy and Pollution Analysis and resolving related problems	All modules

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Electrical Engineering and Automobile Engineering
02	Power plant engineering, thermal power plant
03	Environmental Science

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	nptel.ac.in	E- Learning
02	VTU, E- learning	E- Learning
03	Open courseware	E- Learning



8.0 Books Used and Recommended to Students

Text Books

1. Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education by University grant commission and Bharathi Vidyapeeth Institute of environment education and Research ,Pune
2. De, B. K., Energy Management audit & Conservation, 2nd Edition, Vrinda Publication, 2010.

Reference Books

1. Turner, W. C., Doty, S. and Truner, W. C., Energy Management Hand book, 7th edition, Fairmont Press, 2009.
2. Murphy, W. R., Energy Management, Elsevier, 2007.
3. Smith, C. B., Energy Management Principles, Pergamum, 2007
4. Environment pollution control Engineering by C S rao, New Age International, 2006, reprint 2015, 2nd edition
5. Environmental studies, by Benny Joseph, Tata McGraw Hill, 2008, 2nd edition.

Additional Study material & e-Books

- Nptel.ac.in
- VTU, E- learning
- India Energy Outlook 2015(www.iea.org/.../IndiaEnergyOutlook_WEO2015.pdf)
- Open courseware

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

1. <http://www.nptel.ac.in>
2. www.iea.org

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Elsevier	https://www.journals.elsevier.com/renewable-energy
2	Environmental Sciences Journals	https://www.omicsonline.org/environmental-sciences-journals

11.0 Examination Note

Internal Assessment: 40 Marks

Theoretical aspects as well as relevant sketches should be drawn neatly for questions asked in Internal Assessments

Scheme of Evaluation for Internal Assessment

Internal Assessment test in the same pattern as that of the main examination (Better of the two Tests):40marks.

SCHEME OF EXAMINATION:

- There are five modules two questions from each module
- Student has to answer any five question choosing at least one questions from each module.

Max. Marks: 60Marks



12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1		Basic Introduction to Energy:	20
	1	Energy and power, forms of energy, primary energy sources	
	2	Energy flows, world energy production and consumption	
	4	Key energy trends in India: Demand	
	5	Electricity, Access to modern energy,	
	6	Energy production and trade, Factors affecting India's energy development	
	7	Economy and demographics Policy and institutional framework	
	8	Energy prices and affordability, Social and environmental aspects, Investment	
2		Energy storage systems, Energy Management, Energy Audit, Economic Analysis	20
	1	Thermal energy storage methods,	
	2	Energy saving, Thermal energy, storage systems	
	3	Principles of Energy Management,	
	4	Energy demand.	
	5	Energy estimation, Energy pricing	
	6	Energy Audit: Purpose	
	7	Methodology with respect to process Industries,	
	8	Characteristic method employed in Certain Energy Intensive Industries.	
	9	Economic Analysis: Scope	
3		Environment, Ecosystem:	20
	1	Environment: Introduction, Multidisciplinary nature of environmental studies- Definition, scope and importance.	
	2	Need for public awareness.	
	3	Ecosystem: Concept, Energy flow Structure and function of an ecosystem.	
	4	Food chains, food webs and ecological pyramids	
	5	Forest ecosystem, Grassland ecosystem,	
	6	Desert ecosystem and Aquatic ecosystems,	
	7	Desert ecosystem and Aquatic ecosystems	
4		Environmental Pollution:	20
	1	Environmental Pollution definition, Cause and effects	
	2	Control measures of - Air pollution,	
	3	Water pollution, Soil pollution,	
	4	Marine pollution, Noise pollution.	
	5	Thermal pollution and Nuclear hazards ,	
	6	Solid waste Management, Disaster management	
	7	Role of an individual in prevention of pollution	
8	Pollution case studies		
5		Social Issues and the Environment:	20
	1	Climate change, global warming, acid rain, ozone layer depletion	
	2	Nuclear accidents and holocaust. Case Studies.	
	3	Wasteland reclamation, Consumerism and waste products	
	4	Environment Protection Act	
	5	Air (Prevention and Control of Pollution) Act	
	6	Water (Prevention and control of Pollution) Act, Wildlife Protection Act,	
	7	Forest Conservation Act,	
8	Issues involved in enforcement of environmental legislation		



13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 syllabus	3	Individual Activity and submission of hard copy.	Book 1 and all the reference book
2	Assignment 2: University Questions	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 syllabus	6	Individual Activity and submission of hard copy.	Book 1 and all the reference book
3	Assignment 3: University Questions	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 syllabus	9	Individual Activity and submission of hard copy.	Book 1 and all the reference book
4	Assignment 3: University Questions	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 syllabus	12	Individual Activity and submission of hard copy.	Book 1 and all the reference book
5	Assignment 3: University Questions	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 syllabus	15	Individual Activity and submission of hard copy.	Book 1 and all the reference book

15.0 QUESTION BANK

S.No	Questions
Unit-I	<ol style="list-style-type: none"> 1. Interpret World Energy Scenario with respect to production and consumption using relevant statistics 2. Define Energy and Power. Differentiate the same. 3. Outline the factors that affect India's energy development. 4. Explain the various key energy trends in India. 5. With relevant statistics, enumerate the primary energy production trend for India
Unit-II	<ol style="list-style-type: none"> 1. Explain in the detail the various phases of energy audit methodology. 2. List the various thermal energy storage methods. Explain sensible heat and latent heat storage methods. 3. Define Energy audit. Explain the need for energy audit. 4. Write a short note on energy demand estimation. 5. Calculate the cost of generation per kWh for a power station having the following data: Installed capacity of the plant = 200 MW Capital cost = Rs 400 crores Rate of interest and depreciation = 12% Annual cost of fuel, salaries and taxation = Rs 5 crores Load factor = 50% Also estimate the saving in cost per kWh if the annual load factor is raised to 60%. 6. Explain in the detail the various phases of energy audit methodology. 7. Elaborate the benefits of thermal energy storage.



Unit-III	<ol style="list-style-type: none"> 1. What is an ecosystem? Discuss forest ecosystem. Explain how conservation of forest can be done. 2. Discuss how oxygen cycle is utilized in the ecosystem. 3. Write a short note on (i) ecological succession (ii) food chain, food web and ecological pyramid. 4. Elaborate how the nitrogen cycle ecosystem operates. 5. Enumerate the utilization of carbon in ecosystem. 6. Describe grassland ecosystem. What are its types? How conservation of grassland can be made. 7. Discuss how oxygen cycle is utilized in the ecosystem. 8. Define Environment. Mention its scope. Discuss the need for public awareness
Unit-IV	<ol style="list-style-type: none"> 1. Discuss briefly the causes, effects and control measures of air pollution. 2. Discuss Solid Waste Management techniques. 3. Elaborate the causes, effects and control measures of (i) Soil Pollution (ii) Noise Pollution (iii) Thermal Pollution 4. Enumerate the role of an individual in prevention of pollution. 5. Enumerate the water pollution causes and its effects. Mention the control measures that can be initiated for mitigating the same. 6. Discuss any two case studies related to pollution of environment in detail. 7. Elaborate the causes, effects and control measures of (i) Soil Pollution (ii) Noise Pollution (iii) Thermal Pollution 8. Discuss Solid Waste Management techniques.
Unit-V	<ol style="list-style-type: none"> 1. What is acid rain? What are its effects? 2. Explain the salient features of Air Pollution act. 3. Explain about Environment Impact Assessment (EIA). 4. Discuss (i) Wildlife Protection act (ii) Forest Conservation act 5. Write a note on ozone layer depletion. 6. Express the need for reclaiming the wasteland and its development 7. What are the regulations governing water pollution prevention act? 8. Enumerate the impact of global warming on our mother nature.

16.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
--	--	--	--	--	--	--	--	--	--

Prepared by	Checked by		
Dr.S.N.Topannavar	Dr.S.N.Topannavar	HOD	Principal



Subject Title	ARM Embedded Systems		
Subject Code	18EC753	IA Marks	40
Number of Lecture Hrs / Week	03 L	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
			CREDITS –

FACULTY DETAILS:

Name: Prof. Sachin S Patil	Designation: Asst. Professor	Experience: T-16.09, I-02.3Yrs
No. of times course taught: 00		Specialization: VLSI & Embedded System Design

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	III	Digital Electronics
02	Electronics & Communication Engineering	IV	Microprocessor/Microcontroller

2.0 Course Objectives

This course will enable students to:

1. Understand the importance and applications of ARM Design.
2. Know the architecture of ARM processor.
3. Use instruction sets of ARM processor.
4. Analyze the adaptation of C code, firmware, OS, Interrupts, caches, etc. in ARM embedded systems.

3.0 Course Outcomes

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

	Course Outcome	POs
CO4xx.1	Depict the organization, architecture, bus technology, memory and operation of the ARM processors.	PO1-8,12
CO4xx.2	Employ the knowledge of Instruction set of ARM processors to develop basic Assembly Language Programs.	PO1-8,12
CO4xx.3	Recognize the importance of the Thumb mode of operation of ARM processors.	PO1-8,12
CO4xx.4	Describe the techniques involved in writing C code for ARM processors and Exception & Interrupt handling in ARM Processors	PO1-8,12
CO4xx.5	Describe the importance and use of Firmware, OS and cache in ARM Embedded systems.	PO1-8,12
Total Hours of instruction		40

4.0 Course Content

Content	RBT
Module-1 ARM Embedded Systems Introduction, RISC design philosophy, ARM design philosophy, Embedded system hardware – AMBA bus protocol, ARM bus technology, Memory, Peripherals, Embedded system software – Initialization (BOOT) code, Operating System, Applications. ARM Processor Fundamentals ARM core dataflow model, registers, current program status register, Pipeline, Exceptions, Interrupts and Vector Table, Core extensions.	8Hours L1,L2



Module-2 Introduction to the ARM Instruction set Introduction, Data processing instructions, Load - Store instruction, Software interrupt instructions, Program status register instructions, Loading constants, Conditional Execution. ALP programming.	8 Hours	L1,L2,L3
Module-3 Introduction to the THUMB instruction set Introduction, THUMB register usage, ARM – THUMB interworking, Other branch instructions, Data processing instructions, Stack instructions, Software interrupt instructions. ALP programming	8Hours	L1,L2,L3
Module-4 Efficient C Programming: Overview of C Compilers and optimization, Basic C data types, Local Variable Types, Portability issues Exception and Interrupt Handling: Exception Handling-ARM Processor Exceptions and Modes, Vector Table, Exception Priorities, Link Register Offset, Interrupts- Interrupt Latency, Basic Interrupt Stack design and implementation, Interrupt Handling Schemes(general description only of the schemes)	8Hours	L1,L2,L3 ,L4
Module-5 Firmware: Firmware and Bootloader Embedded Operating Systems: Fundamental Components Caches: The memory Hierarchy and caches memory-caches and memory management units, Cache architecture basic architecture of caches memory, basic operation of cache controller, the relationship between cache and main memory.	8Hours	L1,L2

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Microcontroller based projects
02	Higher	Embedded system	Design and Programming

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Microcontroller based system design
02	Model creation for analysis
03	Development of a software applications

7.0 Gap Analysis and Mitigation

SL. No	Delivery Type	Details
01	Tutorial	Topic: ARM application development tutor
02	NPTEL	ARM Cortex M3/ARM7TDMI Microcontroller Application

8.0 Books Used and Recommended to Students

Text Books
1“ARM System Developers Guide”, Andrew N Sloss, Dominic System and Chris Wright, Elsevier, Morgan Kaufmann publisher, 1 st Edition, 2008, ISBN:1758608745.
Reference Books
1. “ARM System on chip Architecture”, Furber S, Addison Wiley, 2 nd Edition, 2008, ISBN:9780201675191 2. “Embedded System”, Rajkamal, Tata McGraw-Hill Publishers, 2 nd Edition, 2008, ISBN:0070494703.
Additional Study material & e-Books
6. ARM Cortex M3/ARM7TDMI Microcontroller data sheet



9.0

Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References

- 8) <https://vtu.ac.in>
- 9) <http://www.bookspare.com/engineering-vtu>
- 3) <http://www.rejinpaul.com/2014/10/vtu-ece-notes-vtu-ece-1st-2nd-3rd-4th-5th-6th-7th-8th-semester-lecture-notes-download-link.html><http://www.vlab.co.in/>
- 4) <https://www.youtube.com>

10.0

Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE	http://ieeexplore.ieee.org/Xplore/home.jsp
2	PC World	http://www.pcworld.com/article/146957/components/article.html

11.0

Examination Note

Scheme of Evaluation for Internal Assessment (40 Marks)

- (d) Class work, Assignment, Technical quiz : 10Marks.
- (e) Internal Assessment test Average of Three tests): 30marks.

SCHEME OF EXAMINATION:

Two questions to be set from each Module (Module1 to Module5).
Student has to answer one full question each from five modules 20 marks each of Total 100marks.

12.0

Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1:	1	ARM Embedded Systems: Introduction, RISC design philosophy, ARM design philosophy	20
	2	Embedded system hardware – AMBA bus protocol, ARM bus technology	
	3	Memory, Peripherals, Embedded system software	
	4	Initialization (BOOT) code, Operating System, Applications	
	5	ARM Processor Fundamentals: ARM core dataflow model, registers	
	6	current program status register	
	7	Pipeline, Exceptions	
	8	Interrupts and Vector Table, Core extensions	
Module 2:	9	Introduction to the ARM Instruction set: Introduction, Data processing instructions	40
	10	Load - Store instruction	
	11	Software interrupt instructions	
	12	Program status register instructions	
	13	Loading constants	
	14	Conditional Execution	
	15	ALP programming	
	16	ALP programming	
Module 3:	17	Introduction to the THUMB instruction set: Introduction, THUMB register usage	60
	18	ARM – THUMB interworking	
	19	Other branch instructions	
	20	Data processing instructions	
	21	Stack instructions	
	22	Software interrupt instructions	
	23	ALP programming	



Module 4:	24	ALP programming	80
	25	Efficient C Programming: Overview of C Compilers and optimization	
	26	Basic C data types	
	27	Local Variable Types	
	28	Portability issues	
	29	Exception and Interrupt Handling: Exception Handling-ARM Processor Exceptions and Modes	
	30	Vector Table, Exception Priorities, Link Register Offset	
	31	Interrupts- Interrupt Latency, Basic Interrupt Stack design and implementation	
Module 5:	32	Interrupt Handling Schemes	100
	33	Firmware: Firmware and Boot loader	
	34	Embedded Operating Systems: Fundamental Components	
	35	Caches: The memory Hierarchy	
	36	caches memory-caches	
	37	memory management units	
	38	Cache architecture basic architecture of caches memory	
	39	basic operation of cache controller	
40	the relationship between cache and main memory		

Module I

1. What is the ARM Cortex-M3 processor?
2. Briefly explain the THUMB-2 technology.
3. List the Cortex-M3 processor applications.
4. What is built-in nested vectored interrupt controller?
5. Explain in briefly Instruction set of ARM.
6. With brief explanation list the SFRs?
7. Write a note on Exceptions & Interrupts.
8. Describe the stack Memory operations.

Module II

9. Explain ARM Cortex-M3 assembly basics.
10. With example explain 16-bit branch instructions.
11. List 16-bit Data processing instructions.
12. Why is there Rotate right but no Rotate left?
13. With ARM development tools diagram explain Cortex-M3 programming flow.
14. Write a program to display “Hello World”.
15. Write a program to control the speed and direction of stepper motor.

Module III

16. Explain the components of a typical embedded system in detail.
17. What is the difference between Microprocessor and Microcontroller? Explain the role of Microprocessors and Microcontrollers in embedded system design?
18. What is the difference between RISC and CISC processors? Give an example for each.
19. What is sensor? Explain its role in embedded system design? Illustrate with example.
20. What is Actuator? Explain its role in embedded system design? Illustrate with example.
21. What is Embedded Firmware? What are the different approaches available for embedded firmware development?



Module IV

- 22. Explain the different characteristics of embedded systems in detail.
- 23. Explain the significance of the quality attributes Testability and Debug-ability in the embedded system design context.
- 24. Explain the different communication buses used in automotive application.
- 25. Explain the format of assembly language instruction.
- 26. Explain the limitations/drawbacks of ‘Assembly language’ based Embedded firmware development.
- 27. What is the difference between: a) C Vs Embedded C b) Compiler Vs Cross Compiler.

Module V

- 28. Explain the various process interaction model in detail.
- 29. What is Inter Process Communication (IPC)? Give an overview of different IPC mechanisms adopted by various operating systems.

Prepared by	Checked by		
Prof. Sachin S Patil	Prof. Pramod V Patil	HOD	Principal



Subject Title	COMPUTER NETWORKS LABORATORY		
Subject Code	18ECL76	IA Marks	40
Number of Lecture Hrs/ Week	2Hr Tutorial + 2 Hrs Lab	Exam Marks	60
		Exam Hours	03
CREDITS – 02			

FACULTY DETAILS:			
Name: Dr. Raghavendra R. Maggavi	Designation: Associate Professor	Experience: 16years	
No. of times course taught: 00		Specialization: Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	I/II	C-Programming
02	Electronics & Communication Engineering	III	Digital Electronics

2.0 Course Objectives

This course will enable students to:

- Choose suitable tools to model a network and understand the protocols at various OSI reference levels.
- Design a suitable network and simulate using a Network simulator tool.
- Simulate the networking concepts and protocols using C/C++ programming.
- Model the networks for different configurations and analyze the results.

3.0 Course Outcomes

	Course Outcome	RBT Level	POs
C406.1	Choose suitable tools to model network and understand the protocols at various OSI reference levels.	L1,L2, L3	PO1- PO6,PO8,PO10- PO12
C406.2	Design a suitable network and simulate using a network simulator tool.	L1,L2, L3	PO1- PO6,PO8,PO10- PO12
C406.3	Analyze the networking concepts and protocols using C/C++ Programming.	L1,L2,L3	PO1- PO6,PO8,PO10- PO12
C406.4	Model the networks for different configurations and analyze the results.	L1,L2,L3	PO1- PO6,PO8,PO10- PO12
Total Hours of instruction			36

4.0 Course Content

PART-A: Simulation experiments using NS2/ NS3/ OPNET/ NCTUns/ NetSim/ QualNet/ Packet Tracer or any other equivalent tool.

1. Implement a point to point network with four nodes and duplex links between them. Analyze the network performance by setting the queue size and varying the bandwidth.
2. Implement a four node point to point network with links n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP/UDP.
3. Implement Ethernet LAN using n (6-10) nodes. Compare the throughput by changing the error rate and data rate.
4. Implement Ethernet LAN using n nodes and assign multiple-traffic to the nodes and obtain congestion window for different sources/ destinations.



5. Implement ESS with transmission nodes in Wireless LAN and obtain the performance parameters.
6. Implementation of Link state routing algorithm.

PART-B: Implement the following in C/C++

1. Write a program for a HDLC frame to perform the following.
 - i) Bit stuffing
 - ii) Character stuffing.
2. Write a program for distance vector algorithm to find suitable path for transmission.
3. Implement Dijkstra’s algorithm to compute the shortest routing path.
4. For the given data, use CRC-CCITT polynomial to obtain CRC code. Verify the program for the cases
 - a. Without-error
 - b. With error
5. Implementation of Stop and Wait Protocol and Sliding Window Protocol
6. Write a program for congestion control using leaky bucket algorithm.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Projects Based on Computer Networks.
02	VIII	HPCN	Advance Computer Networks.

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Design of networking components like modems, firewalls, routers etc.
02	Model creation for analysis
03	Development of a software application.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Routing algorithms, understanding simulation software’s.
02	NPTEL	C/C++ Programming

8.0 Books Used and Recommended to Students

Text Books
1.Data Communications and Networking, Forouzan, 5th Edition, McGraw Hill,2016 ISBN: 1-25-906475-3.
2. Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 2013, ISBN: 0-273-76896-4
3.Introduction to Data Communication and Networking, Wayarles Tomasi, Pearson Education, 2007, ISBN:0130138282

9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
1) http://nptel.ac.in/courses/106105081/1 2) http://searchnetworking.techtarget.com/
3) https://in.udacity.com/auth?next=/course/computer-networking--ud436



10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Elsevier	https://www.journals.elsevier.com/computer-networks/
2	Scencedirect	https://www.sciencedirect.com/science/journal/13891286

11.0 Examination Note

Scheme of Evaluation for Internal Assessment (40 Marks)

- (a) Lab work, Assignment, Technical quiz: 10 Marks.
(b) Internal Assessment test at the end of semester: 30 Marks.

SCHEME OF EXAMINATION:

Execute Two questions one from Part-A and one from Part-B

12.0 Course Delivery Plan

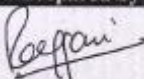
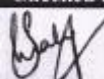


Expt.	Lecture No.	Content	% of Portion
1	1	Implement a point to point network with four nodes and duplex links between them. Analyze the network performance by setting the queue size and varying the bandwidth.	8.33
2	2	Implement a four node point to point network with links n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP/UDP.	16.66
3	3	Implement Ethernet LAN using n (6-10) nodes. Compare the throughput by changing the error rate and data rate.	25
4	4	Implement Ethernet LAN using n nodes and assign multiple traffic to the nodes and obtain congestion window for different sources/ destinations.	33.33
5	5	Implement ESS with transmission nodes in Wireless LAN and obtain the performance parameters.	41.6
6	6	Implementation of Link state routing algorithm.	50
7	7	Write a program for a HDLC frame to perform the following. i) Bit stuffingii) Character stuffing.	58.33
8	8	Write a program for distance vector algorithm to find suitable path for transmission.	66.66
9	9	Implement Dijkstra's algorithm to compute the shortest routing path.	75
10	10	For the given data, use CRC-CCITT polynomial to obtain CRC code. Verify the program for the casesa. Without errorb. With error	83.33
11	11	Implementation of Stop and Wait Protocol and Sliding Window Protocol.	91.66
12	12	Write a program for congestion control using leaky bucket algorithm.	100

13.0 VIVA QUESTION BANK

1. What are functions of different layers?
2. Differentiate between TCP/IP Layers and OSI Layers
3. Why header is required?
4. What is the use of adding header and trailer to frames?
5. What is encapsulation?
6. Why fragmentation requires?
7. What is MTU?
8. Which layer imposes MTU?
9. Differentiate between flow control and congestion control.
10. Differentiate between Point-to-Point Connection and End-to-End connections.
11. What are protocols running in different layers?
12. What is Protocol Stack?
13. Differentiate between TCP and UDP.



14. Differentiate between Connectionless and connection oriented connection.
15. Why frame sorting is required?
16. What is meant by subnet?
17. What is meant by Gateway?
18. What is an IP address?
19. What is MAC address?
20. Why IP address is required when we have MAC address?
21. What is meant by port?
22. What are ephemeral port number and well known port numbers?
23. What is a socket?
24. What are the parameters of socket()?
25. Describe bind(), listen(), accept(), connect(), send() and recv().
26. What are system calls? Mention few of them.
27. What is IPC? Name three techniques.
28. Explain mkfifo(), open(), close() with parameters.
29. What is meant by file descriptor?
30. What is meant by traffic shaping?
31. How do you classify congestion control algorithms?
32. Differentiate between Leaky bucket and Token bucket.
33. How do you implement Leaky bucket?
34. How do you generate busty traffic?
35. What is the polynomial used in CRC-CCITT?
36. What are the other error detection algorithms?
37. What is difference between CRC and Hamming code?
38. Why Hamming code is called 7,4 code?
39. What is odd parity and even parity?
40. What is meant by syndrome?
41. What is generator matrix?
42. What are Routing algorithms?
43. How do you classify routing algorithms? Give examples for each.
44. What are drawbacks in distance vector algorithm?
45. How routers update distances to each of its neighbor?
46. How do you overcome count to infinity problem?
47. What is cryptography?
48. How do you classify cryptographic algorithms?
49. What is public key?
50. What is private key?
51. What are key cipher text and plaintext?
52. What is simulation?
53. What are advantages of simulation?

Prepared by	Checked by		
			
R. R. Maggavi	Prof. S. S. Malaj	HOD	Principal



Subject Title	VLSI LABORATORY		
Subject Code	18ECL77	IA Marks	40
Number of Lecture Hrs / Week	1 Hr Tutorial + 2 Hrs Lab	Exam Marks	100
Total Number of Lecture Hrs	40	Exam Hours	03

FACULTY DETAILS:		
Name: Prof. S. S. KAMATE	Designation: Asst. Professor	Experience: T-19.Yrs, I-00Yrs
No. of times course taught: 15		Specialization: Digital Electronics

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	III	Digital Electronics
02	Electronics & Communication Engineering	V	Fundamentals of CMOS VLSI
03	Electronics & Communication Engineering	VI	Microelectronics Circuits

2.0 Course Objectives

This course will enable students to:

- Design, model, simulate and verify CMOS digital circuits
- Design layouts and perform physical verification of CMOS digital circuits
- Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level netlist
- Perform RTL-GDSII flow and understand the stages in ASIC design.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	POs
C407.1	Design and simulate combinational and sequential digital circuits using Verilog HDL	U	PO1 to PO12
C407.2	Understand the Synthesis process of digital circuits using EDA tool	U	PO1 to PO12
C407.3	Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level net list	U	PO1 to PO12
C407.4	Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.	U	PO1 to PO12
C407.5	Perform RTL-GDSII flow and understand the stages in ASIC design	U	PO1 to PO12
Total Hours of instruction			40

4.0 Course Content

Laboratory Experiments

Part – A

Analog Design

Use any VLSI design tools to carry out the experiments, use library files and technology files below 180 nm.

1. a) Capture the schematic of CMOS inverter with load capacitance of 0.1pF and set the widths of inverter with $W_n = W_p$, $W_n = 2W_p$, $W_n = W_p/2$ and length at selected technology. Carry out the following:



- a. Set the input signal to a pulse with rise time, fall time of 1ns and pulse width of 10ns and time period of 20ns and plot the input voltage and output voltage of designed inverter?
 - b. From the simulation results compute t_{pHL} , t_{pLH} and t_d for all three geometrical settings of width?
 - c. Tabulate the results of delay and find the best geometry for minimum delay for CMOS inverter?
1. b) Draw layout of inverter with $W_p/W_n = 40/20$, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.
 2. a) Capture the schematic of 2-input CMOS NAND gate having similar delay as that of CMOS inverter computed in experiment 1. Verify the functionality of NAND gate and also find out the delay t_d for all four possible combinations of input vectors. Table the results. Increase the drive strength to 2X and 4X and tabulate the results.
 2. b) Draw layout of NAND with $W_p/W_n = 40/20$, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.
 3. a) Capture schematic of Common Source Amplifier with PMOS Current Mirror Load and find its transient response and AC response? Measure the Unity Gain Bandwidth (UGB), amplification factor by varying transistor geometries, study the impact of variation in width to UGB.
 1. b) Draw layout of common source amplifier, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.
 4. a) Capture schematic of two-stage operational amplifier and measure the following:
 - a. UGB
 - b. dB bandwidth
 - c. Gain margin and phase margin with and without coupling capacitance
 - d. Use the op-amp in the inverting and non-inverting configuration and verify its functionality
 - e. Study the UGB, 3dB bandwidth, gain and power requirement in op-amp by varying the stage wise transistor geometries and record the observations.
 4. b) Draw layout of two-stage operational amplifier with minimum transistor width set to 300 (in 180/90/45 nm technology), choose appropriate transistor geometries as per the results obtained in 4.a. Use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.

Part - B

Digital Design

Carry out the experiments using semicustom design flow or ASIC design flow, use technology library 180/90/45nm and below

Note: The experiments can also be carried out using FPGA design flow, it is required to set appropriate constraints in FPGA advanced synthesis options

1. Write verilog code for 4-bit up/down asynchronous reset counter and carry out the following:
 - a. Verify the functionality using test bench
 - b. Synthesize the design by setting area and timing constraint. Obtain the gate level netlist, find the critical path and maximum frequency of operation. Record the area requirement in terms of number of cells required and properties of each cell in terms of driving strength, power and area requirement.
 - c. Perform the above for 32-bit up/down counter and identify the critical path, delay of critical path, and maximum frequency of operation, total number of cells required and total area.
2. Write verilog code for 4-bit adder and verify its functionality using test bench. Synthesize the design by setting proper constraints and obtain the net list. From the report generated identify critical path, maximum delay, total number of cells, power requirement and total area required. Change the constraints and obtain optimum synthesis results.
3. Write verilog code for UART and carry out the following:
 - a. Perform functional verification using test bench
 - b. Synthesize the design targeting suitable library and by setting area and timing constraints
 - c. For various constraints set, tabulate the area, power and delay for the synthesized netlist
 - d. Identify the critical path and set the constraints to obtain optimum gate level netlist with suitable constraints
4. Write verilog code for 32-bit ALU supporting four logical and four arithmetic operations, use case statement and if statement for ALU behavioral modeling.
 - a. Perform functional verification using test bench
 - b. Synthesize the design targeting suitable library by setting area and timing constraints
 - c. For various constraints set, tabulate the area, power and delay for the synthesized netlist
 - d. Identify the critical path and set the constraints to obtain optimum gate level netlist with suitable constraintsCompare the synthesis results of ALU modeled using IF and CASE statements.
5. Write verilog code for Latch and Flip-flop, Synthesize the design and compare the synthesis report (D, SR, JK).



6. For the synthesized netlist carry out the following for any two above experiments:
- Floor planning (automatic), identify the placement of pads
 - Placement and Routing, record the parameters such as no. of layers used for routing, flip method for placement of standard cells, placement of standard cells, routes of power and ground, and routing of standard cells
 - Physical verification and record the LVS and DRC reports.
 - Perform Back annotation and verify the functionality of the design.
 - Generate GDSII and record the number of masks and its color composition.

5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics
01	VIII	Project work	VLSI based projects
02	Higher	VLSI era	Exposure to the VLSI flow and different types of design.

6.0 Relevance to Real World

SL. No	Real World Mapping
01	VLSI design
02	Miniaturization of different designs to provide more flexibility for the designers

7.0 Gap Analysis and Mitigation

SL. No	Delivery Type	Details
02	NPTEL	VLSI design methods

8.0 Books Used and Recommended to Students

Text Books
1. “Basic VLSI Design” by Douglas A. Pucknell and Kamran Eshaghian
2. “CMOS VLSI Design”- A Circuits and Systems Perspective”- Neil H.E. Weste, David Harris, Ayan Banerjee, 3rd Edition, Pearson Education.
3. “FPGA Based System Design”-Wayne Wolf, Pearson Education, 2004, Technology and Engineering

9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
2) https://vtu.ac.in
3) http://www.bookspare.com/engineering-vtu
3) http://www.slideshare.net/farohalolya/8086-microprocessor-lab-manual
4) https://www.youtube.com/results?search_query=microprocessor

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE	http://ieeexplore.ieee.org/Xplore/home.jsp
2	PC World	http://www.pcworld.com/article/146957/components/article.html



11.0 Examination Note

Scheme of Evaluation for Internal Assessment (20 Marks)

(c) Lab work, Assignment, Technical quiz : 5Marks.

(d) Internal Assessment test Average of two Tests out of Three tests): 15marks.

SCHEME OF EXAMINATION:

Two questions to be set each from Module.

Student has to answer both full questions. 80marks Marks divided in three parts Write up 12marks, Conduction 56marks & Viva 12marks.

12.0 Course Delivery Plan

Experiment	Lecture No.	Content	% of Portion
1.		a) Capture the schematic of CMOS inverter with load capacitance of 0.1pF and set the widths of inverter with $W_n = W_p$ $W_n = 2W_p$, $W_n = W_p/2$ and length at selected technology. Carry out the following: a) Set the input signal to a pulse with rise time, fall time of 1ns and pulse width of 10ns and time period of 20ns and plot the input voltage and output voltage of designed inverter? b) From the simulation results compute t_{pHL} , t_{pLH} and t_d for all three geometrical settings of width? c). Tabulate the results of delay and find the best geometry for minimum delay for CMOS inverter?	
2.		a) Capture the schematic of 2-input CMOS NAND gate having similar delay as that of CMOS inverter computed in experiment 1. Verify the functionality of NAND gate and also find out the delay t_d for all four possible combinations of input vectors. Table the results. Increase the drive strength to 2X and 4X and tabulate the results. b) Draw layout of NAND with $W_p/W_n = 40/20$, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.	
3.		a) Capture schematic of Common Source Amplifier with PMOS Current Mirror Load and find its transient response and AC response? Measures the Unity Gain Bandwidth (UGB), amplification factor by varying transistor geometries, study the impact of variation in width to UGB. b) Draw layout of common source amplifier, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations	
4.		a) Capture schematic of two-stage operational amplifier and measure the following: a. UGB b. dB bandwidth c. Gain margin and phase margin with and without coupling capacitance d. Use the op-amp in the inverting and non-inverting configuration and verify its functionality e. Study the UGB, 3dB bandwidth, gain and power requirement in op-amp by varying the stage wise transistor geometries and record the observations. b) Draw layout of two-stage operational amplifier with minimum transistor width set to 300 (in 180/90/45 nm technology), choose appropriate transistor geometries as per the results obtained in 4.a. Use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations	



Part – B Digital Design		
1.	5	1. Write verilog code for 4-bit up/down asynchronous reset counter and carry out the following: a. Verify the functionality using test bench b. Synthesize the design by setting area and timing constraint. Obtain the gate level netlist, find the critical path and maximum frequency of operation. Record the area requirement in terms of number of cells required and properties of each cell in terms of driving strength, power and area requirement. c. Perform the above for 32-bit up/down counter and identify the critical path, delay of critical path, and maximum frequency of operation, total number of cells required and total area.
2.	6	2. Write verilog code for 4-bit adder and verify its functionality using test bench. Synthesize the design by setting proper constraints and obtain the net list. From the report generated identify critical path, maximum delay, total number of cells, power requirement and total area required. Change the constraints and obtain optimum synthesis results.
3.	7	Write verilog code for UART and carry out the following: a. Perform functional verification using test bench b. Synthesize the design targeting suitable library and by setting area and timing constraints. c. For various constraints set, tabulate the area, power and delay for the synthesized netlist d. Identify the critical path and set the constraints to obtain optimum gate level netlist with suitable constraints
4.	8	Write verilog code for 32-bit ALU supporting four logical and four arithmetic operations, use case statement and if statement for ALU behavioral modeling. a. Perform functional verification using test bench b. Synthesize the design targeting suitable library by setting area and timing constraints c. For various constraints set, tabulate the area, power and delay for the synthesized netlist d. Identify the critical path and set the constraints to obtain optimum gate level netlist with suitable constraints Compare the synthesis results of ALU modeled using IF and CASE statements.
5.	9	Write verilog code for Latch and Flip-flop, Synthesize the design and compare the synthesis report (D, SR, JK).
6.	10	For the synthesized netlist carry out the following for any two above experiments: a. Floor planning (automatic), identify the placement of pads b. Placement and Routing, record the parameters such as no. of layers used for routing, flip method for placement of standard cells, placement of standard cells, routes of power and ground, and routing of standard cells c. Physical verification and record the LVS and DRC reports d. Perform Back annotation and verify the functionality of the design e. Generate GDSII and record the number of masks and its color composition

13.0

VIVA BANK

1. The minimum voltage to keep the MOS transistor in on state is known as
2. 'Pinch off of the channel takes place in which region.
3. Which of the following equation is true for liner region?
a) $V_{ds} < V_{gs} - V_t$ b) $I_{ds} > V_{gs} - V_t$ c) $V_{ds} = V_{gs} - V_t$ d) None
4. The oxide layer used in the MOS fabrication is
5. Which of the following Well process is superior?
a) P-well b) N-well c) Both P-well and N-well d) None
6. What is the advantage of CMOS technology?
7. Transit time is given by-----
8. When the VTC of the CMOS inverter shifts towards left,
9. The demarcation line has to be drawn in-----stick diagram.
10. If the value of lambda is 1micrometer then the minimum feature size o the transistor is ?
11. The scaling factor for the Gate capacitance C_g is given by
12. The scaling factor for power-speed product is given by



13. If the gate voltage and the input voltage of the NMOS transistor is 5V and threshold voltage of the transistor is 0.7V, then the output voltage
14. The mobility of the electrons is----- than the holes.
15. As the width of the transistor increases the number of contact cuts-----
16. Transmission gate is-----
17. The CMOS schematic diagram of NAND gate consists of-----
18. If the size of the transistors in an inverter increases, then the input capacitance
19. The minimum value of the scaling factor in a cascaded inverter circuit to drive large capacitive load
20. In a lambda based rules, the distance between two MI layers is
21. Match the following;

A a) CMOS technology b) Bipolar technology c) Transmission gate d) PMOS transistor e) NMOS transistor	B i) Strong '0' ii) Strong '1' iii) High input impedance iv) Low input impedance v) Bi-directional switch
---	---
22. What is rise time & fall time of Inverter.
23. Define Symmetrical inverter.
24. What is the value of ϵ in case of load handling by inverter.
25. What is Pass transistor?
26. Give the disadvantage of Pass transistor.
27. What is the advantage of Transmission gate over Pass transistor.
28. What is a Flip-flop?
29. What is a master slave Flip-flop?
30. What is a race-around condition?
31. Differentiate Serial & Parallel adder.
32. What is a DAC?
33. Name different types of DAC's.
34. What is a ADC
35. Name different types of ADC's.
36. What is SAR?
37. Explain the working of SAR.
38. What is a Buffer?
39. What is a counter?
40. What is synchronous counter?
41. What is asynchronous counter?
42. What is RC extraction?
43. What is Back annotation?
44. What do you mean by DC-analysis?
45. What do you mean by AC-analysis?
46. What is the Gain of common drain amplifier?
47. How the common source amplifier is formed.
48. What is speed Vs area tradeoff?
49. What is the resolution of 4-bit ADC with $V_{\text{reference}} = 5V$
50. What is DRC & ERC.
51. Explain design abstraction for FPGAs.
52. Explain FPGA architecture.
53. Explain in detail the Generic Structure of an FPGA fabric.

14.0 University Result

Examination	FCD	FC	SC	% Passing
New Lab				

Prepared by	Checked by		
 Prof. S S Kamate	 Prof. D M Kumbharl	 HOD	 Principal