DEPARTMENT OF TECHNOLOGY
THIRD YEAR B.TECH
Scheme of Teaching and Examination
Semester – V (Electronics & Communication Technology)

Course code	Course	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credit	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
EC 311	Digital Communication Technology	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 312	Electromagnetic Fields	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC313	Microcontrollers	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 314	Signals & Systems	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 315	Computer Network & Data Communication	03	-		03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	---------
EC 311L	Digital Communication Technology Laboratory	---	---	02	01	--------	-------	--------	EPE	50	20
EC 312T	Electromagnetic Fields Tutorial	---	01	---	01	--------	-------	--------	IOE	50	20
EC 313L	Microcontrollers Laboratory	---	---	02	01	--------	-------	--------	EPE	50	20
EC 315L	Computer Network & Data Communication Laboratory	---	---	02	01	--------	-------	--------	EOE	50	20
EC 316L	Electronic System Design Laboratory	---	---	02	01	--------	-------	--------	IPE	50	20
EC 317	Internship-I	---	--	---	01	--------	-------	--------	IOE	50	20
	Total	**19**	**01**	**08**	**25**	--------	**500**	--------	--------	**300**	--------

Audit Course III

RM 311	Research Methodology	02	---	---	----	Evaluation at institute/ department level	Based on total marks obtained out of 50, the grade to be given by the course auditor (teacher)

Total contact hours per week: 28+02=30

CIE : Continuous Internal Evaluation
SEE : Semester End Examination
IPE : Internal Practical Evaluation
IOE : Internal Oral Evaluation
EPE : External Practical Evaluation
EOE : External Oral Evaluation

Note : Tutorials and Practical shall be conducted in batches with batch strength not exceeding 18 students.

DEPARTMENT OF TECHNOLOGY
THIRD YEAR B.TECH
Scheme of Teaching and Examination
Semester – VI (Electronics & Communication Technology)

Course code	Course	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Total	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
EC 321	Digital Signal Processing	04	---	---	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 322	Operating Systems	03	---	---	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 323	Antenna & Wave propagation	04	---	---	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 324	VLSI Design	03	---	---	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 325	Control Systems	04	---	---	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	---------
EC 321L	Digital Signal Processing Laboratory	---	---	02	01	--------	-------	--------	EPE	50	20
EC 322T	Operating Systems Tutorial		01		01	--------	-------	--------	IOE	50	20
EC323L	Antenna & Wave propagation Laboratory	---	---	02	01	--------	-------	--------	EPE	50	20
EC324L	VLSI Design Laboratory	---	---	02	01	--------	-------	--------	EOE	50	20
EC325T	Control Systems Tutorial	---	01	---	01	-------	-------	--------	IOE	50	20
EC 326L	Mini Project and Seminar Laboratory	---	---	02	02	-------	-------	-------	IPE	50	20
	Total	**18**	**02**	**08**	**25**	--------	**500**	--------	--------	**300**	--------

Audit Course IV

FL 321	Introduction to foreign language	02	---	---	----	Evaluation at institute/ department level	Based on total marks obtained out of 50,the grade to be given by the course auditor

Total contact hours per week: 28+02=30

CIE : Continuous Internal Evaluation
SEE : Semester End Examination
IPE : Internal Practical Evaluation
IOE : Internal Oral Evaluation
EPE : External Practical Evaluation
EOE : External Oral Evaluation

Note : Tutorials and Practical shall be conducted in batches with batch strength not exceeding 18 students.

Note: After semester IV & VI during vacation period, students will undergo Internship I and Internship II for minimum 4 weeks in a reputed industry from standpoint of electronics engineering principles. The students will submit a report of the training. This particular activity is equivalent to one credit and it carries 50 marks as an Internal Oral Evaluation (IOE) which is included in Semester V and semester VII.

For submission of the activity report, all the students will follow one specific format recommended by the Program Advisory Board.

Equivalence of Third Year B.Tech (Electronics and Communication Technology) Semester V and VI

The above detailed syllabus is a revised version of the Third Year B.Tech (Electronics and Communication Technology) Program being conducted by the Shivaji University at the Technology Department of the University. This syllabus is to be implemented from June 2018. (Academic year 2018-19)

The Equivalence for the courses/courses of Electronics and Communication Technology at Third Year B Tech Semester V and VI pre-revised Program under the faculty of Engineering and Technology is as follows.

Third Year B.Tech Semester V (Electronics and Communication Technology)

Sr.No	Third Year B.Tech (Electronics and Communication Technology) Semester V Pre-revised syllabus	Third Year B.Tech(Electronics and Communication Technology) Semester V Revised syllabus	Remark
1.		Digital Communication Technology	Course removed from sem 6 and included in sem 5.
2.	Electromagnetic Fields	Electromagnetic Fields	Syllabus revised
3.	Microcontrollers	Microcontrollers	Syllabus revised
4.	Signals & systems	Signals & systems	Syllabus revised
5.	Computer Networks and data communication	Computer Networks and data communication	Syllabus revised
6.	Electronic System Design	Electronic System Design	No change in syllabus
7.	Linear Integrated Circuits		Course removed and shifted to SY ECT sem. 4
8.		Internship-I	Newly added
9.			
10.			

Third Year B.Tech Semester VI (Electronics and Communication Technology)

Sr. No	Third Year B. Tech (Electronics and Communication Technology) Semester VI Pre-revised syllabus	Third Year B. Tech (Electronics and Communication Technology) Semester VI Revised syllabus	Remark
1.	Digital Signal Processing	Digital Signal Processing	No Change
2.	Digital Communication Technology		Course removed and shifted to sem. 5
3.	Optical Fiber Communication		Course removed and included in sem.VIII
4.	Control Systems	Control Systems	No change
5.	Mini project and Seminar	Mini project and Seminar	No Change
6.		Operating Systems	New course included
7.		Antenna and wave propagation	New course included
8.	VLSI Design	VLSI Design	Syllabus revised
9.	Presentation and Communication Techniques	Presentation and Communication Techniques	No Change

Audit course have not been assigned any credits. The students will be evaluated for these courses by the concerned course in charge. There will be grade conferred to the student. The grade will be based on conversion of marks obtained out of 50. (Obtaining passing grade is essential). Please refer to chart in the detail examination scheme. The chart shows the marks range and the respective grade.

Detailed Evaluation and Examination Scheme

1. Out of total 100 theory marks, 50 marks are assigned for Continuous Internal Evaluation (CIE). In CIE, obtaining minimum 20 marks is essential. It is similar to term work, the completion of which is mandatory to become eligible to appear for the Semester End Examination (SEE). Failing to complete the term in a particular course i.e. not obtaining 20 marks in CIE out of 50 shall be treated as term not granted in that course and it is on the part of the course teacher to officially inform the particular case through the respective Program Coordinator and the Director to the University Examination Section. The section will take a kind note of the same and it will not issue the hall ticket of the particular students for the SEE in the particular course/s.
2. CIE (50 marks) includes :
    - Internal Test - I, of 20 marks in 5^{th} week on 1^{st} & 2^{nd} unit

- Internal Test - II, of 20 marks in 10^{th} week on 3^{rd} & 4^{th} unit
- Activities for the students: 10 marks. It is at the course owners' discretion to get the assignments of varied nature completed by the students. However, the course teacher will plan to cover those course objectives that suit course learning outcomes and program outcomes that may not be covered in the internal tests.

3. For the Semester End Examination (SEE), 100 marks (3 hours) paper will be set and finally it will be converted to 50 marks. The students must secure minimum 40 % i.e. 20 marks in SEE as the University examination passing head.
4. Final theory marks (out of 100) will be the addition of CIE (out of 50 marks) and SEE (out of 50 marks).
5. Internal Practical/Oral Evaluation (IPE/IOE) will be on the basis of Internal Oral/ Practical/Tutorials/Seminar in which students must secure minimum 40% i.e. 20 marks. It is similar to the term work the completion of which is mandatory to be eligible to appear for the Semester End Examination (SEE).
6. External Practical/Oral Evaluation (EPE/EOE) will be conducted under the supervision by some external course expert. The minimum score 40% i.e. 20 marks is required to be secured as the University's passing head in EPE/EOE.
7. *Semester End Examination duration will be 4 hrs.
8. Equivalence for the Course: As elaborated at the end of this whole curriculum document.

Academic Autonomy:

1. Flexibility in deciding Structure and Contents of Curriculum with reasonable frequency for changes in the same.

2. Continuous Assessment of Students performance with newly adopted - Credit System based on award of grade.

3. Credits are simply a means of attaching relative values to courses of different components. These are a currency of learning and in general regarded as a measure of the time typically required to achieve a given curricular outcome.

4. All courses (Courses) under each Program/Discipline are unitized.

Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow him/her to progress at an optimum pace suited to his/her ability or convenience. Each course by every student needs to fulfill minimum requirements of credits for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the Program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All Programs are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course: Chemistry-I: 5 credits (4-0-2)

The credits indicated for this course are computed as follows:

4 hours/week lectures = 4 credits

0 hours/week tutorial = 0 credit

2 hours/week practical = 2 *x* 0.5 = 1 credit

The contact hours in this case of **5** credits course is 6 hours per week. (**4** h Lectures + **0** h Tutorial + **2** h Practical=6 hours per week.)

For each lecture or tutorial credit, the self study component is 1 hour/week and 2 hours/week. In the above example, the student is expected to devote 3 + 1 = 4 hours per week on self study for this course, in addition to class contact of 5 hours per week.

Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance and allows the students to progress at an optimum pace suited to individual ability and convenience.

Features of Credit System at Shivaji University, Kolhapur:

Every course is allotted credits based on its academic importance/weightage.

1. All Courses may not have same credits.
2. There will be 23 to 28 Credits / Semester.
3. Absolute Grading System with 7 Passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.
4. Getting FF grade in 4 heads in one academic year, he/she is considered as failed.
5. Continuous Evaluation: Unit Test I i.e. T_1 [20 marks], and Unit Test II i.e. T_2 [20 marks]. Activities will be for 10 marks and the course owner/in charge will have discretion to decide the nature of activities.
6. Standardization of courses: Each course is unitized in 6 numbers. Unit Test I on units I and II while Unit Test II on units III & IV, SEE will be based on all the units of the course curriculum.
7. Unit Test I & Unit Test II will be supervised and evaluated by internal course teachers while SEE will be evaluated mostly by external and internal teachers as joint examiner ships.
8. Any request for re-test will not be entertained after internal test.
9. For both the semesters' failure courses, re-examination will be only after the even Semester End Examination. No re-examination will be conducted for odd semester courses in even semester or vice-versa.

Attendance rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such conditions, the attendance requirement will be a minimum of 75 % of the classes actually held. A student with less than 75 % attendance in a course during the semester, in lectures, tutorials and practical taken together (as applicable), will be awarded the 'F' grade in that course irrespective of his/her performance in the tests.

Taking into account the consolidated attendance record for the whole semester, the course in charge in consultation with the Program Coordinator will award 'XX' grade to the student who is deficient in attendance. For the purpose of attendance calculation, every scheduled practical class will be counted as one unit irrespective of the number of contact hours.

Attendance record will be maintained based upon roll calls (or any equivalent operation) in every scheduled lecture, tutorial and practical class. The course owner will maintain and consolidate attendance record for the course (lectures, tutorials and practical together, as applicable).

Evaluation system:

1. Semester Grade Point Average (SGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points})}{\sum (\text{Course credits in registered courses})}$$

2. Cumulative Grade Point Average (CGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points) of all Semesters}}{\sum (\text{Course credits in registered courses) of all Semesters}}$$

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below:

   Ist Division with distinction: CGPA $\geq$ 8.25 and above

   Ist Division : CGPA $\geq$ 6.75 and < 8.25

   IInd Division : CGPA $\geq$ 6.25 and < 6.75

As per AICTE Handbook (2011-12), gradation is as follows:

Grade Points	Equivalent Percentage Range
6.25	55
6.75	60
7.25	65
7.75	70
8.25	75

Conversion of CGPA to corresponding equivalent percentage marks for CGPA>5.0 may be obtained using the following equation:

Equivalent Percentage marks = (Respective CGPA x 10) – 7.5

An example of these calculations is given below:

Typical academic performance calculations - I semester

Course no.	**Course credits**	**Grade awarded**	**Earned credits**	**Grade points**	**Points Secured**
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (Col 4* Col 5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	0
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Semester Grade Point Average (SGPA) =

$$\frac{(124)}{(21)} = 5.90$$

2. Cumulative Grade Point Average (CGPA) =

Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this sem.) = 248 Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\frac{\sum (124 + 124)}{\sum (23 + 21)} = 5.63$$

Chart for marks range and its corresponding grade and grade points

Marks Range	**Grade Points**	**Grade**	**Description of Performance**
91-100	10	AA	Outstanding

86-90	09	AB	Excellent
76-85	08	BB	Very Good
66-75	07	BC	Good
56-65	06	CC	Fair
46-55	05	CD	Average
40-45	04	DD	Poor
Below 40	00	FF	Fail
--	--	$	Passed in first attempt
--	--	PP	Passed (Audit Course)
--	--	NP	Not Passed (Audit Course)
--	--	** 2^{nd} *** 3^{rd} **** 4^{th}	One grade punishment for 2^{nd} ,3^{rd}, 4^{th}, …attempt,

Audit Courses:

Additional courses shall be included as audit courses from the third semester onwards. While the performance of the student in audited courses shall be included in the Grade Card, these grades do not contribute to SGPA or CGPA of the concerned student.

Award of Degree:

Following rules prevail for the award of degree:

1. A Student has registered and passed all the prescribed courses under the general institutional and departmental requirements.
2. A student has obtained CGPA≥ 4.5.
3. A student has paid all the institute dues and satisfied all the requirements prescribed.
4. A student has no case of indiscipline pending against him/her.
5. Institute authorities shall recommend the award of B.Tech degree to a student who is declared to be eligible and qualified for above norms.

CGPA Improvement Policy for award of degree:

An opportunity shall be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to

4.00 but less than 4.50, to improve his/her grade by allowing him/her to appear for 100% examinations of maximum two theory courses of seventh and eighth semester. However, CGPA shall be limited to 4.5 even though the performance of a student as calculated through modified CGPA becomes greater than 4.5.

B.Tech (Electronics & Communication Technology) Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs) of the Program:

Program Educational Objectives (PEOs):	
PEO1	Developing graduates with fundamentals and knowledge in science and electronics & communication engineering to provide sustainable technological solutions to industry and society.
PEO2	Development of practical skills, analytical and problem solving abilities for employability, higher studies, entrepreneurship and research and development activities.
PEO3	Impart qualities required for leadership, team work and professional skills to act as good human being and responsible citizen.
Program Outcomes (POs)	
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**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.
PO4	**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.
PO5	**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.
PO6	**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.

PO7	**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.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**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.
PO12	**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.
Program Specific Outcomes(PSOs)	
PSO1	An ability to analyze, simulate and design the electronic circuits and communication systems.
PSO2	An ability to use technical knowledge for successful career and qualifying competitive examinations at national and international levels.

Class & Semester	:	**T. Y. B.Tech (Electronics and Communication Technology) Part III, Semester V**			
Course Title	:	**Digital Communication Technology**	*Course Code*:	:	**EC 311**
Teaching Scheme (Hours)	:	**Lectures 4 hours/weeks=4 x 13 weeks= 52 hours minimum Tutorial= NA Practical= 02 hour/week**	*Total Credits*	:	**04+01 = 05**
Evaluation Scheme (Marks)	:	**CIE = 50 SEE = 50 IPE= NA IOE= NA EPE= 50 Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**	*Month*	:	**April 2018**

Pre-requisites **:** Fundamentals of signals, probability theory, digital circuits.

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze.
Affective : Awareness, Respond, Value, Organize
Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Practical.
2. Semester End Examination.

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal processing in a digital communication system.
4. To analyze error performance of a digital communication system in presence of noise.
5. To understand concept of spread spectrum communication system

Course Outcomes:

1. Differentiate analog and digital communication system.
2. Compare different source encoding techniques
3. Analyze baseband and passband communication system.
4. Apply channel encoding technique to detect and correct errors in digital communication.
5. Discuss spread spectrum modulation and demodulation techniques.
6. Observe and validate results of different digital communication system blocks/elements.

CURRICULUM CONTENT	**Hours**
UNIT.1 Probability and Information Theory	**08**
Probability, joint & conditional probability, statistical average, continuous random variables – PDF and statistical averages, random processes- stationary, time average & ergodicity, power spectral density of stationary random processes, *Information Theory:* Unit of information, entropy, rate of information, mutual information, channel capacity, Shannon's theorem, Shannon Hartley theorem, Shannon fano coding, Huffman coding, Trade-off between bandwidth and S/N ratio.	
UNIT.2 Waveform Coding	**08**
Sampling theorem and recovery of original signal, Quantization – Uniform & Non uniform , PCM, DPCM, Cumulative error in DPCM, minimization of error in DPCM, need of predictors, implementation of predictors at transmitter, Bandwidth requirement in each system, Delta Modulation , limitations of DM, ADM, comparison between DM, PCM and ADM.	
UNIT.3 Baseband Data Communication	**08**
Introduction, Baseband pulse shaping, Shaping of transmitted spectrum , Baseband signal receiver, Integrate and Dump filter, optimum filter, matched filter transfer function, correlate filter transfer function, Inter symbol interference, Equalization , Eye Diagrams , Synchronization: bit, symbol and frame.	
UNIT.4 Digital Carrier Modulation and Detection Schemes	**10**
ASK, PSK, FSK ,DPSK, QPSK, M-ary PSK, QAM, duo-binary signaling, coherent and non-coherent detection, *carrier recovery circuits:* squaring loop and costas loop, Probability of errors and comparison of noise performances in ASK, FSK, PSK.	
UNIT.5 Error Control Coding	
Types of error & codes, Error control coding, Linear Block codes: encoder, decoder, implementation of Linear Block codes. Cyclic codes: encoder, syndrome calculator, decoder. Convolutional codes: encoding and sequential decoding and viterbi decoding.	**10**
UNIT.6 Spread spectrum techniques	
Generation and characteristics of PN sequence, Direct sequence spread spectrum, frequency hopping spread spectrum, applications of spread.	**04**

Text Books **:**

1. Taub & Schling, "Principles of communication system" TMH
2. Apurba Das, 'Digital Communication: Principles and system modeling' Springer Publications

Reference Books **:**

1. John G Proakis, "Digital Communications", TMH Publication
2. K. Sam Shanmugan, "Digital & Analog Communication systems" Wiley Publication
3. B.P. Lathi, " Modern Digital & Analog Communication System" Oxford University Press
4. Siman Haykin, "Digital Communication ", Wiley Publication
5. Bernard Scalar, "Digital Communication Fundamentals & Applications" PHI
6. Todd Moon, "Error Correcting coding', Willy Publication
7. Singh & Sapre , "Communication System Analog & Digital ", TMH.

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">T. Y. B.Tech (Electronics and Communication Technology) Part III, Semester V</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Digital Communication Technology Laboratory</td><td>Course Code:</td><td>:</td><td>EC 311L</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Practical
2 hours/weeks=2 x 13 weeks= 26 hours minimum</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">04+01 = 05</td></tr>
<tr><td colspan="3">Tutorial= NA</td></tr>
<tr><td colspan="3">Practical= 02 hour/week</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE = 50
SEE = 50</td><td>IPE= NA
IOE= NA
EPE= 50</td><td>:
:
:</td><td>Grand Total=150</td><td>Duration of SEE</td><td>:</td><td>3 hours</td></tr>
<tr><td>Revision:</td><td>:</td><td colspan="3">Third</td><td>Month</td><td>:</td><td>April 2018</td></tr>
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Pre-requisites **:** Laboratory work in Engineering Physics, Chemistry-I and Fluid Flow Operations.

Type of Course **:** Practical

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Understand, Apply, Analyze, Evaluate, Create
Affective : Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Tutorial Assessment, Internal Oral Examination.

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal processing in a digital communication system.
4. To analyze error performance of a digital communication system in presence of noise.
5. To understand concept of spread spectrum communication system

Course Outcomes:

1. Differentiate analog and digital communication system.
2. Compare different source encoding techniques
3. Analyze baseband and passband communication system.
4. Apply channel encoding technique to detect and correct errors in digital communication.
5. Discuss spread spectrum modulation and demodulation techniques.
6. Observe and validate results of different digital communication system blocks/elements

Tutorials:

LIST OF EXPERIMENTS :

1. Study of ASK.
2. Study of FSK
3. Study of PSK.
4. Study of DM .
5. Study of ADM.
6. Study of QPSK.
7. Study of TDM-PCM .
9. Study of DPCM.
10. Study of Eye pattern using oscilloscope
11. Study of Hamming Code.
12. Study of DSSS
13. Study of FHSS

Note: Practical consists of minimum ten experiments from above list or based on theory and out of ten minimum two experiments should be based on Simulation tool.

Text Books **:**

1. Apurba Das, 'Digital Communication: Principles and system modeling' Springer Publications

:

Reference Books

1. Taub & Schling, "Principles of communication system" TMH

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Class & Semester	:	**T. Y. B. Tech (Electronics & Communication Technology) Part III, Semester V**					
Course Title	:	**Electromagnetic Fields**			*Course Code*:	:	EC 312
Teaching Scheme (Hours)	:	**Lectures 4 hours/weeks 13 × 4 = 52 hours** **Tutorial= 01 hour/week** **Practical= 00 hours/week**			*Total Credits*	:	**04+01 +00 =05**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE= Nil** **IOE= 50** **EPE= Nil**	: : :	**Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	:	**April 2018**

Pre-requisites **:** Good knowledge of Engineering Mathematics, Fundamentals of Physics

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Evaluate, Design

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Assignments.
2. Semester End Examination.

Course Objectives:

Expose students to Electric and Magnetic Fields and their applications in engineering.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Explain physical interpretation of vectors ,integral and differential operators for electromagnetics
2. Understand the physical interpretation and application of laws and theorems of electric fields
3. Understand the physical interpretation and application of laws and theorems of magnetic fields.
4. Develop field equations from Maxwell's Equations
5. Analyze fields under time varying situations & effect of materials on electric and magnetic fields
6. Identify transmission line parameters and derive equation for transmission line

Curriculum Content

Hours

UNIT.1 Introduction **08**

Introduction and Significance of Electromagnetic Fields, Vector Analysis, Coordinate Systems and Transformation, Concepts of Gradient, Divergence and Curl.

UNIT.2 Electrostatic Field **10**

Coulomb's Law , Electric Field Intensity, Electric Field due to Distributed Charges, Flux Density, Gauss Law and Applications , Divergence Theorem , Work Done, Electric Potential, Potential Gradient, Electric Dipole, Polarization, Electrostatic Energy Density, Boundary Conditions for Electrostatic Field.

UNIT.3 Steady Magnetic Field **O8**

Biot-Savart Law and Applications, Ampere's Circuital Law, Stoke's Theorem, Magnetic Flux Density, Magnetic Scalar & Vector Potential, Current Carrying Conductors in Magnetic Fields, Torque on Loop, Energy Stored in Magnetic Field, Boundary Conditions for Magnetic Field.

UNIT.4 Time Varying Fields and Maxwell's Equations **08**

Continuity Equations for Static Conditions, Displacement Current, Faraday's Law, Inconsistency of Ampere's Law, Maxwell's Equations, Energy Stored in Electric and Magnetic Time Varying Fields, Comparison of Field & Circuit Theory.

UNIT.5 Propagation of Electromagnetic Waves **08**

Wave Propagation in Dielectric & Conducting Media, Wave Equations for Sinusoidal Time Variations, Characteristics of Plane Wave in Pure Dielectric Media and Conducting Media. Reflection of Electromagnetic Wave for Normal and Oblique Incidence , Polarization, Poynting Theorem and Power Flow in Electromagnetic Field, Skin Depth, Phase Velocity and Group Velocity, Boundary Conditions.

UNIT.6 Transmission Lines **10**

Types of Transmission lines, Transmission line Equation, Transmission Line Parameters, The Terminated Uniform Transmission Line, Reflection Coefficient, VSWR, Group Velocity, Phase Velocity, Impedance Matching Techniques, Smith Chart and Applications.

Text Books **:**

1. William Hayt, "Engineering Electromagnetics", 8th Edition, Mc Graw Hill.
2. Matthew. N.O. Sadiku, "Elements of Electromagnetics", Fourth Edition, Oxford University Press, First Indian Edition 2007

Refrence Books **:**

1. R.K Shevgaonkar "Electromagnetic Waves", Tata McGraw-Hill.
2. John D. Kraus, "Electromagnetics with Applications", Fifth edition, McGraw-Hill.
3. C.A. Balanis "Advanced Engineering Electromagnetics", 2nd Edition, John Wiley & Sons

Class & Semester : **T. Y. B. Tech (Electronics & Communication Technology) Part III, Semester V**

Course Title	:	**Electromagnetic Fields Tutorial**			*Course Code*:	:	EC 312T
Teaching Scheme (Hours)	:	**Tutorials 1 hours/weeks 13 × 1 = 13 hours Tutorial= 01 hour/week Practical= 00 hours/week**			*Total Credits*	:	**04+01 +00 =05**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE= Nil** : **IOE= 50** : **EPE= Nil** :	**Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**			*Month*	:	**April 2018**

Pre-requisites **:** Good knowledge of Engineering Mathematics, Fundamentals of Physics

Type of Course **:** Tutorial

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Evaluate, Design

Course Assessment Methods:

1. Tutorials based on syllabus.
2. Internal Oral Examination.

Course Objectives:
Expose students to Electric and Magnetic Fields and their applications in engineering.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Explain physical interpretation of vectors ,integral and differential operators for electromagnetics
2. Understand the physical interpretation and application of laws and theorems of electric fields
3. Understand the physical interpretation and application of laws and theorems of magnetic fields.
4. Develop field equations from Maxwell's Equations
5. Analyze fields under time varying situations & effect of materials on electric and magnetic fields
6. Identify transmission line parameters and derive equation for transmission line

Note- Minimum eight tutorials should be conducted based on syllabus.

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="6">T. Y. B.Tech (Electronics & Communication Technology) Part III, Semester V</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Microcontrollers</td><td>Course Code:</td><td>:</td><td>EC 313</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Lectures hours/week = 04</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">04+00 +01 =05</td></tr>
<tr><td colspan="3">Tutorial= 00 hour/week</td></tr>
<tr><td colspan="3">Practical= 02 hours/week</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE = 50
SEE =50</td><td>IPE=Nil
IOE=Nil
EPE= 50</td><td>:
:
:</td><td>Grand Total= 150</td><td>Duration of SEE</td><td>:</td><td>3 hours</td></tr>
<tr><td>Revision:</td><td>:</td><td colspan="3">Third</td><td>Month</td><td>:</td><td>April 2018</td></tr>
</table>

Pre-requisites **:** Basics of digital electronics, c and c++ programming languages

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

1. Continuous Internal Evaluation, Semester end examination.

Course Objectives:

1. Study and understand the architecture of MCS 51 family.
2. Study assembly language instructions of 8051 microcontroller.
3. Write program for 8051 microcontroller in assembly language and c language.
4. Study the architecture of PIC 16F877 microcontroller.
5. Study the instruction set of PIC 16F877 microcontroller
6. Write program for PIC 16F877 microcontroller in assembly and c language.
7. Study the interfacing with microcontrollers.

Course Outcomes:

1. Discuss and compare on chip features of microcontrollers.
2. Develop programs in assembly and C language for 8051 and PIC microcontrollers.
3. Interface devices to microcontrollers.
4. Illustrate the difference between CISC and RISC architectures.
5. Select suitable microcontroller for particular application.
6. Utilize Integrated Development Environments for microcontrollers.

Curriculum Content

	hours
UNIT I. MCS-51 Microcontroller family Introduction to MCS-51 architecture, 8051 microcontroller hardware, Input /output pins, external memory, register files, counters and timers, interrupts, serial communication, development tools IDE .	10
UNIT II. Programming MCS-51 microcontrollers Addressing modes, instruction set, assembly language programming, programming by using embedded c language, timing subroutines. Lookup table	9
UNIT III. MCS-51 Microcontroller interfacing and programming Interfacing of switches, matrix keyboards, seven segment displays, LCD displays, ADC, DAC, relays, thumbwheel , interfacing I^2C,SPI bus devices,RS232.	9
UNIT IV. Microchip PIC microcontroller family Introduction to RISC & CISC architectures, Microchip PIC 16F8XX microcontroller family , CPU architecture, register file structure, I/O ports and TRIS registers, interrupts, timers, oscillator configurations, reset alternatives, WDT, sleep mode , on chip resources, interrupt structure,	10
UNIT V. Programming PIC microcontrollers Instruction set, assembly language programming, embedded c programming	6
UNIT VI. PIC families and MPLAB development tools Overview of PIC microcontroller derivatives with comparison. MPLAB development environment, programming, debugging, simulation tools.	4

Text Books **:**

1. Kenneth Ayala, "The 8051 Microcontroller Architecture, programming and Applications" Penram Intrnational
2. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded systems"Pearson Education Asia LPE

Reference Books **:**

1. Intel or Atmel MCS 51 Family Microcontrollers Data Sheets.
2. Mike Predcko "8051 Microcontrollers programming and practice"
3. John B. Peatman, "Design with PIC Microcontrollers " Pearson Education Asia. LPE
4. Microchip Midrange Embedded Microcontrollers Handbook
5. Microchip PIC 16F8XX family Microcontrollers Data sheets.

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology), Part III, Semester V**									
Course Title	:	**Microcontrollers Laboratory**						*Course Code*:	:	**EC 313L**	
Teaching Scheme (Hours)	:	**2 hr /week= 2 x13= 26 hours**						*Credits*	:	**1**	
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **Nil**	**EPE** **EOE**	: :	**50** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**	
Revision:	:	**Third**						*Month*	:	**April 2018**	

Pre-requisites **:** Basics of digital electronics, c and c++ programming languages

Type of Course **:** Practical

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Understand, Apply, Analyze, Evaluate, Create

Course Assessment Methods:

Practical Journal Assessment, External Practical Examination

Course Objectives:

1. Study and understand the architecture of MCS 51 family.
2. Study assembly language instructions of 8051 microcontroller.
3. Write program for 8051 microcontroller in assembly language and c language.
4. Study the architecture of PIC 16F877 microcontroller.
5. Study the instruction set of PIC 16F877 microcontroller
6. Write program for PIC 16F877 microcontroller in assembly and c language.
7. Study the interfacing with microcontrollers.

Course Outcomes:

1. Discuss and compare on chip features of microcontrollers.
2. Develop programs in assembly and C language for 8051 and PIC microcontrollers.
3. Interface devices to microcontrollers.
4. Illustrate the difference between CISC and RISC architectures.
5. Select suitable microcontroller for particular application.
6. Utilize Integrated Development Environments for microcontrollers.

Practical List **:**

Minimum eight experiments should be performed from following list based on syllabus. Out of these eight experiments minimum four experiments should be conducted for each 8051 and PIC 16F877 microcontrollers.

1) Bit handling operations.
2) Serial communication using assembly and embedded C language
3) Programming 7 segment displays using assembly and embedded C language
4) Programming LCD displays using assembly and embedded C language
5) Programming DC motor using assembly and embedded C language
6) Programming geared motor using assembly and embedded C language
7) Programming stepper motor using assembly and embedded C language
8) Traffic light control system using assembly and embedded C language
9) Programming timer and counter using assembly and embedded C language
10) Relay interfacing and programming in assembly and embedded C
11) Buzzer interfacing and programming in assembly and embedded C
12) Programming ADC/ DAC using assembly and C language

Lab Manual **:**

- Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Reference **:**

Books

1. Intel or Atmel MCS 51 Family Microcontrollers Data Sheets.
2. Mike Predcko "8051 Microcontrollers programming and practice"
3. John B. Peatman, "Design with PIC Microcontrollers " Pearson Education Asia. LPE
4. Microchip Midrange Embedded Microcontrollers Handbook
5. Microchip PIC 16X family Microcontrollers Data sheets.

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">T. Y. B.Tech (Electronics and Communication Technology) Part III, Semester V</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Signals and Systems</td><td>Course Code:</td><td>EC 314</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Lectures
4 hours/weeks=4 x 13 weeks= 52 hours minimum</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">04+01 = 05</td></tr>
<tr><td colspan="3">Tutorial= 01 hour/week</td></tr>
<tr><td colspan="3">Practical= NA</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE = 50
SEE = 50</td><td>IPE= NA
IOE= NA
EPE= NA</td><td>:
:
:</td><td>Grand Total=100</td><td>Duration of SEE</td><td>:</td><td>3 hours</td></tr>
<tr><td>Revision:</td><td>:</td><td colspan="3">Third</td><td>Month</td><td>:</td><td>April 2018</td></tr>
</table>

Pre-requisites **: Fundamentals of Fourier, Laplace and Z Transform.**

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze.
Affective : Awareness, Respond, Value, Organize

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, assignments.
2. Semester End Examination.

Course Objectives:

1.To classify both continuous and discrete time signals and systems

2.To make Spectral analysis of CT periodic and aperiodic signals using CT Fourier methods.

3.To Analysis and Characterization of the CT systems through Laplace Transform and Fourier Transform.

4.To Analysis and Characterization of the CT and DT systems through Time domain method.

5.To Analysis and Characterization of the DT systems through Z Transform.

Course Outcomes:

1. Differentiate different types of signals.
2. Identify type of Systems.
3. Analyze LTI systems in time domain.
4. Apply Fourier techniques to transform the signals in frequency domain.
5. Analyze LTI systems using Laplace transform and Z- transforms.
6. Demonstrate signals and interdependencies of time and frequency domain parameters.

CURRICULUM CONTENT	**Hours**
UNIT.1 Introduction to Signals Signals, Continuous and discrete time signals, Classification of Signals , Periodic aperiodic, even & odd energy and power signals, deterministic and random signals, complex exponential and sinusoidal signals , periodicity properties of discrete time signals, complex exponential, unit impulse, unit step, impulse functions, transformation of independent variable.	**05**
UNIT.2 Systems and Time domain analysis Properties of systems: Linearity, Causality, Time invariance, Stability, Invertability. *Time domain analysis of LTI systems:* System modeling, Solution of Differential equation with initial conditions, Zero state response and Zero input response, representation of LTI system by impulse response (continuous and discrete Convolution), Identifying properties of system from impulse response.	**07**
UNIT.3 Frequency domain Analysis of systems Fourier series representation of continuous time and discrete time periodic signals (Exponential), properties of continuous time and discrete time Fourier series. Continuous time and discrete time Fourier Transform, properties of the CT and DT Fourier Transform, Characterization using differential and difference equation, Parseval's relation, convolution in time and frequency domains, applications of Fourier transform.	**14**
UNIT.4 Sampling Theorem Representation of continuous time signals by its sample, Sampling theorem, aliasing effect, antialiasing , methods reconstruction of a Signal from its samples, Interpolation techniques, discrete time processing of continuous time signals, sampling of band pass signals.	**04**

UNIT.5 Laplace Transform **09**

Introduction, pole-zero plot, ROC, Properties of Laplace Transform, Inverse Laplace transform using partial fraction method, transfer function of LTI-CT system, impulse response and transfer function, convolution and de-convolution using LT, stability in S domain, system realization of LTI system in S domain. Application: solution of electronics circuit, solution of differential equation.

UNIT.6 Z-Transform **09**

Basic principles of z-transform, z-transform definition, region of convergence, properties of ROC, Properties of z-transform, Poles and Zeros, inverse z-transform using residue Theorem, power Series expansion and partial fraction expansion, Computation of Impulse response & Transfer function using Z Transform, stability of LTI Systems, system realization of LTI system in Z domain. Applications: solution of difference equation.

Text Books **:**

1. Nagoor Kani, "Signals & Systems", Tata McGraw Hill
2. Anand Kumar, "Signals & Systems", PHI

Reference Books **:**

1. John G.Proakis and Dimitris G.Manolakis , "Digital Signal Processing, Principles, Algorithms and Applications" , 3rd editionn., PHI.
2. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, "Signals & Systems", Pearson Education, 1997.
3. M.J.Roberts ,"Signals and Systems Analysis using Transform method and MATLAB" , TMH 2003.
4. K.Lindner, "Signals and Systems", McGraw Hill International, 1999.
5. Michael J. Roberts "Fundamentals of signals & systems", Tata McGraw Hill, 2007

Class & Semester	:	**T. Y. B.Tech (Electronics and Communication Technology) Part III, Semester V**				
Course Title	:	**Computer Networks & Data Communication**		*Course Code*:	:	**EC 315**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3x 13 weeks= 39 hours minimum** **Practical= 02 hours/week**		*Total Credits*	:	**03 +00+ 01 = 04**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE=Nil** **IOE=Nil** **EOE= 50**	: **Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	: **April 2018**

Pre-requisites **:** In order to complete the course studies successfully Basic knowledge of Electronics devices & communication technology.

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate
Affective : Awareness, Respond, Value, Organize
Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Assignments.
2. Semester End Examination.

Course Objectives:

1. The course will introduce the student with fundamental concept of computer networking and data communication.
2. To acquire the basic knowledge of networking and hands on network devices.

Course Outcomes:

CO1 Explain different network topologies and Compare OSI and TCP/IP reference models
CO2 Explain guided and unguided transmission media
CO3 Discuss error detection and correction mechanism for data link layer
CO4 Explain multiple access protocols and Data link control protocols
CO5 Define IEEE standards and Compare wired and wireless LANs
CO6 Describe network layer protocols

Curriculum Content

Hours

06

UNIT I: Introduction to Data communications

Introduction to Data communications, components, data representation, data flow, networks, Network topology: Mesh, Star, Bus, Ring, Network Categories: LAN, MAN,WAN, internet, Network Models: OSI model, TCP-IP protocol suite, Comparison of OSI and TCP-IP model, addressing, Crimping tool. **06**

UNIT II: Physical Layer

Guided transmission media, Unguided transmission media, switching - circuit switched networks, datagram networks, virtual circuit networks. Structure of switch. **06**

UNIT.III Data Link Layer

Error detection and correction: types of errors, Block coding : error detection and error correction, Linear Block Codes Hamming code, Cyclic Redundancy check ,Checksum **08**

UNIT.IV Data link control and Medium Access Control Sublayer

Framing, flow control and error control DLL protocols: Noiseless channels and noisy channels , sliding window protocols HDLC point to point protocol Channel allocation, multiple access: random access controlled access channelization, Broadband wireless.

UNIT.V Wired and Wireless LANS **07**

IEEE Standards, Ethernet, wireless LAN IEEE 802.11, addressing mechanism, hidden station and exposed station problem, Bluetooth, zigbee, wifi, Connecting devices.

UNIT.VI Network Layer

IPv4 address, IPv4 subnetting, IPv6 address, Transition from IPv4 to IPv6, Routing Protocols (RIP, OSPF, BGP), congestion control algorithms, QoS. **06**

Text Books **:**

1. Behrouz Forouzan, “Data Communications and Networking”, Fourth Edition, TMH
2. Andrew S. Tanenbaum, “Computer Networks”,Fourth Edition, PHI Publications
3. W. Stallings, “Data and Computer Communications”, Sixth Edition, PHI Publications

Reference Books **:**

1.Leon Couch, “Digital & Analog Communication Systems”, MacMillan,

Class & Semester	:	**T. Y. B.Tech (Electronics and Communication Technology) Part III, Semester V**								
Course Title	:	**Computer Networks & Data Communication Laboratory**						*Course Code*:	:	**EC 315L**
Teaching Scheme (Hours)	:	**2 hr /week= 2 x13= 26 hours**						*Credits*	:	**1**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **Nil**	**EPE** **EOE**	: :	**Nil** **50**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**
Revision:	:	**Third**						*Month*	:	**April 2018**

Pre-requisites **:** Good knowledge of communication devices

Type of Course **:** Practical

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Understand, Apply, Analyze, Evaluate, Create

Course Objectives:

1 The course will introduce the student with fundamental concept of computer networking and data communication.

2 To acquire the basic knowledge of networking and hands on network devices.

Course Outcomes:

CO1 Explain different network topologies and Compare OSI and TCP/IP reference models

CO2 Explain guided and unguided transmission media

CO3 Discuss error detection and correction mechanism for data link layer

CO4 Explain multiple access protocols and Data link control protocols

CO5 Define IEEE standards and Compare wired and wireless LANs

CO6 Describe network layer protocols.

Course Assessment Methods:

Practical Journal Assessment, External Oral Examination

Practical List:

1. Half duplex and full duplex communication by using RS – 232 for character transfer.
2. Half duplex, Full duplex file transfer between two PC by using RS – 232.
3. LAN implementation.
4. Finite state machine design (Tutorial type)
5. Demonstration of bit stuffing.
6. Demonstration of Stop and wait protocol.
7. Demonstration of Go Back N protocol.
8. Demonstration of Selective repeat protocol.
9. Sliding window protocols using RS 232c.
10. Demonstration of error detection method.
    a. Hamming code.
    b. CRC method.
11. Shortest path routing algorithm (By simulation)
12. Study of QOS by using NETFLOW and Live action Softwares.

Note : Minimum 8 Experiments on basis of above mention list or Syllabus

Lab Manual **:**

- Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Reference Books **:**

Leon Couch, "Digital & Analog Communication Systems", MacMillan.

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology) Part III, Semester V**					
Course Title	:	**Electronic system design laboratory**			*Course Code*:	:	EC 316L
Teaching Scheme (Hours)	:	**Practical hours/weeks = 2 hours/week** **Tutorial= 00 hour/week** **Practical= 02 hours/week**			*Total Credits*	:	**00+00 +01 =01**
Evaluation Scheme (Marks)	:	**CIE= Nil** **SEE =Nil**	**IPE=50** **IOE=Nil** **EPE= Nil**	: : :	**Grand Total= 50**	*Duration of SEE*	: **Nil**
Revision:	:	**Third**			*Month*	:	**April 2018**

Pre-requisites	**:**	Analog Electronics, Digital Electronics
Type of Course	**:**	Practical
Course Domain	**:**	Core
Skills Imbibed	**:**	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

1. Internal Practical Examination. Performance of students will be supervised throughout semester in the practical slot of ESD. At the time of examination students have to deliver seminar and project demonstration in front of examiners. Students should submit the project report to department.

Course Objectives:

8. Survey of existing problems and case studies.
9. Understanding the working of electronic circuits.
10. Applying technical knowledge to solve any problem.
11. To learn documentation and presentation skills.
12. Understand ethical practices and work in team.
13. Project management

Course Outcomes:

1. Illustrate different basic steps involved in electronic project development.
2. Analyze various electronics circuits.
3. Apply acquired knowledge to achieve given task.

4. Write report and express technical details.
5. Manage project and finance
6. Team work and relevant ethical practices

Curriculum Content

Laboratory work should consists of design and implementation of small electronics systems based on OP-AMP, Timer 555 IC, encoders, decoders, multiplexers, demultiplexers, switching regulators, PLL etc. A group will consists of maximum two students, who will work on one system for entire semester. The work includes design, implementation, validation and report writing of the system.
At the end of course project report consisting detail information should be submitted. Students have to deliver seminar on the project.
Note: Microcontroller based systems are strictly not allowed.

Text Books **:**

1. Reputed national, international journals and magazines, authentic sources from web sites.

Practical List **:**

Any small project that can be carried out by group of two students within one semester. Students have to execute this project step wise. Every week students will work out on this project for at least two hours and report the progress to supervisor.

Reference Books **:**

1. Reputed national, international journals and magazines, authentic sources from web sites.

Lab manual

Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology) Part III, Semester V**			
Course Title	:	**Internship-I**	*Course Code*:	:	EC 317
Teaching Scheme (Hours)	:	**4 week internship**	*Total Credits*	:	**00+00+01 =01**

Evaluation Scheme (Marks)	:	**CIE= Nil SEE =Nil**	**IPE=Nil IOE=50 EPE= Nil**	: : :	**Grand Total= 50**	*Duration of SEE*	:	**Nil**
Revision:	:	**Nil**				*Month*	:	**April 2018**

Pre-requisites	**:**	After completion of fourth semester students should undergo industrial training
Type of Course	**:**	Industrial Training
Course Domain	**:**	Core
Skills Imbibed	**:**	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

After completion of fourth semester during vacation period students will undergo industrial training for 4 weeks. Every student will individually submit the report in given format to department. Program coordinator will appoint panel of faculty members who will assess the students' performance by Power point presentation / oral examination.

Course Objectives:

1. To expose students to real working environment and get acquainted with the organization structure, business operations and administrative functions.
2. To have hands on experience in the related field to get exposure with the industrial trend.
3. To promote cooperation and to develop synergetic collaboration between industry and the university.
4. To set the step for future recruitment.

Course Outcomes:

1. Know the industrial working environment.
2. Utilize the technical resources.
3. Write technical documents and appear for interview / power point presentations/ technical discussions.
4. Develop attitude of a team pl ayer and ability of life-long learning.
5. Adapt and develop professional skills required for employability.
6. Motivation for entrepreneurship.

Curriculum Content

Four week industrial training in reputed industry from stand point view of electronics engineering is mandatory. Students should learn and understand the concepts of industrial organization and management. They should get familiarity with different departments like R

& D, production, quality, purchase, sales & marketing and other. Students should submit detail report in the given format to the B.Tech Electronics & Communication Technology program in which all details of internship must be included. Panel of faculty members appointed by the program coordinator will assess the individual student.		
Text Books	**:**	
NIL		
Practical List	***:***	
NIL		
Reference Books	**:**	
NIL		
Lab manual		
NIL		

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology) Part III, Semester V**						
Course Title	:	**Research Methodology**				*Course Code*:	:	RM 311
Teaching Scheme (Hours)	:	**Lectures 2 hours/weeks= 2 x 13 weeks= 26 hours** **Tutorial= 00 hour/week** **Practical= 00 hours/week**				*Total Credits*	:	**02+00 +00 =00**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 00**	**IPE=Nil IOE=Nil EPE= 50**	: : :	**Grand Total=150**	*Duration of SEE*	:	**0 hours**
Revision:	:	**Third**				*Month*	:	**April 2018**

Pre-requisites **:** Good knowledge of engineering mathematics,

		fundamentals of physics, Chemistry, Electronics
Type of Course	**:**	Audit
Course Domain	**:**	Audit
Skills Imbibed	**:**	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

1. Continuous Internal Evaluation: Assignments, case studies

2. Audit

Course Objectives:

1 To develop understanding of the basic framework of research process.

2 To develop an understanding of various research designs and techniques.

3 To identify various sources of information for literature review and data collection.

4 To develop an understanding of the ethical dimensions of conducting applied research.

5 Appreciate the components of scholarly writing and evaluate its quality

Course Outcomes:

1 Demonstrate knowledge of research processes (reading, evaluating, and developing);

2 Perform literature reviews using print and online databases;

3 Identify, explain, compare, and prepare the key elements of a research proposal/report;

4 Compare and contrast quantitative and qualitative research

5 Describe sampling methods, measurement scales and instruments, and appropriate uses of each;

6 Explain the rationale for research ethics, and its importance.

Curriculum Content	**Hours**
UNIT 1 Introduction to Research Methodology Meaning and significance of research. Objective of Research, Types of Research, Research Methods and Methodology,	**03**

Scientific method of Research, Research Process	
UNIT 2 Research Formulation – Defining and formulating the research problem -Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem –Literature review – Primary and econdary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. Summarizing a Technical Paper - summary template Online tools - Google, CiteSeer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Searching patents	**06**
UNIT 3 Research Design Research design, sampling design and scaling techniques – Research design – Basic Principles- Need of research design — Features of good design – mportant concepts relating to research design, basic principles of experimental designs, implications of sample design, steps in sample design, criteria of selecting sampling procedure, characteristics of good sampling design, different types of sample design. Scaling techniques: measurement scales, sources of error, technique of developing measurement tool, important scaling techniques, scale construction techniques.	**06**
UNIT 4 Data Collection and analysis:- Observation and Collection of primary and secondary data – Methods of data collection, processing operations, types of analysis, statistics in research, measures of central tendency, measures of dispersion, measures of asymmetry, measures of relationships, simple regression analysis, multiple correlation and regression, partial correlation.	**03**
UNIT 5 Reporting and thesis writing – Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation – Practice – Making presentation – Use of visual aids - Importance of effective communication - Documentation and presentation tools: LATEX	**03**
UNIT 6 Types of technical papers - Journal papers, Conference papers, Survey papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper, Organization and flow of thesis/ Project report, Research proposal: preparation, budgeting, presentation, funding agencies for engineering research, Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights	**05**

Reference Books **:**

References Books:

1 C.R.Kothari "Research Methodology" New Age International (P) Ltd.
2 D.K.Bhattachary "Research Methodology";; Excel Books
3 Goodday &Hack "Research Methodology"
4 Hilary Glasman-Deal "Science Research Writing", Imperial College Press, London, UK
5 Ranjit Kumar, "Research Methodology: A Step by Step Guide for Beginners",
6 Stuart Melville and Wayne Goddard, " Research methodology: an introduction for science & engineering students",

Pedagogy:

Teaching methods include readings, lectures, group discussions, exercises, and assignments. Lectures are designed such that ensure greater scholar participation.

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology) PartI III, Semester VI**				
Course Title	:	**Digital Signal Processing**		*Course Code*:	:	EC 321
Teaching Scheme (Hours)	:	**Lectures 4 hours/weeks = 4 x 13 weeks= 52 hours** **Tutorial= 00 hour/week** **Practical= 02 hours/week**		*Total Credits*	:	**04**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE=Nil IOE=Nil EPE= 50** : : : **Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**		*Month*	:	**April 2018**

Pre-requisites	**:**	Good knowledge of engineering mathematics, fundamentals of Signals and Systems
Type of Course	**:**	Theory & Practical
Course Domain	**:**	Core
Skills Imbibed	**:**	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, assignments
2. Semester End Examination.

Course Objectives:

1. To study DFT and its properties, IDFT, FFT algorithms, circular convolution, correlation
2. To study FIR filter design using different methods.
3. To study FIR filter design using different methods.
4. Study of adaptive filter and its applications
5. To study DCT and Wavelet transforms, its applications.
6. To study applications of Digital Signal Processing in different fields.

Course Outcomes:

1. Apply different algorithms to find DFT, IDFT and convolution .
2. Design FIR filters using different methods
3. Design IIR filters using different methods
4. Explain adaptive signal processing and adaptive filter models.
5. Apply DCT and wavelet transforms
6. Illustrate the role of DSP in different areas

Curriculum Content	**Hours**
UNIT I. DFT and FFT Introduction to DSP system, DFT, Relation between DFT and Z Transform, Properties of DFT, Circular convolution ,IDFT. DIT FFT & DIF FFT algorithm implementation, fast convolution signal, overlap save & overlap-add algorithm segmentation, correlation, circular correlation, IFFT, DFT properties of circular correlation.	**10**
UNIT II. FIR Filter Design Characteristics of FIR filter, properties of FIR filter, digital network for FIR filter, frequency sampling, Fourier series & windowing method, filter design using Kaiser window, Realization of FIR by direct form structures, cascade, parallel form.	**09**
UNIT III. IIR Filter Design Impulse invariant technique, Bilinear transformation Placement of poles & zeros, frequency band transformation, analog filter approximation ,quantization and rounding problems, Effect of finite word length on stability and frequency response, Realization of IIR by direct form structures, cascade & parallel form.	**09**
UNIT IV. Adaptive Filter Introduction to adaptive signal processing, Adaptive direct form FIR filters, Least Mean Square (LMS) algorithm.	**08**
UNIT V. DCT and Wavelet Transform Forward DCT, Inverse DCT, DCT as a orthogonal transformer. Introduction to wavelets, time ,frequency representations, continues time wavelet, Continues wavelet transform (CWT), Inverse CWT, Properties of CWT, Discrete wavelet transform, STFT, Comparison of Fourier transform & wavelet transform ,Application of wavelets transforms .	**08**
UNIT VI. Application of Digital Signal Processing Mobile communication, Bio-medical Engineering, image processing, Acoustic Noise Canceller, Dynamic range compression, LPC analysis and synthesis, SSB modulation, Radar tracking & implementation	**08**

,Study of architecture of TMS 320C6XXX processor		
Text Books	**:**	
1. John G Prokis , "Digital Signal Processing ,Principles, Algorithms and Application", PHI 2**.** S.K.Mitra, "Digital Signal Processing", TMH 3. E. C. Ifleachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", Second Edition, Pearson education. 4.Avtar Singh, S. Srinivasan, "Digital Signal Processing Implementation using DSP, Microprocessors with examples from TMS 320C6XXX", Thomas Publication.		
Reference Books	**:**	
1. A.V.Oppenheins and R.W. Schalfer , "Discrete Time Signal Processing", PHI 2. S. Salivahanam, A Vallavaraj, C. Guanapriya, "Digital Signal Processing",TMH 3. Raghuveer M. Rao and Ajit S. Boperdikar , "Wavelet Transforms – Introduction to theory and applications", Pearson Education. 4. Smith, "Scientist and Engg. Guide on Digital Signal Processing"		
Note for question paper setter: Minimum sixty percent marks must be allocated for numerical and derivations.		

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology), Part III, Semester VI**									
Course Title	:	**Digital Signal Processing Laboratory**						*Course Code*:	:	**EC 321L**	
Teaching Scheme (Hours)	:	**2 hr /week= 2 x13= 26 hours**						*Credits*	:	**1**	
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **Nil**	**EPE** **EOE**	: :	**50** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**	
Revision:	:	**Third**						*Month*	:	**April 2018**	

Pre-requisites **:** Good knowledge of engineering mathematics, fundamentals of Signals and Systems

Type of Course **:** Practical

Course Domain **:** Core

Skills Imbibed

: Cognitive: Understand, Apply, Analyze, Evaluate, Create

Course Assessment Methods:

Practical Journal Assessment, External Practical Examination

Practical List :

Minimum 8 experiments should be carried out by using Matlab based on above syllabus.

1) Convolution of CT and DT signals on MATLAB.
2)Design of FIR filter using Kaiser Window method.
3)Design of IIR filter using BLT technique.
4)Power Spectrum Estimation using any one non-parametric method.
5)Study of Hardware and Software utilities for DSP starter kits (Texas, ADSP or Motorola).
6) Implementation of any application on DSP starter kit.
7)Implementation of the DSP Algorithms by using MATLAB
8)Implementation of FIR Filter by using MATLAB.
9)Implementation of IIR Filter by using MATLAB.

Lab Manual :

- Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Class & Semester	:	**T. Y. B.Tech (Electronics and Communication Technology) Part III, Semester VI**			
Course Title	:	**Operating Systems**		*Course Code*:	: **EC 322**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 13 weeks= 39 hours minimum Tutorial= 01 hour/week Practical= NA**		*Total Credits*	: **03+01 = 04**
Evaluation Scheme (Marks)	:	**CIE = 50 SEE = 50**	**IPE= NA IOE= 50 EPE= NA**	: **Grand Total=150**	*Duration of SEE* : **3 hours**
Revision:	:	**Third**			*Month* : **April 2018**

Pre-requisites **:** NA

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand.
Affective : Awareness, Respond, Value, Organize

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Tutorial.
2. Semester End Examination.

Course Objectives:

7. To make the students understand basic concepts of operating system.
8. To expose the students to various functions of the Operating system and their usage.
9. To provide exposure to Linux and windows 7 operating systems.
10. To provide knowledge of real time operating system.

Course Outcomes:

7. Explain basic concepts of operating systems.
8. Explain Processes & Threading environment in operating systems.
9. Discuss issues related to the memory & I/O in Operating systems.
10. Describe various process management concepts like scheduling, synchronization, deadlocks.
11. Explain concepts of memory management.

12. Compare different operating systems.

CURRICULUM CONTENT **Hours**

UNIT I: **Overview of Operating Systems** **06**

Abstract view of an operating system, Fundamental principles of OS operations, OS interaction with the computer and user programs, Efficiency, system performance and user service, Multiprogramming System, The Time Sharing System, The Real Time Operating System, Distributed operating system, Operation of OS, Operating system with monolithic structure, Virtual machine operating system, Kernel based operating system, Microkernel based operating system

UNIT II: Processes, Threads and Synchronization **06**

Processes and programs, Implementing processes, Threads, Process synchronization, Race condition, Critical Section, Synchronization approaches, Classic process, synchronization problems, Semaphores, Monitors. *Process Scheduling*: Scheduling terminology and concepts, Non preemptive scheduling policies, Preemptive scheduling policies, Long, Medium and short term scheduling.

UNIT III: Memory Management and Deadlock **06**

What is deadlock, Deadlock in resource allocation, Handling Deadlocks: Deadlock, Detection and Resolution, Deadlock prevention, Deadlock avoidance, managing the memory hierarchy, Memory allocation to a process, Heap Management, Contiguous Memory Allocation and Non Contiguous Allocation, Segmentation and Segmentation with paging, Virtual memory basics, Demand paging, and Page replacement policies, controlling memory allocation to a processes.

UNIT IV: File systems and I/O systems **06**

Overview of file processing, Files and file operations, Fundamental file organizations and access methods, Overview of I/O system, I/O hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O request to h/w operation.

UNIT V: Case Study **06**

Linux: Linux History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, Interposes Communication, Network Structure, Security. *Windows 7:* History, Design Principles, System Components, Terminal Services and Fast User, Switching, File System, Networking, Programmer Interface.

UNIT VI: Real Time Operating Systems **06**

RTOS, scheduler, objects, scheduler, services, RTOS characteristics. Tasks: Tasks states and scheduling, synchronization, communication , concurrency, deadlocks, *Semaphores:* definition, operations, *Queue:* queue states, queue content, use of message queue in communication. Exceptions and interrupts, processing of general exceptions. Memory:

Dynamic memory allocation, fixed size memory management, hardware memory management

Text Books **:**

1. Operating System Concepts - Abraham Silberschatz, Peter B. Galvin & Grege Gagne (Wiley)
2. Operating Systems - A Concept Based approach - Dhananjay M Dhamdhere (TMGH).

Reference Books **:**

1. Unix Concepts and Applications – Sumtabha Das (TMGH).
2) Operating System : Concepts and Design - Milan Milenkovic (TMGH)
3) Operating System with case studies in Unix, Netware and Windows NT - Achyut S. Godbole (TMGH).

Class & Semester : **T. Y. B.Tech (Electronics and Communication Technology) Part III, Semester VI**

Course Title	:	**Operating Systems Tutorial**		*Course Code*:	: **EC 322T**
Teaching Scheme (Hours)	:	**Tutorial** **1 hours/weeks=3 x 13 weeks= 13 hours minimum** **Tutorial= 01 hour/week** **Practical= NA**		*Total Credits*	: **03+01 = 04**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE= NA** **IOE= 50** **EPE= NA**	: **Grand Total=150**	*Duration of SEE* : **3 hours**
Revision:	:	**Third**			*Month* : **April 2018**

Pre-requisites **:** Basics of C programming

Type of Course **:** Tutorial

Course Domain : Core

Skills Imbibed : Cognitive: Understand, Apply.
Affective : Awareness, Respond, Value, Organize

Course Assessment Methods:

Tutorial Assessment, Internal Oral Examination.

Course Objectives:

1. To classify both continuous and discrete time signals and systems
2. To make Spectral analysis of CT periodic and aperiodic signals using CT Fourier methods.
3. To Analysis and Characterization of the CT systems through Laplace Transform and Fourier Transform.
4. To Analysis and Characterization of the CT and DT systems through Time domain method.
5. To Analysis and Characterization of the DT systems through Z Transform

Course Outcomes:

1. Explain basic concepts of operating systems.
2. Explain Processes & Threading environment in operating systems.
3. Discuss issues related to the memory & I/O in Operating systems.
4. Describe various process management concepts including scheduling, synchronization, deadlocks.
5. Explain concepts of memory management.
6. Compare different operating systems.

Tutorials: Minimum eight tutorials should be conducted based on theory curriculum.

Text Books :

1. Operating System Concepts - Abraham Silberschatz, Peter B. Galvin & Grege Gagne (Wiley)

:

2. Operating Systems - A Concept Based approach - Dhananjay M Dhamdhere (TMGH).

Reference Books

1) Unix Concepts and Applications – Sumtabha Das (TMGH).
2) Operating System : Concepts and Design - Milan Milenkovic (TMGH)
3) Operating System with case studies in Unix, Netware and Windows NT - Achyut S. Godbole (TMGH).

Class & Semester	:	**T. Y. B. Tech (Electronics & Communication Technology) Part III, Semester VI**					
Course Title	:	**Antenna and Wave Propagation**			*Course Code*:	:	EC 323
Teaching Scheme (Hours)	:	**Lectures 4 hours/weeks 13 × 4 = 52 hours** **Tutorial= 00 hour/week** **Practical= 02 hours/week**			*Total Credits*	:	**04+00 +01 =05**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE=Nil** **IOE=Nil** **EPE= 50**	: : :	**Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	:	**April 2018**

Pre-requisites **:** Good knowledge of Engineering Mathematics, Fundamentals of Physics and Electromagnetics.

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Evaluate, Design

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Assignments.
2. Semester End Examination.

Course Objectives:

1. Expose the students to basic principle of radiation mechanism and fundamentals of antenna.
2. To study various antennas, arrays and their applications.
3. To study wave propagation and their characteristics.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Explain the radiation mechanism of antenna and calculate antenna parameters
2. Analyze array of antennas and their applications.
3. Identify and analyze various wire antennas.
4. Design and analyze antennas for different applications
5. Analyze wave propagation characteristics for ground and space wave
6. Evaluate effect of different ionospheric phenomenon on wave propagation

Curriculum Content

Hou

UNIT.1 Antennas and Fundamental Parameters

Introduction, radiation mechanism, Omni-directional and isotropic antennas, Basic Antenna parameters: Antenna pattern, Half power beam width, Beam area, Radiation intensity, Beam efficiency, Directivity and Gain, Radiation resistance, Resolution, Front to Back ratio, Antenna aperture, Effective height, Reflection coefficient, Impedance bandwidth, pattern bandwidth, polarization ,Antenna Temperature. Fields from oscillating dipole, Antenna field zones, The radio communication Link: Friis Transmission Equation. **8 10**

UNIT.2 Antenna Arrays **09**

Arrays of two isotropic point sources: same amplitude and phase, same amplitude and opposite phase, same amplitude and in phase quadrature, same amplitude and any phase difference, Unequal amplitude and any phase difference. Nonisotropic but similar point sources and the principle of pattern multiplication, Nonisotropic and Dissimilar point sources, Linear arrays of n isotropic point source of equal amplitude and spacing. Null direction and half power beam width of linear arrays of n isotropic point source of equal amplitude and spacing. Broadside Array, Endfire Array. 8

UNIT.3 Wire antennas **09**

Infinitesimal Dipole, Half-Wavelength Dipole, Ground Effect, monopole antenna, folded dipole, Loop Antenna, Helical Antenna- Modes in Helical Antenna, Effect of No. of Turns (n), V Antenna, Yagi-Uda antennas 6

UNIT.4 Antennas for different Applications [

Introduction, E-Plane Sectoral Horn, H -Plane Sectoral Horn, Pyramidal Horn, Conical Horn, Corrugated Horn, Plane Reflector, Corner Reflector, Parabolic Reflector, Feed Mechanisms, Microstrip Antennas: Introduction, Rectangular Patch, Circular Patch, Feed Networks, Biconical Antennas- Directional, Disk cone and Bow Tie, Rumsey's Principle and Illinois Story, Log-periodic antennas, Composite Yagi Uda Corner Log Periodic Array. **7 10**

UNIT.5 Ground Wave Propagation:

Plane Earth Reflection, Space Wave and Surface Wave, Space Wave Propagation: Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth.. **6 06**

UNIT.6 Sky wave Propagation: **08**

Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics 7

Text Books **:**

1. John. D. Kraus, "Antennas & Wave Propagation", Fifth Edition, Tata McGraw Hill.
2. C. A .Balanis, "Antenna Theory Analysis and Design", John Wiley.

Refrence Books **:**

1. G. S. N. Raju, "Antennas and Wave Propagation", Pearson Education.
2. K. D. Prasad, "Antenna and Wave Propagation", Satya Prakashan.

Class & Semester	:	**T. Y. B. Tech (Electronics & Communication Technology) Part III, Semester VI**						
Course Title	:	**Antenna and Wave Propagation Laboratory**				*Course Code*:	:	EC 323L
Teaching Scheme (Hours)	:	**2 hours/weeks 13 × 2 = 26 hours**				*Total Credits*	:	**01**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	**:** **:**	**EPE** **EOE**	**50** **:**	*Duration of Exam (in case of External Evaluation)*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**April 2018**

Pre-requisites **:** Good knowledge of Engineering Mathematics, Fundamentals of Physics and Electromagnetics.

Type of Course **:** Practical

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Evaluate, Design

Course Assessment Methods:

Practical Journal Assessment, External Practical Examination

Practical List:

1. Study of antenna trainer kit.
2. Measurement of radiation pattern of Simple λ/2 Dipole Antenna.
3. Measurement of radiation pattern of folded Dipole Antenna.
4. Measurement of radiation pattern of 3 element Yagi-UDA antenna
5. Measurement of radiation pattern of 5 element Yagi-UDA antenna
6. Measurement of radiation pattern of 7 element Yagi-UDA antenna
7. Measurement of radiation pattern of Loop antenna
8. Measurement of radiation pattern of Log Periodic Antenna
9. Measurement of radiation pattern λ/2 Phase Array
10. Study of broadside and end fire array antennas

Note:

Any 8 experiments based on above syllabus but not limited to this list.

Class & Semester	:	**T.Y. B.Tech (Electronics & Communication Technology) Part III, Semester VI**				
Course Title	:	**VLSI Design**		*Course Code*:	:	EC 324
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 03 x 13 hrs=39** **Tutorial= 00 hour/week** **Practical= 02 hours/week**		*Total Credits*	:	**03+00 +01 =04**
Evaluation Scheme (Marks)	:	**CIE =50** **SEE =50**	**IPE=Nil** **IOE=Nil** **EPE= Nil** **EOE=50**	**Grand Total= 150**	*Duration of SEE* :	**3 hours**
Revision:	:	**Third**			*Month* :	**April 2018**

Pre-requisites **:** Basics of digital electronics, c and c++ programming languages

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

1. Continuous Internal Evaluation, Semester end examination.

Course Objectives:

1.Get knowledge of LSI, MSI, VLSI, ULSI
2.Understand CMOS IC manufacturing process
3.Understand structure of programmable logic devices
4.Learn Hardware Description Language

5.Understand construction and characteristics of MOS devices
6.Implement basic digital circuits using VHDL

Course Outcomes:

1. Describe the structure, working principle and characteristics of MOS devices.
2. Explain CMOS IC fabrication technology.
3. Experiment using VHDL language and explain features of HDL.
4. Develop VHDL code for different digital circuits.
5. Describe construction and features of programmable logic devices.
6. Propose testing strategies for testing digital circuits

Curriculum Content

	hours
UNIT.1 MOS Devices Introduction to MOS Technology, I – V Characteristics of NMOS and PMOS, Transfer Characteristics Of CMOS Inverter, Detailed analysis of CMOS inverter, Logic realization using nMOS and CMOS circuits, effect of parasitic elements.	7
UNIT.2 CMOS IC Fabrication and Layout Basic CMOS Technology: Self aligned CMOS process, N well, P well, Twin tub, Layout of CMOS Inverter, CMOS Layout and Design rules. Silicon on Insulator technology	7
UNIT.3 Introduction To VHDL Introduction to VHDL, Elements of VHDL, Modeling styles: Sequential, Behavioral, Structural and data flow modeling, sequential and concurrent statements**,** Design flow, Data types and data objects in VHDL, lexicals in VHDL, Operators, sequential statements, Comparison of various Hardware Description Languages. Test benches	7
UNIT.4 Design using VHDL Designing basic gates, combinational circuit, designing general purpose processor, datapath, ALU, encoder, decoder, comparator, adder, subtractor, multiplexer, de-multiplexer, tri-state drivers,PIPO	6
UNIT.5 Circuit Design Using CPLD & FPGA Introduction, study of architecture of CPLDs and FPGAs. Function block architecture, input/output Block and interconnect, switch matrix, FPGA fabric. Study of architecture of Xilinx 9500 series and Altera MAX 700 series CPLD . Study of architecture of Xilinx Spartan 4000 architecture.	6
UNIT.6 Design for Testability Fault model, need of design for testability, path sensitizing, random tests, BIST(built inself test), boundary scan test. Introduction to fault coverage, Testability, Design for testability concept, stuck at Fault Model, stuck Open and Stuck short faults, Boundary Scan check, JTAG technology, TAP controller and TAP controller state diagram, Scan path, Full and partial scan	6

Text Books **:**

1) N. Weste and K. Eshranghian, "Principles of CMOS VLSI Design", Addison Wesley.
2) Douglas Perry, "VHDL", Tata MC-Graw Hill
3) J Bhasker, "A VHDL Synthesis Primer", Addison Wesley
4) Angsuman Sarkar, Swapnadip De, Ckandan Kumar Sarkar, "VLSI Design and EDA tools", Scitech

5) Stephen Brown and Zvonko, " Vranesic,Fundamaentals of Digital Logic with VHDL design", Tata McGraw Hill

6) BushnellAgrawal , "Essentials of Electronic Testing for digital memory and mixed signal VLSI circuits", Kulwar Academic Publisher

7) Charles H. Roth, "Systems design using VHDL", PWS publishing company

Reference Books **:**

1) The Programmable Logic data Book. Xilinx data manual
2) John F. Wakerly, " Digital Design, Principles and Practices", Pentice Hall, Publication.
3) Amar Mukharjee, "Introduction to nMOS and cMOS VLSI systems design", Prentice Hall
4) Peter Ashenden, " The Designer's Guide to VHDL", Harcourt Asia PTE LTD
6) www.xilink.com
7) www.altera.com
8) www.actel.com

Class & Semester	:	**T.Y. B.Tech (Electronics & Communication Technology), Part III, Semester VI**							
Course Title	:	**VLSI Design Laboratory**						*Course Code*:	: **EC 324L**
Teaching Scheme (Hours)	:	**2 hr /week= 2 x13= 26 hours**						*Credits*	: **1**
Evaluation Scheme (Marks)	:	**IPE**	:	**Nil**	**EPE**	:	**Eil**	*Duration of Exam (in case of External Evaluation)*	: **03 hours**
		IOE	:	**Nil**	**EOE**	:	**50**		
Revision:	:	**Third**						*Month*	: **April 2018**

Pre-requisites **:** Basics of digital electronics, c and c++ programming languages

Type of Course **:** Practical

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Understand, Apply, Analyze, Evaluate, Create

Course Assessment Methods:

Practical Journal Assessment, External oral Examination

Course Objectives:

1. Get knowledge of LSI, MSI, VLSI, ULSI
2. CMOS IC manufacturing process
3. Understand structure of programmable logic devices
4. Get knowledge of Hardware Description Language
5. Understand construction and characteristics of MOS devices
6. Understand implementation of small circuits using HDL

Course Outcomes:

1. Describe the structure, working principle and characteristics of MOS devices.
2. Explain CMOS IC fabrication technology.
3. Experiment using VHDL language and explain features of HDL.
4. Develop VHDL code for different digital circuits.
5. Describe construction and features of programmable logic devices.
6. Propose testing strategies for testing digital circuits

Practical List **:**

Minimum eight experiments should be performed from following list based on syllabus.
Writing VHDL codes for implementing

1. Basic gates
2. Combinational circuits
3. Sequential circuits
4. Adders
5. Subtractors
6. Half adders
7. Full adders
8. Encoders
9. Decoders
10. Multiplexer
11. Demultiplexer
12. Tristate driver
13. Arithmetic Logic Units
14. Comparators
15. PIPO
16. SIPO

Experiments should include use of suitable ISE, CPLD, FPGA boards

Lab Manual **:**

- Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Reference **:**

Books

1. The Programmable Logic data Book. Xilinx data manual
2. John F. Wakerly, " Digital Design, Principles and Practices", Pentice Hall, Publication.
3. Amar Mukharjee, "Introduction to nMOS and cMOS VLSI systems design", Prentice Hall
4. Peter Ashenden, " The Designer's Guide to VHDL", Harcourt Asia PTE LTD
5. www.xilink.com
6. www.altera.com
7. www.actel.com

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology) Part III, Semester VI**						
Course Title	:	**Control Systems**				*Course Code*:	:	EC 325
Teaching Scheme (Hours)	:	**Lectures 4 hours/weeks= 4 x 13 weeks= 52 hours** **Tutorial= 01hour/week** **Practical= 00 hours/week**				*Total Credits*	:	**04+00 +01 =05**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE= Nil** **IOE=50** **EPE= Nil**	: : :	**Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**April 2018**

Pre-requisites **:** Engineering math II and III, Electric circuit analysis

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed	**:**	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, assignments

2. Semester End Examination.

Course Objectives:

1. To study mathematical modeling of physical system.

2. To study and analyse physical systems using various time and frequency domain methods.

3. To study stability of linear systems using different methods..

Course Outcomes:

1) Understand the basic principles, types of control systems and I/P –O/P relationship by using mathematical model and transfer function.
2) Analyze parameters of a feedback control system and its transient behavior.
3) Evaluate the stability of a system by using different stability criteria.
4) Plot the Root locus and Nyquist plot for a given control system for stability analysis.
5) Plot Bode plot for a given control system for stability analysis.
6) Understand and analyze performance of control system by using state space.

Curriculum Content

Hours

UNIT I. **12**

Modeling in the Frequency domain: Types of control system, Laplace transform review, Transfer function of electrical, mechanical, thermal, hydraulic system, Electrical circuits analogs, Block dia. Representation and reduction, types of feedback systems, signal flow graph , Mason's gain rule, SFG

UNIT II. Time Response **09**

Time domain Response of first and second order system, general second order system, response with additional pole and zeros, steady state error for unity feedback system, static error constants and systems type, steady state error specifications,

Concept of stability for linear systems, Absolute and relative stability, Routh stability criterion and its application in special cases.	
UNIT III. Modelling in Time domain state-space representation, Applying the state- space representation, converting the transfer function to state-space, converting from state -space to transfer function	**07**
UNIT IV. Root Locus Techniques Definition of root locus, Rules for plotting root loci, Root contour, stability analysis using root locus, effect of addition of pole and zero.	**08**
UNIT V. Frequency Domain Techniques Frequency domain specification, Correlation between time and Frequency domain specifications, Bode plot, Nyquist criterion, stability, gain margin, phase margin by Nyquist diagram and bode plot, Effect of gain variation and addition of poles and zeros on Bode plot .	**10**
UNIT VI. Feedback control systems Feedback control system characteristics, Objectives, Different types of controllers, P,I,D, PI, PD and PID Controllers, Effects of these controllers on system performance, Tuning of controllers.	**06**

Text Books **:**

1. "Control System Engineering", Norman S. Nise,John willey and Sons, 6th Edition, 2015.
2. "Control System Engineering",I.J. Nagrath and M. Gopal,New age International publication, 5th Edition, 2014.

Reference Books:

1. "Modern Control Engineering", Katsuhiko Ogata,Prentice Hall of India Pvt Ltd, 5th edition.
2. "Automatic Control System", Benjamin C. Kuo, Prentice Hall of India Pvt Ltd, Wiley publication, 9th edition
3."Control Systems-Principles and Design", M.Gopal, Tata McGraw-Hill Education Pvt. Ltd, 4th edition, 2014.

Class & Semester : **T. Y. B.Tech (Electronics & Communication Technology), Part III, Semester VI**

Course Title : **Control systems Tutorial** *Course Code*: : **EC 325T**

Teaching Scheme (Hours)	:	**1hr /week= 1 x13= 13 hours**						*Credits*	:	**1**
Evaluation Scheme (Marks)	:	**IPE**	:	**Nil**	**EPE**	:	**Nil**	*Duration of Exam (in case of External Evaluation)*	:	**-**
		IOE	:	**50**	**EOE**	:	**Nil**			
Revision:	:	**Third**						*Month*	:	**April 2018**

Pre-requisites **: Engineering math II and III, Electric circuit analysis**

Type of Course **:** Tutorial

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Understand, Apply, Analyze, Evaluate, Create

Course Assessment Methods:

Tutorial Assessment, Internal oral Examination

Course Objectives:

1. To study mathematical modeling of physical system.
2. To study and analyse physical systems using various time and frequency domain methods.
3. To study stability of linear systems using different methods..

Course Outcomes:

1) Understand the basic principles, types of control systems and I/P –O/P relationship by using mathematical model and transfer function.
2) Analyze parameters of a feedback control system and its transient behavior.
3) Evaluate the stability of a system by using different stability criteria.
4) Plot the Root locus and Nyquist plot for a given control system for stability analysis.
5) Plot Bode plot for a given control system for stability analysis.
6) Understand and analyze performance of control system by using state space.

Tutorial List **:**

Minimum eight Tutorials should be completed based on syllabus.

Reference Books **:**

1. “Modern Control Engineering”, Katsuhiko Ogata,Prentice Hall of India Pvt Ltd, 5th edition.

2. "Automatic Control System", Benjamin C. Kuo, Prentice Hall of India Pvt Ltd, Wiley publication, 9th edition

3."Control Systems-Principles and Design", M.Gopal, Tata McGraw-Hill Education Pvt. Ltd, 4th edition, 2014.

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology) Part III, Semester VI**				
Course Title	:	**Mini project and seminar Laboratory**		*Course Code*:	:	EC 326L
Teaching Scheme (Hours)	:	**Lectures hours/weeks = Nil Tutorial= 00 hour/week Practical= 02 hours/week**		*Total Credits*	:	**00+00 +01 =01**
Evaluation Scheme (Marks)	:	**CIE = Nil SEE =Nil**	**IPE=50 IOE=Nil EPE= Nil** : : :	**Grand Total= 50**	*Duration of SEE* :	**3 hours**
Revision:	:	**Third**			*Month* :	**April 2018**

Pre-requisites **:** Analog electronics, digital electronics, microcontroller programming, telecommunications

Type of Course **:** Practical

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate

Course Assessment Methods:

1. Internal practical examination. Performance of students will be supervised throughout semester in the practical slot of mini project. At the time of examination students have to deliver seminar and project demonstration in front of examiners.

Course Objectives:

14. Illustrate basic steps in electronic system design
15. Survey the problem and find technological solution.
16. Design small scale electronics systems to accomplish task.
17. Construct circuit models and simulate.

18. Work in team to complete the task.
19. Manage project in given time

Course Outcomes:

7. Illustrate fundamental stages in development of electronics engineering projects.
8. Apply engineering knowledge for providing technological solutions.
9. Simulate and design the circuits.
10. Work in team environment.
11. Write report and express technical details.
12. Manage the project within time constraints.

Curriculum Content **hours**

Group size and activities:

1) Mini project group size should not exceed **three** students per every group.
2) Project idea should be proposed and finalized in consultation with guide.
3) Proposed weekly plan of the project should be finalized with guide.
4) Project work should be carried out in following steps
   a) Selection of project & problem definition.
   b) Paper design (Circuit design and flow chart of software)
   c) Simulation if required.
   d) Hardware implementation
   e) Software implementation (if required)
   f) Testing and calibration
   g) Report writing
5) Compulsory submission of mini project report by each group is a must.
6) Projects of two or more groups should not be same.
7) Seminar must be delivered after completion of project by each group preferably by using power point presentation.
8) Mini-project report must be submitted before/at the time of viva-voce .

Project Contents:

1) It should consists of hardware part and software part is optional.
2) Design of PCB by using suitable CAD tool, simulation if necessary, component mounting, soldering, testing , result analysis should be done by group.
3) Design and development of cabinet should be done for the project.

Guidelines for mini-project selection

Parameter monitoring, parameter / system controlling applications, data acquisition systems, microcontroller based systems, digital design, communication projects, power supply and batteries

Text Books **:**

Articles from reputed journals, magazines, websites, real world problems, case studies

Reference Books **:**

Articles from reputed journals, magazines, websites, real world problems, case studies

Class & Semester	:	**T. Y. B.Tech (Electronics & Communication Technology), Part III, Semester VI**								
Course Title	:	**Introduction to Foreign Language**						*Course Code*:	:	**FL 321**
Teaching Scheme (Hours)	:	**2 hr /week= 2 x13= 26 hours**						*Credits*	:	**Nil**
Evaluation Scheme (Marks)	:	**Assignments** **Viva voce**	: :	**50** **25**	**Written Test** **Grand Total**	: :	**25** **100**	*Duration of Exam*	:	**Not Applicable**
Revision	:	**Third**						*Month*	:	**April 2018**

Pre-requisites	**:**	As it is the introduction to the language, it has no any pre-requisites
Type of Course	**:**	Audit Course at institute level
Course Domain	**:**	Linguistics
Skills Imbibed	**:**	Cognitive: Understand, Predicting Situation, Comprehend, Affective : Receive, Listen, Respond, Showing self-reliance, Organize Psychomotor: Imitation, adaptation, articulation, origination

Course Assessment Methods:

The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives:

1. To make the students able to communicate and translate in foreign languages for the *technical and scientific documentation,* beneficial to Defense and other Government sector services.
2. To make them globally competent in the era of industrial liberalization.
3. To complement their core studies in international business.
4. To make them confident while opting for better career prospects in Multinational Companies (MNCs) for technical and scientific translation/ interpretation tasks while working for joint ventures or collaborative partnership.

Course Outcomes:

1. The students will be able to acquire a good knowledge the basic grammar of foreign

language and learn Alphabet, Common Words and Phrases in foreign language.

2. The students will also be able to learn to read the simple texts in foreign language.
3. The students would be able to speak a little using the greetings, well wishes etc. in Foreign Language.
4. The students will learn to count numbers, answer to the questions like, what is your name, surname, tell age, and can initiate little communication in Foreign Language.
5. The students can also translate simple sentences in foreign language.

Curriculum Content	Hours
Unit I: General Information on Basic Grammar of the foreign language, Introduction to Alphabet.	**05**
Unit II: Gender of Noun, Number of Noun, Pronouns, Adjectives, Verbs and their usage in simple sentences, Numbers (up to 10), Simple Greetings in foreign language.	**05**
Unit III General Questions in foreign language, like What is your name/surname? Who/What is this? Etc.	**04**
Unit IV: Simple narration about self/family/friend/University in foreign language chosen for studies. Practicing the learnt topics in the class itself.	**05**
Unit V: Formation of simple sentences using Parts of Speech, Information on Cases, One or Two simple lessons from any book.	**05**
Unit VI: Basic information on Country & Culture of language under study.	**04**
Reference Books :	

1. V.N.Wagner and V. G. Ovsienko, Russian, People's Publishing House, New Delhi.
2. S. Khavronina and A. Shirochenskaya, Russian in Exercises.
3. Genki – Japan Times
4. Aural Comprehension in Japanese – Osamu & Nobuko Mizutani.
5. An Introduction to Modern Japanese - Osamu & Nobuko Mizutani.
6. Japanese for Today – Y. Yoshida.
7. Lagune 1(Full set), Published by Langers, (An imprint of Saraswati House Pvt.Ltd), New Delhi 1 10002 (India).