DEPARTMENT OF TECHNOLOGY

FINAL YEAR B.TECH

Scheme of Teaching and Examination

Semester – VII (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 411	Audio and Video Engineering	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 412	Industrial and Power Electronics	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC413	ARM & Embedded systems	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 414	Microwave Engineering	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC 415	Elective-I	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	---------
EC 416L	Major project (Phase-I) Laboratory	-	-	2	5	--------	-------	--------	IPE	50	20
EC 411L	Audio and Video Engineering Laboratory	-	-	2	1	--------	-------	--------	EPE	50	20
EC 412L	Industrial and Power Electronics Laboratory	-	-	2	1	--------	-------	--------	EPE	50	20
EC 413L	ARM & Embedded systems Laboratory	-	-	2	1	--------	-------	--------	EOE	50	20
EC 414L	Microwave Engineering Laboratory	-	-	2	1	--------	-------	--------	IPE	50	20
EC 417	Internship-II	-	--	-	1	--------	-------	--------	IOE	50	20
	Total	**15**	**00**	**10**	**25**	--------	**500**	--------	--------	**300**	--------

Audit Course III

HS 411	Professional Ethics	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: 25+02=27

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

FINAL YEAR B.TECH

Scheme of Teaching and Examination

Semester – VIII (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
EC421	Broadband Communication	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC422	Satellite and Radar Engineering	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC423	Optical Fiber Communication	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC424	Mobile Communication	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
EC425	Elective-II	3	-	-	3	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	---------
EC426	Major Project (Phase-II) Laboratory	-	-	2	5	--------	-------	--------	EPE	50	20
EC421L	Broadband Communication Tutorial	-	1	-	1	--------	-------	--------	IOE	50	20
EC422L	Satellite and Radar Engineering Laboratory	-	-	2	1	--------	-------	--------	EPE	50	20
EC423L	Optical Fiber Communication Laboratory	-	-	2	1	--------	-------	--------	IPE	50	20
EC424L	Mobile Communication Laboratory	-	-	2	1	-------	-------	--------	EOE	50	20
EC425 L	Elective –II Tutorial	-	1	-	1	-------	-------	-------	IOE	50	20
	Total	**15**	**02**	**08**	**25**	--------	**500**	--------	--------	**300**	--------

Audit Course IV

HS421	Introduction to Indian Constitution	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: 25+02=27

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 VI, during vacation period, students will undergo Internship II for minimum 4 weeks in a reputed industry from stand point 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 VII.

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

Equivalence of Final Year B.Tech (Electronics and Communication Technology) Semester VII and VIII

The above detailed syllabus is a revised version of the Final 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 2019. (Academic year 2019-20)

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

Final Year B.Tech Semester VII (Electronics and Communication Technology)

Sr.No	Final Year B.Tech (Electronics and Communication Technology) Semester VII Pre-revised syllabus	Final Year B.Tech(Electronics and Communication Technology) Semester VII Revised syllabus	Remark
1.	Audio and Video Engineering	Audio and Video Engineering	No Change
2.	Industrial and Power Electronics	Industrial and Power Electronics	No Change
3.	Microwave Engineering	Microwave Engineering	No Change
4.	Mobile and cellular communication	---	Course removed
5.	Elective-I (Real Time Operating Systems Removed)	Elective-I (Internet of Things added)	Few more electives added
6.	Major Project (phase-I)	Major Project (phase-I)	No Change
7.	Professional Ethics	Professional Ethics	No Change
8.	----	Internship-II	Newly added

Final Year B.Tech Semester VIII (Electronics and Communication Technology)

Sr. No	Final Year B. Tech (Electronics and Communication Technology) Semester VIII Pre-revised syllabus	Final Year B. Tech (Electronics and Communication Technology) Semester VIII Revised syllabus	Remark
1.	Broadband Communication	Broadband Communication	No Change
2.	Satellite Communication	------	Course removed
3.	Antennas and Radar Engineering	------	Course removed
4.	Elective-II	Elective-II	More elective courses added.
5.	Major Project (Phase-II)	Major Project (Phase-II)	No Change
6.	----	Optical Fiber Communication	Course removed from sem. 6 and added to sem. 8.

7.	----	Mobile Communication	New course added
8.	----	Satellite and Radar Communication	Course removed
9.	Constitution of India	Constitution of India	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.

LIST OF PROGRAM ELECTIVES

Sr. No.	**Program Elective-I**
1	Automotive Electronics
2	Speech and audio processing
3	Micro Electro Mechanical Systems
4	Wireless sensor networks
5	PLC and automation

Sr. No.	**Open Elective-I**
1	Mechatronics
2	Robotics
3	Internet of Things

Sr. No.	**Program Elective II**
1	Fuzzy logic and applications
2	High speed digital design
3	Digital Image Processing
4	Biomedical Instrumentation and Technology
5	RF circuit design
6	Software Defined Radio

Sr. No.	**Open Elective II**
1	Remote Sensing and GIS
2	Machine Learning

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 5th week on 1st & 2nd unit
- Internal Test-II, of 20 marks in 10th week on 3rd and 4th 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 3 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) =

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

2. Cumulative Grade Point Average (CGPA) =

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

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 > 8.25 and above
Ist Division : CGPA > 6.75 and < 8.25
IInd Division : CGPA > 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) =
(124)
---------- = 5.90
(21)

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
Σ (124 + 124)
---------- = 5.63
Σ (23 + 21)

Chart for marks range and its corresponding grade and grade points

Grade10	**Grade Points**	**Range**	**Description of Performance**
AA	10	91-100	Outstanding
AB	09	86-90	Excellent
BB	08	76-85	Very Good
BC	07	66-75	Good
CC	06	56-65	Fair
CD	05	46-55	Average
DD	04	40-45	Poor
FF	00	Below 40	Fail
XX	--	--	Detained
ABSENT	--	--	Absent
*, **, ***,...	--	--	Passed in 2^{nd}, 3^{rd}, 4^{th}… Attempt
PP	--	--	Passed (Audit Course)
NP	--	--	Not Passed (Audit Course)

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	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**				
Course Title	:	**Audio and Video Engineering**			*Course Code*:	: EC 411
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks = 3 x 12 weeks= 36 hours** **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= 50**	: : : **Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	: **December 2018**

Pre-requisites **:** Good knowledge of engineering Science and mathematics
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 introduce fundamentals of audio and video transmission and reception
2. To study different audio amplifiers and their operation
3. To study cable TV components.
4. To study cable TV systems .

Course Outcomes:

1. Comprehend the basic principles of electronics circuit design.
2. Analyze unregulated power supplies.
3. Analyze and design voltage regulator circuits.
4. Study the working principle and characteristics of electronics circuit.
5. Analyze and design voltage amplifiers, tuned amplifiers.
6. Design and experiment with basic electronic circuits.

Curriculum Content

Hours

UNIT I. Hi Fi Audio Amplifier **06**

Introduction to Amplifiers: Mono, Stereo, Public Address; Difference between stereo amplifier and Mono amplifier; Block diagram of Hi Fi amplifier and

explanation; Graphic equalizer concept, circuit diagram and operation. (5 Point Circuit diagram); Dolby NR recording system; Types of speaker woofer, Midrange and Tweeter; Cross over network circuit and its function.

UNIT II. CD Player **06**

CD – material used, size; Block diagram of CD player and explanation; Principle and working of detection used in CD player; Component used for CD mechanism (i) CD pick-up assembly, (ii) gear system, (iii) drive motors, (iv) CD lens; Function of controls; Parts, function of remote control (transmitter unit) and function of receiver used in CD player; Advantages of florescent display system used in CD player.

UNIT III. TV Fundamentals

Concept of Aspect ratio, image continuity, interlace scanning, scanning periods, horizontal and vertical, vertical resolution, horizontal resolution; Vestigial sideband transmission, bandwidth for Colour signal, picture tube, brightness, contrast, viewing distance luminance, hue, saturation, compatibility; Colour theory, primary colors and secondary colors, additive Colour mixing subtractive Colour mixing; Composite Video Signal, Pedestal height, Blanking pulse, Colour burst, Horizontal sync pulse details, Vertical sync pulse details, Equalizing pulses, CCIR B standards for Colour signal transmission and reception. **06**

UNIT IV. TV Transmitters and Receiver

Audio and Video signal transmission; Positive and Negative modulation; Merits and Demerits of Negative modulation; Introduction to television camera tube (a) Vidicon; (b) Plumbicon; (c) Solid State camera based on CCD; Color Picture tube (a) PIL, (b) Delta gun picture tube; Block diagram of monochrome TV transmitter; Block diagram of Colour TV transmitter; Block diagram of monochrome TV Receiver. **06**

UNIT V. Colour TV

Block Diagram and operation of color TV receiver (PAL D type); Explain –Yagi Uda Antenna; Explain block diagram of PAL-D decoder with circuit diagram of chroma signal amplifier, Burst pulse blanking, Colour killer control, Basic Circuit for Separation of U and V signals. AGC Amplifier. Colour signal matrixing, RGB drive amplifiers; EHT generation: circuit explanation for line output stage using transistor or IC in Colour TV; Comparisons between NTSC, PAL and SCAM Systems. **06**

UNIT VI. Cable Television **06**

Working principle and specification of following components : Dish antenna, LNBC, Multiplexer, Attenuators Connectors (two ways and three ways), Amplifier and cable; MATV, CATV and CCTV; Design concept for cable TV network; Block diagram of dB meter with working principle; Direct to Home System (DTH) Introduction and Block Diagram.

Text Books **:**

1. R.R. Gulati –‘ Mono Chrome and Colour Television’- New Age International
2. R.G. Gupta -‘ Television Engg. and Video System’- Tata McGraw Hill

Reference Books **:**

1. A.M. Dhake-‘ Television & Radio Engineering’ -Tata McGraw Hill.
2. R.G. Gupta-‘ Audio Video Systems’- Tata McGraw Hill.
3.R.R. Gulati-‘ Modern TV Pratice’- New Age International.
4. S. Sharma- ‘Basic Radio and Television ‘ -Tata McGraw Hill.
3. R.R. Gulati-‘ Modern TV Pratice’- New Age International.

6. Bernard Grob-‘ Basic Television and Video System’- Tata McGraw Hill.
7. Manohar Lotia-‘ Modern CD Player Servicing Manual’- BPB Publication.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VII**					
Course Title	:	**Industrial and Power Electronics**			*Course Code*:	:	**EC 412**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 12 weeks= 36 hours minimum**			*Total Credits*	:	**03**
Evaluation Scheme (Marks)	:	**CIE = (50) SEE = 50**	**IPE= NA IOE= NA EPE= 50**	: : :	**Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **Dec 2018**

Pre-requisites **:** Semiconductor theory, RLC 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, Assignments.
2. Semester End Examination.

Course Objectives:

1. To understand the Difference between power devices and low power devices.
2. To understand internal mechanism, limitations of the different power devices.
3. To analyze configurations of controlled rectifier circuit.
4. To understand chopper and inverter circuits.
5. To study different application of power electronics in industry.

Course Outcomes:

1. Explain structure and working of power devices.
2. Analyze triggering methods, Commutation methods and protection circuits used for SCR.
3. Calculate different parameters of controlled rectifier.
4. Calculate different parameters of chopper circuit.
5. Demonstrate use of power electronics devices.
6. Explain different inverters and industrial application of power devices.

CURRICULUM CONTENT **Hours**

UNIT I Power Devices & Driving Circuits **06**

Semiconductor Theory. Construction, working, V-I Characteristics, Driving Circuit of: Power Diode, Power BJT, Schokkttey Diode, Diac, Triac, GTO, MOSFET, IGBT.

UNIT-II Silicon Controlled Rectifier **07**

SCR, Construction, **V**-I Characteristics, gate triggering Characteristics, rating & specifications, SCR triggering methods- R, RC, UJT triggering (using pulse Transformer), PUT, SUS, SBS triggering methods. SCR Turn off method - Class A, Class B, Class C, Class D, Class E, & Class F, dv/dt & di/dt protection circuits.

UNIT III Single & Three Phase Controlled Converter **07**

1 Φ Half Wave Controlled Rectifier, 1 Φ Full Wave Controlled Rectifier, 3 Φ Controlled rectifier with and without freewheeling diode , 1 Φ semi converter, Full Converter & dual converter. (Derivations & Numericals expected).

UNIT-IV Inverters

Concept of inverter, types of inverters. Thyristorised inverters: series inverter, parallel inverter, IGBT based inverters: 1-phase half and full bridge inverter. 3-phase bridge inverter (120 and 180 mode of conduction) Voltage control of 1-phase and 3-phase inverter, harmonic reduction techniques. **06**

UNIT-V Choppers and Cycloconverters

Choppers: Step up and Step down chopper, classification and voltage control techniques of choppers. *Cycloconverters* : On off control, Phase control, step up and step down. **05**

UNIT-VI Industrial Electronics

High frequency heating: Induction Heating, *Di-electric heating* - Basic Principle, Applications. *Electric welding*: Introduction, Resistance welding, energy storage welding. *Ultrasonic wave generation*, AC voltage stabilizer, *UPS* - basic configuration and types. **05**

Text Books **:**

1. P.C. Sen, “Power Electronics”, 1st Edition, Tata McGraw Hill.
2. M.D. Singh, K.B. Khanchandani, “Power Electronics”, 2nd Edition, Tata- McGraw Hill

Reference Books **:**

1. Mohan, Undeland, Riobbins, “Power Electronics” 3rd Edition, Wiley.
2. Dubey, Doralda, Joshi,Sinha, “Thyristorised Power Controllers”, 1st Edition, New Age International Edition.
3. M.H. Rashid, “Power Electronics”, 3rd Edition, Pearson.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**			
Course Title	:	**ARM and Embedded systems**	*Course Code*:	:	EC 413
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 03**	*Total Credits*	:	**03+00 +01 =04**

		Tutorial= 00 hour/week **Practical= 02 hours/week**						
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE =50**	**IPE=Nil** **IOE=Nil** **EOE= 50**	: : :	**Grand Total= 150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**December 2018**

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

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. Study and understand the architecture of ARM7TDMI family.
2. Study assembly language instructions of ARM microcontroller.
3. Write programs for ARM microcontroller in assembly language and c language.
4. Understand the memory management techniques.
5. To be familiar with embedded systems.

Course Outcomes:

1. Discuss the architecture of ARM7TDMI microcontroller.
2. Explain the instruction set of ARM microcontroller
3. Write programs in assembly and C language for ARM microcontroller family.
4. Discuss the memory management scheme of ARM microcontroller.
5. Compare the features of 8 bit, 16 bit and 32 bit microcontrollers.
6. Illustrate the features and applications of embedded systems.

Curriculum Content

hours

UNIT-I INTRODUCTION TO ARM ARCHITECTURE **6**

ARM7TDMI architecture, registers, interrupts, exception process, status registers processor modes, memory, memory mapped I/O, endianness,

UNIT - II ARM INSTRUCTION SET **6**

ARM instruction set: Data processing instruction, Load, store, Branch, interrupt instruction, program status register instruction, loading constants, conditional execution.

UNIT - III THE THUMB INSTRUCTION SET **6**

Entering thumb state, Thumb instruction set: Thumb register usage, ARM Thumb Interworking,

branch instructions, Data processing, single register load-store, multiple register load-stores, stack instructions, software interrupt instruction.

UNIT - IV INTERRUPTS

Interrupts and exception handling schemes **4**

UNIT – V MEMORY MANAGEMENT UNIT

Memory architecture, Memory access sequence, translation process, access permissions, domains, Aborts **7**

UNIT-VI EMBEDDED SYSTEMS

Introduction, CISC and RISC architectures, features of 16/32 bit microcontrollers, device drivers, Interrupt servicing mechanisms, programming concepts in embedded c and c++, Prototype development phases, software design and implementation , Hardware software co design, Case study: Adaptive cruise control system in car. **7**

Text Books **:**

1. ARM architecture reference manual
2. Sloss, Symes, Wright, “ARM system developers guide” Morgan Kaufman, Elsevier, publication
3. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", TMH, 2003.
4. Wolf, Wayne, "Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.

Reference Books **:**

1. Vahid, Frank and Givargi, Tony, "Embedded System Design: A Unified Hardware/Software Introduction", John Wiley & Sons, New York, 2000.
2. Deshmukh, Ajay V., "Microcontroller Theory and Applications", Tata McGraw-Hill.
3. ARM7TDMI manual
4. Philips LPC 2148 manual

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**					
Course Title	:	**Microwave Engineering**			*Course Code*:	:	**ECT 414**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks= 3 x 12 weeks= 36 hours maximum** **Tutorial = Nil** **Practical = 02 hours/week**			*Total Credits*	:	**03+01 =04**
Evaluation Scheme (Marks)	:	**CIE =50** **SEE**	**IPE= 50** **IOE=Nil** **EPE= Nil**	: : :	**Grand Total=150**	*Duration of SEE*	: **3 hours**

		=50						
Revision:	:	**Third**				*Month*	:	**Dec 2018**

Pre-requisites **:** Engineering Physics, Engineering Mathematics, Electromagnetic Fields

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:

The course aims to:

1. Inculcate fundamentals of microwave engineering in students and to make their skills competent to communication industry.
2. Introduce the students to various microwave sources and components used in industry, space and various other domains.
3. Generate awareness in students about different types of Microwave Hazards.
4. Introduce manufacturing technique of HMIC & MMIC.

Course Outcomes:

1. Explain basic microwave system, its applications and hazards caused.
2. Analyze different modes of propagation in waveguides.
3. Design and select the appropriate waveguide components for various applications.
4. Illustrate generation and amplification of microwaves using microwave tubes and Semiconductor devices.
5. Differentiate between Hybrid and Monolithic Microwave Integrated Circuits.
6. Articulate process of measurement of microwaves characteristics.

Curriculum Content

Hours

Unit I: Introduction to microwaves **05**

Microwave bands, microwave characteristics, microwave system, traditional, industrial and biomedical applications, microwave hazards: HERP, HERO, HERF; Introduction to Co-axial line, strip lines, microstrip lines and co-planar wave-guides.

Unit II: Microwave Waveguides **06**

TE, TM and TEM modes in wave guides, power transmission in wave guide, power losses in wave guide, excitation modes in wave guide, Characteristics of standard wave guides, (with Numerical), microwave cavities.

Unit III: Wave guide components & Resonators **06**

Introduction of s-parameters, Hybrid junctions, Directional couplers, circulators, isolators, waveguide terminations, Attenuators, Phase-shifter, Transmission line resonators, Rectangular and circular cavity resonators.

Unit IV: Microwave Generation **06**

Microwave tubes :

Klystrons, Reflex klystrons, TWT, Backward wave oscillator, magnetron, Forward wave cross field Amplifiers;

Semiconductor Devices: Microwave tunnel diode, PIN diodes, Gunn effect, RWH Theory, Gunn diode, IMPATT diode.

Unit V: Hybrid and Monolithic MICs **06**

Hybrid MIC: Definition, characteristics, comparison with conventional circuits, Materials: substrate, conductor dielectric & resistive material; HMIC fabrication Process steps. Monolithic MIC: Definition, MMIC growth, thin film formation, wafer process steps. Fields of application and limitations.

Unit VI: Microwave measurements **07**

Smith chart, Transmission line measurement using smith chart (with numerical), Impedance matching techniques, Measurement of VSWR, Frequency, Wavelength, Power, Attenuation.

Text Books **:**

1. Microwave Devices and circuits - Samuel Liao PHI Publication
2. Microwave Engineering - David Pozar, John Wiley and Sons publication
3. Techniques of Microwave Measurement-Carol G. Montgomery

Reference Books **:**

1. Basic Microwave Techniques and laboratory manual- M.L. Sisodia, G. S. Raghuvans Wiley eastern Limited publication
2. Foundation for Microwave Engg. – R.E.Collin, Wiley Publications
3. Microwave engineering passive circuits - Peter A. Rizzi PHI Publication
4. Microstrip Circuit Analysis - David H. Schrader, Prentice Hall PTR, New Jersey 07458.
5. Microstrip lines and Slot lines- KC. Gupta, R. Gargand I.J. Bahl, Artech House.
6. MIIC Design: GaAs FETs and HEMTs- Peter Ladbrooke, Artech House.

Class & Semester	:	**Final. Y. B.Tech (Electronics & Communication Technology) Part IV, Semester VII**						
Course Title	:	**Automotive Electronics**				*Course Code*:	:	EC 415
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks = 3 x 12 weeks= 36 hours**				*Total Credits*	:	**03+00 +00 =03**
		Tutorial= 00 hour/week						
		Practical= 00 hours/week						
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE=Nil** **IOE=Nil** **EPE=**	: : :	**Grand Total=100**	*Duration of SEE*	:	**3 hours**

			Nil					
Revision:	:	**Third**				*Month*	:	**December 2018**

Pre-requisites **:** Knowledge of Instrumentation, Microcontrollers.

Type of Course **:** Theory

Course Domain **:** Elective

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

Course Assessment Methods:

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

Course Objectives: The objectives of the course are to make student aware of fundamentals of automotive electronics, empower them to design electronics devices and systems in automotive electronics and prepare them for real world applications.

Course Outcomes: *The student will be able to:*

1. Comprehend the roles and implementations of various systems used in automotive.
2. Understand the automotive sensory systems
3. Discuss the various actuators for automotive systems.
4. Understand need for protocol & intra processor communication protocol
5. Understand working various automotive protocols and compare them.
6. Compare Automotive Grade Microcontrollers

Curriculum Content

Hours

UNIT I. Automotive Systems Overview **06**

Automotive Vehicle Technology, Overview of Vehicle Categories, Various Vehicle Sub Systems like Chassis, Body, Driveline, Engine, Fuel, Emission, Brakes, Suspension, Doors, Safety & Security , Comfort & Multimedia, Communication & Lighting, Future Trends in Automotive Embedded Systems : Drive by Wire, Autopilot, Robotics.

UNIT II. Automotive Sensory System **05**

Concept to Market : Understanding Automotive Product Design Cycle, Building Blocks of Automotive Electronic Product -Automotive Sensors and Transducers: Types, Force, Humidity, Carbon Dioxide (CO2),Carbon Monoxide (CO),Oxygen (O2)Sensor, LAMBDA Sensor, Proximity Distance Sensors, Speed,Engine Knock Sensor, Flow Sensor, New developments in sensor technology

UNIT III. Automotive Actuators **05**

Introduction, Function & Operating principle, Construction & working of solenoid actuators, Relays, Motorized actuators, Thermal Actuators, Electro hydraulic & Electrochemical Valve actuators, Application & New Developments in the Actuators Technology

UNIT IV. Automotive Protocols I **06**

The need for Protocol , Intra processor Communication Protocols : UART, I2C & I2S, SPI , RS485 MODBUS & USB

UNIT V. Automotive Protocols II : **08**

LIN, CAN, Overview of - KWP2000 , J1850 & J1939 FlexRay.

UNIT VI. Automotive Grade Microcontrollers **06**

Overview of Automotive Grade Microcontrollers, Microcontrollers with Built in CAN Interface ATMega164P , AT32UC3C2512C , Safety Critical Microcontrollers like Hercules TMS470M ARM Cortex-M3 Series, Case study- cruise control of car, Artificial Intelligence and engine management.

Text Books **:**

1. Understanding Automotive Electronics by William B. Ribbens
2. Automobile Electrical and Electronic Systems by Tom Denton
3. Automobile Engineering Vol 1 &Vol 2 by Kripal Singh

Reference Books **:**

1.Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive
2. Automobile Mechanics by W.H. Crouse, Tata McGraw Hill

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VII**						
Course Title	:	**Speech and Audio Processing**				*Course Code*:	:	**EC 412**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 12 weeks= 36 hours minimum**				*Total Credits*	:	**03**
Evaluation Scheme (Marks)	:	**CIE = (50) SEE = 50**	**IPE= NA IOE= NA EPE= Nil**	: : :	**Grand Total=100**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**Dec 2018**

Pre-requisites **:** Signals and Systems.

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, Assignments.
2. Semester End Examination.

Course Objectives:

1. To study human auditory system.
2. To understand speech signal attributes.
3. To understand time domain processing techniques for speech signal.
4. To understand Frequency domain processing techniques for speech signal.
5. To study Speech signal coding techniques and challenges.

Course Outcomes:

1. Understand theory of speech signal and speech production.
2. Understand time domain speech processing.
3. Understand Frequency domain speech processing.
4. Explain LPC its challenges and solutions.
5. Understand human auditory system.
6. Explain audio signal coding techniques and standards.

Hours

CURRICULUM CONTENT

UNIT - I Digital models for the speech signal **06**

Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals.

UNIT - II Time domain models for speech processing **06**

Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Short time autocorrelation function, Pitch period estimation using autocorrelation function, Median smoothing.

UNIT - III Short time Fourier analysis

Linear Filtering interpretation, Filter bank summation method, Gamma tone filter, other considerations in filter bank design, speech spectrum analysis using FFT. **06**

UNIT - IV Linear predictive coding of speech

Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications. **06**

UNIT - V Audio Processing

Auditory perception and psychoacoustics - Masking, frequency and loudness perception, spatial perception, Digital Audio, Audio Coding - High quality, low-bit-rate audio coding standards, Multichannel audio - Stereo, Multichannel surround sound. **06**

Text Books **:**

1. Ben gold and N Morgan, “Speech and audio signal processing”, John Wiley and sons
2. L. R. Rabiner and R. W. Schafer**,** “Digital Processing of Speech Signals," Pearson Education (Asia) Pte. Ltd., 2004.

Reference Books **:**

1. D. O’Shaughnessy, “Speech Communications: Human and Machine,”Universities Press.
2. L. R. Rabiner and B. Juang,“Fundamentals of Speech Recognition,” Pearson Education (Asia) Pte. Ltd., 2004.
3. Z. Li and M.S. Drew**,** “Fundamentals of Multimedia,” Pearson Education (Asia)

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Micro Electro Mechanical Systems</td><td>Course Code:</td><td>:</td><td>EC 415</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Lectures 3 hours/weeks=3 x 12 weeks= 36 hours maximum</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">03</td></tr>
<tr><td colspan="3">Tutorial = Nil</td></tr>
<tr><td colspan="3">Practical = Nil</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE =50
SEE = 50</td><td>IPE= Nil
IOE=Nil
EPE= Nil</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>Dec 2018</td></tr>
</table>

Pre-requisites **:** Engineering Physics, ECAD-I

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:

The course aims to:

1. Introduce student to the fundamental of MEMS and develop basic understanding of fabrication techniques.

2 Develop basic understanding of packaging of MEMS structures and their integration with other electronic devices.

3. Enable student to apply basic design procedure & fabrication steps to model MEMS circuits for meeting the desired specifications.

Course Outcomes:

1. Explain fundamentals of MEMS technology and its applications.
2. Discuss material used for MEMS devices and fabrication processes.
3. Estimate performance parameters by mechanical modelling of MEMS device.
4. Illustrate types and models of MEMS switches.
5. Classify MEMS Transducers, Sensors and actuators.
6. Explain MEMS packaging.

Curriculum Content — Hours

Unit I: Introduction **06**

Introduction to MEMS technology, MEMS fabrication, Power Handling and Reliability of MEMS devices, MEMS applications

Unit II: MEMS materials **06**

Semiconductors and their processing, silicon micromachining techniques, Thermo responsive Materials, Piezoelectric Materials, Electrostrictive/Management Materials, Rheological Materials Ceramics, Polymers and their synthesis

Unit III: Modeling of MEMS **06**

Introduction, Mechanical Modeling of MEMS Devices, Spring Constant of Fixed – Fixed Beams, Spring Constant of Cantilever Beams, Forces on MEMS Beams

Unit IV: MEMS Switches **06**

Introduction to MEMS switches, Electrostatic Actuation, Capacitive shunt and series switches: Physical description, circuit model and electromagnetic modelling; Techniques of MEMS switch fabrication.

Unit V: Transducers, Sensors and Actuators **06**

Introduction, Principles of sensing and actuation, Microplates, Capacitive effects, Flow measurement using Integrated paddle-cantiliver structure, MEMS Gyroscopes. Chemical and Biological Transducers: basic concepts of cellular biology, chemical sensors, molecule-based biosensors, cell-based biosensors.

Unit VI: Integration and Packaging **06**

Role of MEMS packages, types of MEMS packages, module packaging, packaging materials and reliability issues.

Text Books **:**

1. MEMS: Theory Design and Technology - Rebeiz, G.M. John Wiley & Sons.
2. RF MEMS and their Applications- Varadan, V.K., Vinoy, K.J. and Jose, K.J., John Wiley & Sons.

Reference Books **:**

1. Physics of Semiconductor Devices-Sze, S.M, John Wiley & Sons. 1994
2 RF MEMS Circuit Design for Wireless Communications - De Los Santos, H.J, Artech House.
3. Micromechanics & MEMS - Trimmer, W., IEEE Press

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Wireless Sensor Network</td><td>Course Code:</td><td>:</td><td>EC 415</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Lectures
3 hours/weeks=3 x 12 weeks= 36 hours minimum</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">03+00+00 =03</td></tr>
<tr><td colspan="3">Tutorial= Nil</td></tr>
<tr><td colspan="3">Practical= Nil</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE = (20+20+10)
SEE = 50</td><td>IPE=Nil
IOE=Nil
EPE= Nil</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>December 2016</td></tr>
</table>

Pre-requisites **:** Instrumentation, computer network and data communication

Type of Course **:** Theory

Course Domain **:** Elective.

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Evaluate
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: The course is designed to fulfill the following objectives:
To provide exposure to students in gaining knowledge on concepts, design and applications of wireless sensor technology and supporting protocols.

Course Outcomes: Upon completion of the course student will be able to:
1. Describe & adequately use vocabulary, terminology and nomenclature of wireless sensor networks.
2. Understand main concepts of mobile ad hoc networks.
3. Compare routing protocols for sensor networks and main design issues.
4. Understand key MAC protocols for sensor networks and main design issues
5. Understand the concepts of underwater wireless sensor networks.
6. Understand wireless sensor network design principles.

Curriculum Content

Hours

Unit-1 Introduction to Wireless Sensor Networks **06**

Introduction to Sensor Networks Constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Introduction of Wireless Sensor Networks Coverage (Type, Coverage, Topology management), Wireless Sensor Networks Issues and challenges, Mobile Sensor Networks

Unit-2 Mobile Ad-hoc Networks **06**

Mobile Ad-Hoc Networking with a View of 4G Wireless: Imperatives and Challenges, Off-the-Shelf Enables of Ad Hoc Networks, IEEE 802.11 in Ad Hoc Networks: Protocols, Performance and Open Issues, Mobile Ad Hoc Networks Routing Technology for Dynamic, Wireless Networking, Routing Approaches in Mobile Ad Hoc Networks, Mobile Ad Hoc Network Security.

Unit-3 Wireless Sensor Networks- Routing Protocols **06**

Introduction, Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks Network Scale and Time-Varying Characteristics, Resource Constraints, Sensor Applications Data Models, Routing Strategies in Wireless Sensor Networks: WSN Routing Techniques, Flooding and Its Variants, Sensor Protocols for Information via Negotiation, Low-Energy Adaptive Clustering Hierarchy, Power-Efficient Gathering in Sensor Information Systems, Directed Diffusion, Geographical Routing.

Unit-4 Wireless Sensor Networks- MAC Protocols **06**

Wireless Transmission Technology and Systems: Radio Technology Primer, Available Wireless Technologies. Medium Access Control Protocols for Wireless Sensor Networks: Fundamentals of MAC Protocols, MAC Protocols for WSNs, MAC performance issues Sensor-MAC Case Study

Unit-5 Underwater Wireless Sensor Networks **06**

Introduction of underwater Wireless Sensor Networks (Need, Differences with terrestrial sensor networks), Potential application- Ocean environment monitoring, Ocean mapping, oil/mineral exploration , Disaster prevention, assisted navigation and tracking, Research challenges, Physical effects -properties of sea water , Physical properties, Network topology and localization, UWSN Deployment- Static and self-adjusted, UWSN Architecture- static, hybrid and mobile, Enegy issues, Localization, Mobility.

Unit-6 Wireless Sensor Networks- Design Principles

Design Principles, approach for Wireless Sensor Networks, IoT Gateway Concepts, Need of gateway, Wireless Sensor Networks sensor nodes Structure, Hardware design of sensor node, Application Protocols MQTT, REST/HTTP, CoAP. Wireless Sensor Networks Security- requirements, attack type, protocol **06**

Text Books **:**

1. Ad Hoc Wireless Networks: Architectures and Protocols by C. Siva Ram Murthy, B. S. Manoj Prentice Hall PTR, 2007.
2. Protocols & Architectures for Wireless Sensor Networks by Holger Karl , Andreas Willig Wiley.
   Guide to Wireless Sensor Networks by Sudip Misra, springer.

Reference Books **:**

1 Wireless Sensor Networks An Information Processing Approch by Feng Zhao, Leonidas J Guibas, Morgan Kaufmann Publishers.
2. AD HOC Wireless Network A Communication-Theoretic Perspective by Ozan K. Tonguz, Gianluigi Ferrari by Wiley Publications.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**					
Course Title	:	**PLC and Automation**			*Course Code*:	:	EC 415
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 03** **Tutorial= 00 hour/week** **Practical= 00 hours/week**			*Total Credits*	:	**03+00 +00 =03**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE =50**	**IPE=Nil** **IOE=Nil** **EOE= Nil**	: : :	**Grand Total= 100**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	:	**December 2018**

Pre-requisites **:** Analog electronics, Digital electronics, microcontrollers, measurement and instrumentation

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, Internal Oral evaluation.

Course Objectives:

1. Understand the evolution and need of automation
2. Study the PLC and their types
3. Study the programming concept in PLC
4. Understand the need of PLC in automation
5. Study the commissioning and maintenance of PLCs
6. Study the SCADA

Course Outcomes:

1. Explain the need of automation for industry and society
2. Describe the PLC types and architecture
3. Write program for PLC to control the application
4. Explain the role of PLC in manufacturing automation.
5. Explain the role of PLC in process automation.
6. Discuss the installation and commissioning issues in PLCs

Curriculum Content

hours

Unit 1-Introduction to Automation 7

Introduction to Automation, Evolution of Industrial Automation. Controllers, Role of PLC in automation, PLC Types, PLC programming, Standard Hierarchical Automation Systems Levels, Functional Levels & Database Organization. Automation in manufacturing and process control. Automation options with merits and demerits – PC, DCS, PLC, Fieldbus & hybrid architectures-selection criteria and comparative study.

Unit 2-Fundamentals of PLC 8

Families, Processors, operation, Programming tools, memory structure, access & programming modes. PLC Hardware- Physical components, racks, slot, Power, CPU, Discrete & Analog Input/Output modules, RTUs & HMI panels Programming- Numbering systems, Ladder Logic Symbols, Instructions, Program Logic Development, testing & debugging.

Unit 3- PLC programming 5

Programming Language Standards IEC 61131-3: IL, ST, SFC, FBD, L L Programming, Multi Rung Ladders, Sequence, Logic, transfer of control timers & counters. Process Interfacing elements-analog sensors, digital sensors, actuators , Linear & Rotary Encoders.

Unit 4- PLC in manufacturing and process automation 8

Logic Development steps for programming, Fail safe Programming, Emergency shutdown, Safety Interlocks **Case Studies-** AC/ DC Motor Controls, Variable speed AC motor drives, conveyer belt, robots, CNCs, Computer integrated manufacturing. Control strategies in process automation-Auto/Manual control, Open loop, closed loop, on-off. **Case Studies-** Temperature control system, Level control system, Pressure & flow control, Continuous & Batch processing.

Unit 5-Commissioning & Maintenance 8

Project Planning, installation and verification, Project & Program Documentation. PLC Fault Handling & Diagnosis, Redundant configurations, networking.

Unit 6-SCADA 3

Plant monitoring & control based on SCADA. Functions of SCADA, PLC/SCADA Communication, Graphics & HMI, animation, database configuration, Real-Time & historical trends, wireless controls.

Text Books **:**

1. Programmable Logic Controllers, John & Fredric Hackworth, Pearson
2. Programmable Logic Controllers, Webb & Reis, PHI
3. Distributed computer control for Industrial Automation, Popovic & Bhatkar
4. Introduction to Programmable Logic Controllers, Gary Dunning, Thomson
5. SCADA : Supervisory Control And Data Acquisition By : Stuart Boyer ISA

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**			
Course Title	:	**Mechatronics**	*Course Code*:	:	EC 415
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 03**	*Total Credits*	:	**03+00 +00 =03**

Evaluation Scheme (Marks)	:	**CIE = 50 SEE =50**	**IPE=Nil IOE=Nil EOE= Nil**	: : :	**Grand Total= 100**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**December 2018**

Pre-requisites **:** Analog electronics, Digital electronics, microcontrollers,

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, Internal Oral evaluation.

Course Objectives

1. To provide multidisciplinary knowledge
2. Understand role of electrical and electronics control in mechanical engineering
3. Familiarity with mechanical components.
4. Awareness about MEMs and control systems
5. Familiarity with data acquisition in mechatronics
6. Study physical system modeling

Course Outcomes

1. Explain different mechatronic systems
2. Describe the controlling mechanism behind mechatronic systems.
3. Discuss optimization of mechatronics systems.
4. Understand role of software in mechatronic systems
5. Model the system
6. Apply knowledge of electronics engineering and mathematics.

Curriculum Content

hours

Unit I. Introduction to Mechatronics 4

Basic definitions, Key Elements, Mechatronics Design Approach, Functions of Mechatronics system, Ways of Integration, Concurrent design procedure, System interfacing and control systems, microprocessors based controllers, microelectronics, PLCs, microsensors, microactuators, 8

Unit II . Mechanical components and systems 8

Bearings and Bushings, Belts and Pulleys, Brakes and clutches, Chains and Sprockets, Couplings and joints, gears, Pulleys and Belts, Solenoids, springs, Switches.

8

Unit III. Physical system modeling

Electromechanical system modeling, fundamental laws of mechanics, structures in mechatronics systems, transducers, mass-spring-damper mathematical damper, fluid power systems. Force current analogy 8

Unit IV. Sensors and actuators

Sensors, classification, operational principles, signal conditioning, actuators, their types and working principles, important characteristics of sensors and actuators, encoders, light detection, 8

Unit V. Systems and Control

Role of controls in Mechatronics, Key elements of controlled Mechatronics system, Integrated Modeling, design and control implementation, Case study: Design of a mobile Robot, Modern examples of Mechatronics systems in action, Special Requirements of Mechatronics that Differentiate from Classic Systems and Control Design, State space analysis controller examples, real time control, data communications and transmissions, communication protocols

Unit VI. Software and Data Acquisition

Data logging functional requirement: Acquisition, Sensors, Signal Connectivity, Signal Conditioning, Conversion, Online Analysis, Logging and Storage, Offline Analysis, Display, Report Generation, Data Sharing and Publishing; Data-Logging Systems Different applications of Mechatronics as Case study

***Text Books* :**

1. R.H.Bishop, "The mechatronics handbook, CRC press
2. D.G.Alciatore, M.B.Histand, „Mechatronics" _2nd edition, TMH
3. Jurgen Gausemeier, Sascha Kahl, „Architecture and Design of self –optimization Mechatronics System" InTech publication

***Reference Books* :**

1. Mohamed Gad-el-Hak, "The MEMS Handbook, Second Edition" - 3 Volume Set _CRC Press.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**					
Course Title	:	**Robotics**				*Course Code*:	: **EC 415**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 12 weeks= 36 hours maximum** **Tutorial = Nil** **Practical = Nil**				*Total Credits*	: **03**
Evaluation Scheme (Marks)	:	**CIE =50** **SEE = 50**	**IPE= Nil** **IOE=Nil** **EPE= Nil**	: : :	**Grand Total=100**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **Dec 2018**

Pre-requisites **:** Engineering Mathematics

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:

The course aims to:

1. Introduce student to the fundamental of robotics and its applications.

2 Develop basic understanding of robot operation and implementation of sense and control in robot.

3. Enable student to apply basic design mechanism & kinematics equations to model robot for performing tasks.

Course Outcomes:

1. Classify robots and explain applications of robotics.
2. Illustrate fundamental mechanism of robots.
3. Formulate position and motion of robot using kinematic equations.
4. Select drive and control to be used for robot.
5. Classify sensors and design robot end effectors for specific application.

Curriculum Content

Hours

Unit I: Introduction **05**

History of Robotics, Classification of Robots, Laws of Robotics, Robot Components, Advantages and Disadvantages of Robots, Applications of Robotics, Social and labor issues.

Unit II: Mechanism of Robot **06**

Robot Degrees of Freedom, Robot Joints, Robot Coordinates, Robot Reference Frames, Robot Workspace, Robot Characteristics, Programming Modes, Robot Mechanism

Unit III: Kinematics of Robot **06**

Matrix Representation: point, vector, frame, rigid body; Homogeneous Transformation Matrices, Representation of Transformations : pure translation, pure rotation and combined transformation; Transformations Relative to the Rotating Frame (with Numerical); Inverse of Transformation Matrices, Forward and Inverse Kinematics of Robots, Forward and Inverse Kinematic Equations: Position, orientation.

Unit IV: Drives and Control system **07**

Hydraulics systems, Pneumatic drive, Electric drives: DC motor, Stepper motor, Servo motors; Gear Power transmission systems: Rotary to linear motion conversion Types of gears, Gear drive, Belt drives; Types of Controller, characteristics of control system.

Unit V: End Effectors **06**

Types of end effectors, Types of Gripper mechanisms: Mechanical grippers, Grippers force analysis, Vacuum cups, Magnetic Grippers, Adhesive Grippers; Tools as end effector, Robot end effector interface, considerations in gripper selection and design

Unit VI: Sensors and machine vision **06**

Position sensors, Velocity sensors, Accelerometers, Proximity sensors, Force and Pressure Sensors, Range Finders, Remote Center Compliance (RCC) Device; Machine vision system.

Text Books **:**

1. Introduction to robotics analysis, control and applications Saeed B. Niku: willey publication
2. Industrial Robotics: Technology, programming and applications. Mikell P. Groover, TMH

Reference Books **:**

1. Yoremkoren,Robotics for Engineers,McGraw- Hill,USA,1987
2. Robotic Engineering: An integrated approach Richard D. kalfter, PHI

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**						
Course Title	:	**Internet of Things**				*Course Code*:	:	EC 415
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 03**				*Total Credits*	:	**03+00 +00 =03**
Evaluation Scheme (Marks)	:	**CIE = 50 SEE =50**	**IPE=Nil IOE=Nil EOE= Nil**	: : :	**Grand Total= 100**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**December 2018**

Pre-requisites **:** Analog electronics, Digital electronics, microcontrollers, computer networking, wireless communication

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, Internal Oral evaluation.

Course Objectives:

1. Study of wireless protocols used for internetworking
2. Study of different topologies
3. Study of RFID Technology
4. Understanding power line communication
5. Study of protocols for networking
6. Study of protocols for utility metering

Course Outcomes:

1. Explain the Internet of Things and the entities involved therein.
2. Explain the wireless protocols involved in IoT
3. Illustrate the working principle of RFID technology
4. Describe the issues in power line communication
5. Explain the protocols involved in networking and automation
6. Explain the M2M protocols involved in utility metering

Curriculum Content

hours

Unit 1- Introduction to IoT 4

Introduction, history, objects in IoT, identifiers, identification technology, sensing and actuating technology, connection and network of objects,

Unit 2- IEEE 802.15.4 7

IEEE 802 family protocols, physical layer, Media access control layer, Use of 802.15.4 protocol, IEEE 802.15.4e, IEEE 802.15.4g, challenges and requirements in WSN, issues in nodes and communications

Unit 3- RFID technology and issues 7

Introduction, RFID principle, RFID system components, concepts and terminology-RF identification, transponder classes, standards, system architecture. RFID applications and research issues.

Unit 4- Power line communication 7

Introduction, existing PLC technologies, types of technologies, security, performance issues, standards and normalization, architecture for home network application, role of PLC in IoT, ideal PLC system for M2M and its issues.

Unit 5- M2M protocols for networking and automation 7

Introduction to BACnet protocol, LonWorks platform, Modbus, KNA, ZigBee, Z-wave protocols

Unit 6- M2M protols for utility metering 7

Introduction to M-bus, wireless M-bis, ANSI C 12 suite, DLMS/COSEM

Text Books **:**

4. Oliver Hersent, David Boswarthick, Omar Elloumi, " The internet of Things- Key applications and protocols" Wiley
5. Adrian McEwen, Hakim Cassimally, " Designing the Internet of Things" Wiley

Reference Books **:**

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology), Part IV, Semester VII**									
Course Title	:	**Major project- Phase I Laboratory**						*Course Code*:	:	**EC 416L**	
Teaching Scheme (Hours)	:	**2 hr /week= 2 x12= 24 hours**						*Credits*	:	**5**	
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**50** **Nil**	**EPE** **EOE**	: :	**Nil** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**02 hours**	
Revision:	:	**Third**						*Month*	:	**December 2018**	

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

Type of Course **:** Practical

Course Domain **:** Core

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

Course Assessment Methods:

Weekly supervision, External Practical Examination

Course Objectives:

1. Understand basic stages in electronic system design
2. Surveying the problem and finding technological solution.
3. Designing electronics systems.
4. Learning and using circuit simulation and development tools
5. Working in team to accomplish task
6. Project management and life-long learning

Course Outcomes:

1. Identify social, environmental, market needs and solutions.
2. Explain design and development stages in electronics engineering projects.
3. Apply engineering knowledge for solving real world problems.
4. Manage project and finance.
5. Provide technological solutions on recent problems and lifelong learning.
6. Work in team, follow ethical practices, and prepare documentation and presentation.

Curriculum Content

The project work is to be carried out in two semesters of final year B. Tech. (E & CT), semester VII & VIII. Each major project group will consists of maximum 3 students.

In semester – VII, group will select a project with the approval of the guide and submit the synopsis of project in the month of August. The group is expected to complete detailed system design, layout etc. and at least 50% project work should be completed in semester – VII, as a part of term work. In addition all students of project group will deliver the seminar on the

proposed project only. Team of faculty members and guide will assess the term work.

If a group of student select a project under sponsored category from industry, it is essential that they should take prior written permission & approval at the beginning of semester-VII from Head of Institution through Head of Department & Concerned Guide.

Practical List **:**

Major project sanctioned by guide

Lab Manual **:**

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

Reference **:**

Books

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

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology), Part IV, Semester VII**								
Course Title	:	**Audio and Video Engineering Laboratory**						*Course Code*:	:	**EC 411L**
Teaching Scheme (Hours)	:	**2 hr /week= 2 x12= 24 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*	:	**December 2018**

Pre-requisites **:** Good knowledge of engineering Science and mathematics

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 based on following TV Sections)

1. Study of circuit diagram of color TV receiver
2. CCVS for different test patterns

3. RF tuner
4. Video IF & detector
5. Video Amplifier
6. Sync separators (V & H)
7. Sound IF
8. Horizontal section
9. Vertical section
10. Trouble shooting of color TV
11. DTH

Lab Manual **:**

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

Reference Books **:**

1. Manohar Lotia-' Modern CD Player Servicing Manual'- BPB Publication.
2. Manohar Lotia-' MonochromeTV Servicing Manual'- BPB Publication.
3. Manohar Lotia-' Modern Colour TV Servicing Manual'- BPB Publication.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VII**					
Course Title	:	**Industrial and Power Electronics Laboratory**				*Course Code*:	: **EC 412L**
Teaching Scheme (Hours)	:	**Theory= NA** **Tutorial= NA** **Practical= 02 hour/week**				*Total Credits*	: **01**
Evaluation Scheme (Marks)	:	**CIE = Nil** **SEE = Nil**	**IPE= NA** **IOE= NA** **EPE= 50**	: : :	**Grand Total=50**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **December 2018**

Pre-requisites **:** Handling lab Equipments.

Type of Course **:** Laboratory

Course Domain **:** Core

Skills Imbibed **:** Affective : Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

External practical Examination.

Course Objectives:

1. To understand the Difference between power devices and low power devices.
2. To understand internal mechanism, limitations of the different power devices.
3. To analyze configurations of controlled rectifier circuit.
4. To understand chopper and inverter circuits.
5. To study different application of power electronics in industry.

Course Outcomes:

1. Explain structure and working of power devices.
2. Analyze triggering methods, Commutation methods and protection circuits used for SCR.
3. Calculate different parameters of controlled rectifier.
4. Calculate different parameters of chopper circuit.
5. Demonstrate use of power electronics devices.
6. Explain different inverters and industrial application of power devices.

Tutorials:

LIST OF EXPERIMENTS :

1. VI Characteristics of SCR.
2. Single phase Half wave controlled rectifier.
3. Single phase full wave controlled rectifier.
4. Single phase Bridge Full controlled rectifier.
5. SCR Triggering Circuits.
6. SCR Commutation Circuits.
7. 3 Phase controlled rectifier.
8. Cyclo-converter circuit
9. AC voltage regulator.
10. SCR step down chopper.
11. SCR step up chopper
12. Series inverter
13. Parallel Inverter
14. Bridge Inverter

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

Text Books **:** P.C. Sen, “Power Electronics”, 1st Edition, Tata McGraw Hill

Reference Books **:** M.H. Rashid, “Power Electronics”, 3rd Edition, Pearson

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**									
Course Title	:	**ARM and Embedded systems Laboratory**						*Course Code*:	:	**EC 413L**	
Teaching Scheme (Hours)	:	**2 hr /week= 2 x12= 24 hours**						*Credits*	:	**01**	
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **Nil**	**EPE** **EOE**	: :	**Nil** **50**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**	
Revision:	:	**Third**						*Month*	:	**December 2018**	

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

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 ARM7TDMI family.
2. Study assembly language instructions of ARM microcontroller.
3. Write programs for ARM microcontroller in assembly language and c language.
4. Understand the memory management techniques.
5. To be familiar with embedded systems.

Course Outcomes:

1. Discuss the architecture of ARM7TDMI microcontroller.
2. Explain the instruction set of ARM microcontroller
3. Write programs in assembly and C language for ARM microcontroller family.
4. Discuss the memory management scheme of ARM microcontroller.
5. Compare the features of 8 bit, 16 bit and 32 bit microcontrollers.
6. Illustrate the features and applications of embedded systems.

Practical List **:**

Minimum eight experiments should be performed from following list based on syllabus.

1) Blinking LEDs interfaced with ARM microcontroller.
2) Switch interfacing and programming
3) Relay interfacing and programming
4) Seven segment interfacing and programming
5) DC motor clockwise and anticlockwise programming
6) ADC/DAC interfacing and programming

7) LCD interfacing and programming
8) Buzzer interfacing and programming
9) Stepper motor interfacing and programming
10) RTOS programming
11) ARM based simulation
12) Use and handling Integrated Development Environments for ARM controller

Lab Manual **:**

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

Reference **:**

Books

1. Vahid, Frank and Givargi, Tony, "Embedded System Design: A Unified Hardware/Software Introduction", John Wiley & Sons, New York, 2000.
2. Deshmukh, Ajay V., "Microcontroller Theory and Applications", Tata McGraw-Hill.
3. ARM7TDMI manual
4. Philips LPC 2148 manual

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**								
Course Title	:	**Microwave Engineering Laboratory**						*Course Code*:	:	**EC 414L**
Teaching Scheme (Hours)	:	**2 hr /week= 2 x12= 24 hours**						*Credits*	:	**1**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**50** **Nil**	**EPE** **EOE**	: :	**Nil** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**-**
Revision:	:	**Third**						*Month*	:	**Dec 2018**

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

Course Assessment Methods:

Practical Journal Assessment, Internal Practical Examination

Practical List **:** Minimum 8 experiments should be carried out by from following list :

1. Study of Microwave Test Bench.
2. Study of Characteristics of reflex klystron.
3. Measurement of V-I Characteristics of Gunn Oscillator.
3. Measurement of Unknown frequency by Wavemeter.
4. Measurement of Unknown attenuation.
5. Study of characteristics of circulator.
6. Study of characteristics of variable attenuator.
7. Study of characteristics of E-Plane Tee and H-Plane Tee.
8. Study of characteristics of Magic Tee.
9. Study of characteristics of directional coupler.
10. Measurement of wavelength by slotted line method.
11. Study of smith chart for measurement of transmission line characteristics.
12. Study of impedance matching techniques.

Lab Manual **:**

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

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Internship-II</td><td>Course Code:</td><td>:</td><td>EC 417</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Lectures hours/weeks = Nil</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">00+00+01 =01</td></tr>
<tr><td colspan="3">Tutorial= 00 hour/week</td></tr>
<tr><td colspan="3">4 week industrial training</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE= Nil
SEE =Nil</td><td>IPE=Nil
IOE=50
EPE= Nil</td><td>:
:
:</td><td>Grand Total= 50</td><td>Duration of SEE</td><td>:</td><td>Nil</td></tr>
<tr><td>Revision:</td><td>:</td><td colspan="3">NIL</td><td>Month</td><td>:</td><td>December 2017</td></tr>
</table>

Pre-requisites **:** After completion of sixth 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 sixth 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 player 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	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VII**				
Course Title	:	**Professional Ethics**		*Course Code*:	:	HS 421
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 02** **Tutorial= 00 hour/week**		*Total Credits*	:	**Nil**
Evaluation Scheme (Marks)	:	**CIE = Nil** **SEE =Nil**	**IPE=Nil** **IOE=Nil** **EPE= Nil** : : : Course auditor will conduct written exam of 50 marks and will give grade	*Duration of SEE*	:	**Nil**
Revision:	:	**Third**		*Month*	:	**December 2017**

Pre-requisites **:** -------

Type of Course **:** Theory

Course Domain **:** Audit course

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze.

Course Assessment Methods:

Course auditor will conduct theory examination of 50 marks at the end of the semester. After assessment grade will be given to the students.

Course Objectives:

Course is designed to understand ethical practices need to follow in the corporate life. Also responsibility towards society and people.

Course Outcomes:

1. Understand ethical theories
2. Apply rational Thinking in professional practices
3. Practice ethical code in life.
4. Adopt moral values in profession
5. Handle dilemma in profession
6. Understand engineers responsibility towards welfare of society

Curriculum Content

1. HUMAN VALUES 04

Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character .

2. ENGINEERING ETHICS 05

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment –

3. ENGINEERING AS SOCIAL EXPERIMENTATION 05

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

4. SAFETY, RESPONSIBILITIES AND RIGHTS 05

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

5. GLOBAL ISSUES 05

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership.

Text Books **:**

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

Practical List ***:***

NIL

Reference Books **:**

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.

Lab manual

NIL

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**				
Course Title	:	**Broadband Communication**		*Course Code*:	:	**ECT 421**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3x 12 weeks= 36 hours minimum** **Practical= 02 hours/week**		*Total Credits*	:	**03 +00+ 01 = 04**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE=Nil** **IOE=50** **EOE= Nil**	: : :	**Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**December 2018**

Pre-requisites **:** In order to complete the course studies successfully Basic knowledge of 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 Optical communication.
2. To acquire the basic knowledge of optical Fiber Communication System.

Course Outcomes:

1. Discuss different switching networks and evolution of switching techniques.
2. Illustrate ISDN architecture, transmission structure and its interworking.
3. Explain ISDN physical, data link and network layer and its services.
4. Differentiate between broadband and narrowband ISDN with its protocol interface model.
5. Explain ATM architecture, virtual connections and switching types.
6. Describe frame relay architecture and congestion control mechanism.

Curriculum Content **Hours**

UNIT I: Fundamentals of communications Network

Switching network, circuit switching, routing In circuit switching network, control signals in circuit switching, packet switching, comparison between packet and circuit switching, other switching techniques, X.25 **4**

UNIT II: ISDN Architecture and Interface **5**

Integrated digital networks, concept of ISDN, transmission structure, User-Network interface, protocol architecture, addressing, Interworking, ISDN standards.

UNIT III: ISDN protocol and Service **7**

ISDN physical layer: user network interface, U interface; ISDN Data link layer: LAPD, terminal adaption, data link layer; ISDN Network layer: basic call control, supplementary control; ISDN service: bearer services, tele-services, basic and supplementary service

UNIT IV: Broadband ISDN: architecture and control **4**

Architecture, B-ISDN, standards, services, requirements, protocol interface model, physical layer, SONET

UNIT V: Asynchronous Transfer Mode **8**

Asynchronous transfer mode, transmission of ATM cell, ATM adaption layer, ATM traffic attributes and congestion control, flow control, error detection and control.

UNIT VI: Frame relay protocol and services **8**

Frame mode protocol architecture, call control, LAPF, congestion in frame relay, congestion control, traffic rate management, explicit congestion avoidance, implicit congestion control.

Text Books **:**

1. . William Stallings,"ISDN and Broadband ISDN with Frame Relay and ATM, 4th edition.

Reference Books **:**

1. Balaji Kumar," Broadcast Communications", McGraw Hill Publication.
2. W. Stallings, "ISDN-An Introduction", McGraw Hill Publishing company.
3. M. Schwartz, " Telecommunication Network "Addison Wesley publication.
4. M. Schwartz," Computer Communication network – Design & Analysis" Prentice Hall India Publication.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VIII**			
Course Title	:	**Satellite and Radar Engineering**	*Course Code*:	:	**EC 422**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 12 weeks= 36 hours maximum**	*Total Credits*	:	**03+01 = 04**
		Tutorial = Nil			
		Practical = 02 hours/week			

Evaluation Scheme (Marks)	:	**CIE =50 SEE = 50**	**IPE= 50 IOE=Nil EPE= Nil**	: : :	**Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**Dec 2018**

Pre-requisites **:** Engineering Physics, Engineering Mathematics, Electromagnetic Fields

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:

The course aims to:

1. Introduce student to the fundamental concepts of satellite communication, satellite subsystems and their operation.
2. Enable the student to locate satellite and determine antenna angles for establishment of link.
3. Enable student to analyze, design satellite link and evaluate performance of satellite link.
4. Aware students about different satellite application in communication, navigation, and defense domains.

Course Outcomes:

1. Explain basic satellite system with its subsystems.
2. Define orbital parameters and determine antenna look angles, range for GEO.
3. Classify types of losses and formulate power link budget for satellite.
4. Illustrate applications of satellite communication such as DBS, VSAT and GPS.
5. Determine range, power and other performance parameters required for radar.
6. Differentiate between different types of radars with their application.

Curriculum Content

Hours

Unit I: Introduction to Satellite Systems **06**

Introduction, Frequency Allocations, Satellite services, , Satellite Subsystem : Attitude and control system(AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystem, Satellite antennas, Equipment reliability and space qualification.

Unit II: Orbital Mechanics and Geostationary Satellite **06**

Introduction, Kepler's Laws, Orbital Elements, Orbit Perturbations, Inclined Orbits, Local Mean Solar Time and Sun-Synchronous Orbits, Antenna Look Angles determinations, Limits of Visibility, Earth Eclipse of Satellite, Sun Transit Outage, Polar Orbiting Satellites.

Unit III: Satellite Link Design **06**

Introduction, , Atmospheric Losses, Ionospheric Effects, Rain Attenuation, transmission losses, link power budget equation, system Noise, carrier to noise ratio for uplink and downlink, combined uplink and downlink carrier to noise ratio, inter modulation noise.

Unit IV: Satellite communication applications **06**

Introduction to DBS system: Orbital Spacing, Power Rating and Number of Transponders, Frequencies and Polarization, Transponder Capacity; Home DBS system : Bit Rates for Digital Television, MPEG Compression Standards, Home Receiver Outdoor Unit (ODU), Home Receiver Indoor Unit (IDU); The TCP Link, Enhancing TCP Over Satellite Channels; Satellite Mobile and Specialized Services: Introduction, Satellite Mobile Services, VSATs, Radarsat, Global Positioning Satellite System (GPS), Orbcomm, Iridium.

Unit V: RADAR Fundamentals **06**

Introduction, Radar performance factors, Display methods, Radar range equation, Radar beacons, Beacon range equation, Antennas and scanning, Frequency allocation and applications of radar.

Unit VI: RADAR Systems **06**

Pulsed radar system, Moving target indication radar, CW Doppler radar, Frequency modulated CW radar, phase array radar: principles, operation, performance, limitations and applications.

Text Books **:**

1. Satellite Communications - Dennis Roddy - 3rd edition, Mc-Graw Hill Publication
2. Electronic Communication System –Kennedy Davis – 4th edition TMH Publication

Reference Books **:**

1. Satellite Communications systems - M. Richharia - 2nd edition Mc Millan publication
2. Introduction to Satellite Communication - Bruce R. Elbert, Third Edition , Artech house London
3. Introduction to Radar System - M. I. Skoh1ik ,Mc-Graw Hill publication

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**			
Course Title	:	**Optical Fiber Communication**	*Course Code*:	:	**ECT 423**
Teaching Scheme (Hours)	:	**Lectures** **3 hours/weeks=3x 12 weeks= 36 hours minimum**	*Total Credits*	:	**03 +00+ 01 = 04**

		Practical= 02 hours/week					
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE=Nil** **IOE=50** **EOE= Nil**	: : :	**Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **December 2018**

Pre-requisites **:** In order to complete the course studies successfully Basic knowledge of 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 Optical communication.
2. To acquire the basic knowledge of optical Fiber Communication System.

Course Outcomes:

1. Determine characteristics of optical fiber
2. Describe fiber materials, properties and fabrication methods.
3. Explain dispersion and its types also evaluate attenuation and scattering losses of optical fiber.
4. Discuss fiber splicing, connectors and calculate losses in fiber
5. Classify and compare different optical sources and detectors.
6. Understand working of different optical networks.

Curriculum Content

Hours

UNIT I: Introduction to Optical Fiber communications **06**

Overview of optical fiber communication system, advantages of optical fiber communications. Optical wave guides, ray theory transmission, total internal reflection, acceptance angle, numerical aperture, skew rays. cylindrical fibers, modes, V number, mode coupling, step index fibers, graded index fibers.

UNIT II: Optical fiber material and fabrication methods **06**

Single mode fibers,cut off wavelength, mode field diameter, effective refractive index. Fiber materials:Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers, Fiber fabrication methods.

UNIT III: Optical fiber Attenuation and dispersion **06**

Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, group delay, types of dispersion , material dispersion, wave guide dispersion, polarization mode dispersion, intermodal dispersion. pulse broadening. optical fiber connectors connector types, single mode fiber connectors, connector return loss.

UNIT IV: Optical fiber connectors and splicing **06**

Fiber Splicing- Splicing techniques, Splicing single mode fibers. Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints,. optical fiber connectors connector types, single mode fiber connectors, connector return loss.

UNIT.V: Optical Sources and Detectors **07**

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies. Reliability of LED&ILD. light emitting diodes (LEDs), laser diodes, light source linearity, modal, partition and Reflection Noise, source to fiber power launching , output patterns, power coupling, power launching, equilibrium numerical aperture, laser diode to fiber coupling.

Optical detectors, physical principles of PIN and APD, detector response time, temperature effect on avalanche gain, comparison of photo detectors, optical receiver operation, fundamental receiver operation, digital signal transmission, error sources, receiver configuration, digital receiver performance, probability of error, quantum limit, analog receivers.

UNIT VI: Optical Networks **05**

Basic Networks, SONET/SDH, Broadcast-and –Select WDM Networks,Wavelength Routed Networks, Nonlinear Effects on Network Performance,Performance of WDM + EDFA Systems, Solitons, optical CDMA, Ultrahigh Capacity network.

Text Books **:**

1. Gerd Keiser ,“Optical Fiber Communications”, 3rd Edition Mc Graw-Hill International edition, 2000.
2. John M. Senior, “Optical Fiber Communications”, PHI, 2nd Edition, 2002.

Reference Books **:**

1. D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, “Fiber Optic Communications” Pearson Education, 2005.
2. S.C .Gupta, Text Book on Optical Fibre Communication and its Applications”, PHI
3. Govind P. Agarwal, John Wiley, “ Fiber Optic Communication Systems”,3rd Edition
4. Joseph C. Palais , “Fiber Optic Communications”, 4th Edition, Pearson Education

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">Final Year B. Tech (Electronics & Communication Technology) Part IV, Semester VIII</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Mobile Communication</td><td>Course Code:</td><td>:</td><td>EC 424</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Lectures
3 hours/weeks=3 x 12 weeks= 36 hours minimum</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">03+01+00 =04</td></tr>
<tr><td colspan="3">Tutorial= 00 hour/week</td></tr>
<tr><td colspan="3">Practical= 02 hour/week</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE = 50
(20+20+10)
SEE = 50</td><td>IPE=Nil
IOE=Nil
EOE= 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>December 2018</td></tr>
</table>

Pre-requisites **:** Analog & Digital communication, Computer Network & Data Communication, Electromagnetic Wave Propagation

Type of Course **:** Theory

Course Domain **:** Core

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Evaluate
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: The course is designed to fulfill the following objectives:
1. To study the concept of cellular system design with frequency-reuse, cell sectoring and handoff techniques.
2. Study of evolution of mobile communication generations 1G, 2G, 2.5G, 3G & 4G with their characteristics and limitations.

Course Outcomes: Upon completion of the course student will be able to:
1. Understand the basic concepts of Cellular System and the design requirements.
2. Have in-depth understanding of the architecture & design consideration of GSM.
3. Analyze CDMA system functioning with knowledge of forward and reverse channel details.
4. Gain insights into various mobile radio propagation phenomenons and how the diversity can be exploited to improve performance.
5. Understand 2.5 G & 3G Netwok technologies.
6. Understand emerging technologies for fourth generation mobile systems

Curriculum Content

Hours

Unit 1: Cellular Concepts **06**

Cellular system, Hexagonal Geometry Cell, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Distance to Frequency Reuse Ratio, Interference & System Capacity, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems -Cell Splitting, Cell Sectorization, Repeaters, Micro Cell Zone Concept

Unit 2: Global System for Mobile Communication **06**

First Generation, Second Generation, Frequency allocation, GSM System Architecture: GSM Radio subsystem, Interfaces, Network and switching subsystem, Operation subsystem, Details of following blocks in GSM (Mobile Station, Base Station System, Switching Subsystems, Home Location Register, Visiting Location Registers, Equipment Identity Register),GSM Channels: Traffic Channel Multi frame, Control (Signaling) Channel Multi frame, Frames, Multi-frames, Super-frames and Hyper-frames, Mapping of GSM layers onto OSI layers

Unit 3: CDMA Technology **06**

Architecture of IS-95 CDMA system, Air interface, CDMA forward channels, CDMA reverse channels, Packet & Frame Formats in IS-95, Soft Handoff, CDMA Features, Power Control in CDMA, Performance of CDMA System, IMT -20000, Forward Channel in W-CDMA & CDMA 2000, Reverse Channels in W-CDMA and CDMA-2000, Comparison of GSM and CDMA Technology

Unit 4: Mobile Radio Propagation: **06**

Large Scale Path Loss- Free Space Propagation Model, Reflection, Ground Reflection (Two Ray) Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Overview of Outdoor Propagation Models & Indoor Propagation Models, Signal Penetration into Buildings ,Small Scale Fading Multipath Propagation, Types of Small Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading.

Unit 5: 2.5 G & 3 G Networks **06**

2.5G Networks: GPRS Architecture, GPRS Network Nodes: Mobile Station, Base Station System, GPRS Support Node, HLR and VLR, GPRS Interfaces 3G Networks: The Universal Mobile Telecommunication System (UMTS) - UMTS Network Architecture, UMTS FDD and TDD, Next Generation Networks - 3GPP LTE

Unit 6: 4G Networks **06**

Introduction , 4G Vision, 4G Features & Challenges , Applications of 4G, 4G Technologies: Multicarrier Modulation, Smart Antenna Techniques, OFDM-MIMO systems, Adaptive Modulation and Coding with Time Slot Scheduler, Cognitive Radio.

Text Books **:**

1. T.S.Rappaport, “Wireless Communications Principles and Practice”, Pearson.
2. Jochen Schiller,”Mobile Communications”,Pearson.

Reference Books **:**

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. William C.Y.Lee, “Mobile Communications Engineering Theory & Applications”, TMH.
3. Gary J. Mullett, “Wireless Telecommunications Systems & Networks”, CENGAGE Learning.
4. V.K.Garg, J.E.Wilkes, “Principle and Application of GSM”, Pearson Education.
5. V.K.Garg, “IS-95 CDMA & CDMA 2000”, Pearson Education.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**				
Course Title	:	**Fuzzy Logic and Applications**			*Course Code*:	: **EC 425**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 12 weeks= 36 hours minimum**			*Total Credits*	: **03**
Evaluation Scheme (Marks)	:	**CIE = (50) SEE = 50**	**IPE= NA IOE= 50 EPE= NA**	: : : **Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	: **Dec 2018**

Pre-requisites **:** Basics of Set Theory.

Type of Course **:** Theory

Course Domain **:** Elective

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 understand the Difference between Fuzzy and crisp set.
2. To understand membership functions used in fuzzy logic.
3. To understand fuzzy relations.
4. To understand defuzzification methodes.
5. To study different application fuzzy logic.

Course Outcomes:

1. Define Fuzzy and crisp set.
2. Select appropriate membership function.
3. Explain fuzzy relations and fuzzy inference systems.
4. Discuss fuzzification and defuzzification using Knowledge base.
5. Explain use of fuzzy system in nonlinear control.
6. Explain use of fuzzy system in adaptive control.

CURRICULUM CONTENT **Hours**

UNIT 1: Introduction to Fuzzy Logic **04**

Origin of Fuzzy Set Theory, Historical developments Fuzzy Logic, Benefits, Limitations of Fuzzy Logic, Application potentials and application domains of Fuzzy Logic

UNIT 2: Fuzzy Set Theory **04**

Fuzzy Set: discrete and continuous domains, Crisp Set versus Fuzzy Set, Concept of membership function and its features, Types of Fuzzy Sets, Characteristic properties of Fuzzy Set, Methods of assigning membership grade values, Hedges, Labels, Fundamental operations (Union, Intersection, Complement, Containment)

UNIT 3: Fuzzy Relation and Implications **08**

Classical (Crisp) and Fuzzy Relations, Fundamental operations (Union, Intersection, Complement, Containment), Properties of Fuzzy Relation, Fuzzy Proposition, Formation of Fuzzy Rules, Compound rules, Aggregation of Fuzzy rules, Fuzzy (Approximate) Reasoning, Types of Fuzzy Reasoning, Mamadani and TSK methods of Fuzzy Reasoning, Fuzzy Inference System (FIS), Types of FIS: Mamadani and Sugeno type, Comparison, Fuzzy Implication: Generalized Modus Ponens and Tolens, Types of Implications, Conversion of Fuzzy Rules into Fuzzy Relation by Zadeh and Mamadani type implications, Compositional Rule of inference.

UNIT 4: FKBC Design Parameters **08**

The FKBC architecture, choice of variables & content of rules, Derivation of rules, choice of membership functions, choice of scaling factors, choice of fuzzification procedure, choice of defuzzification procedure, comparison and evaluation of defuzzification methods.

UNIT 5: Nonlinear Fuzzy Control **06**

The Control Problem, The FKBC as a Non-Linear Transfer Element, Types of FKBC such as PID-like FKBC, Sliding Mode FKBC, Sugeno FKBC.

UNIT 6: Adaptive Fuzzy Control **06**

Design & Performance Evaluation, Approaches to Design such as membership function tuning using gradient descent, membership function tuning using performance criteria, the self-organizing controller, model based controller.

Text Books **:**

1. Fuzzy logic with engineering applications By T J Ross, Wiley publications
2. An introduction to fuzzy control. By D Driankov, H Hellendoorn, M Reinfrank

Reference Books **:**

1. Introduction to fuzzy sets, fuzzy logic and fuzzy control system By Guanron Chan, Trung Pham
2. Fuzzy sets and fuzzy logic: Theory and application By Klin and Yaun

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Fuzzy Logic and Applications Tutorial</td><td>Course Code:</td><td>:</td><td>EC 425L</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3"></td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">01</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 =
Nil
SEE =
Nil</td><td>IPE= NA
IOE= 50
EPE= NA</td><td>:
:
:</td><td>Grand Total=50</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>December 2018</td></tr>
</table>

Pre-requisites **: --**

Type of Course **:** Laboratory

Course Domain **:** Core

Skills Imbibed **:** Affective : Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Internal Oral Examination.

Course Objectives:

1. To understand the Difference between Fuzzy and crisp set.
2. To understand membership functions used in fuzzy logic.
3. To understand fuzzy relations.
4. To understand defuzzification methodes.
5. To study different application fuzzy logic.

Course Outcomes:

1. Define Fuzzy and crisp set.
2. Select appropriate membership function.
3. Explain fuzzy relations and fuzzy inference systems.
4. Discuss fuzzification and defuzzification using Knowledge base.
5. Explain use of fuzzy system in nonlinear control.
6. Explain use of fuzzy system in adaptive control.

Tutorials: **:** Minimum eight Tutorials based on theory.

Text Books **:**

1. Fuzzy logic with engineering applications By T J Ross, Wiley publications

:

Reference Books

1. Fuzzy sets and fuzzy logic: Theory and application By Klin and Yaun

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**					
Course Title	:	**High Speed Digital Design**			*Course Code*:	:	**EC 425**
Teaching Scheme (Hours)	:	**Lectures** **3 hours/weeks=3 x 12 weeks= 36 hours minimum**			*Total Credits*	:	**03**
Evaluation Scheme (Marks)	:	**CIE = (50)** **SEE = 50**	**IPE= NA** **IOE= 50** **EPE= NA**	: : :	**Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	:	**Dec 2018**

Pre-requisites **:** Digital Electronics.

Type of Course **:** Theory

Course Domain **:** Elective

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 understand the challenges in High speed ICs fabrication.
2. To understand power distribution and noise sources in digital systems.
3. To understand RC interconnects and driving losses in the digital systems.
4. To understand impact of timing and clock distribution in synchronous system.
5. To study ultra-fast VLSI circuits.

Course Outcomes:

1. Explain need and challenges in High speed ICs.
2. Explain power distribution and noise sources in digital systems.
3. Explain RC interconnects and driving losses.
4. Explain impact of timing and clock distribution in synchronous system.
5. Explain ultra-fast VLSI circuits.

CURRICULUM CONTENT **Hours**

Unit 1 Introduction to High Speed Digital Design **08**

Frequency, time and distance, Capacitance and Inductance Effects, High speed properties of logical gates, Speed and power modeling of wires, Geometry and Electrical properties of wires, Electrical model of wires, transmission lines, lossless LC transmission lines, lossy RLC transmission lines – Special transmission lines

Unit 2 Power Distribution and Noise: **07**

Power supply network Local power regulation IR drops Area bonding On chip bypass capacitors Symbiotic bypass capacitors Power supply isolation –Noise sources in digital system Power supply Noise – Cross talk Inter symbol interference.

Unit 3 Signaling convention and Circuits: **07**

Signaling modes for transmission lines signaling over lumped transmission media Signaling over RC interconnects driving lossy LC lines simultaneous bidirectional Signaling terminators transmitter and receiver circuits.

Unit 4 Timing Convention and Synchronization: **07**

Timing fundamentals Timing properties of clocked storage elements signals and events open loop Timing , level sensitive clocking pipeline Timing closed loop Timing –clock Distribution Synchronization failure and meta stability PLL and DLL based lock aligners.

Unit 5 Ultra fast VLSI Circuits and Systems: **07**

GaAs crystal structure, Technology development, Device modeling and performance estimation, Thermal design, Electromagnetic compatibility.

Text Books **:**

1. "Digital System Engineering", William S.Dally & John W. Paulton, Cambridge University Press,1998.
2. "High Speed Digital Circuits", Masakazu Shoji.,Addison Wesley Publishing Company, 1996

Reference Books **:**

1. "Digital Integrated Circuits: A design Perspective", Jan M.Rabaey et al;2nd Edition 2. "Basic VLSI Design", Douglas A.Pucknell & Kamran Eshraghian, Prentice Hall,1994.
2. "Design for Test for Digital ICs & Embedded core Systems", Alfred L Crouch; Prentice Hall.
3. "High Speed Digital DesignA Hand book of Black Magic", Howard Johnson & Martin Graham, Prentice Hall PTR,1993.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**			
Course Title	:	**High Speed Digital Design**	*Course*	:	**EC 425L**

		Tutorial				*Code*:		
Teaching Scheme (Hours)	:	**Tutorial= 01 hour/week**				*Total Credits*	:	**01**
		Practical= NA						
Evaluation Scheme (Marks)	:	**CIE = Nil** **SEE = Nil**	**IPE= NA** **IOE= 50** **EPE= NA**	: : :	**Grand Total=50**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**December 2018**

Pre-requisites	**:**	Digital Circuit.
Type of Course	**:**	Tutorial
Course Domain	**:**	Elective
Skills Imbibed	**:**	Affective : Awareness, Respond, Value, Organize Psychomotor: Perception, Imitation, manipulation, articulation
Course Assessment Methods: Internal Oral Examination.		
Course Objectives: 1. To understand the challenges in High speed ICs fabrication. 2. To understand power distribution and noise sources in digital systems. 3. To understand RC interconnects and driving losses in the digital systems. 4. To understand impact of timing and clock distribution in synchronous system. 5. To study ultra-fast VLSI circuits.		
Course Outcomes: 7. Understand need and challenges in High speed ICs. 8. Explain power distribution and noise sources in digital systems. 9. Understand RC interconnects and driving losses. 10. Understand impact of timing and clock distribution in synchronous system. 11. Understand ultra-fast VLSI circuits.		
Tutorials:	**:**	Minimum eight Tutorials based on theory.
Text Books	**:**	1. "Digital System Engineering", William S.Dally & John W. Paulton, Cambridge University Press,1998. 2."High Speed Digital Circuits", Masakazu Shoji.,Addison Wesley Publishing Company, 1996
Reference Books	**:**	1. "Design for Test for Digital ICs & Embedded core Systems", Alfred L Crouch; Prentice Hall. 2. "High Speed Digital DesignA Hand book of Black Magic", Howard Johnson & Martin Graham, Prentice Hall PTR,1993.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Digital Image Processing**				*Course Code*:	: **EC 425**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 12 weeks= 36 hours minimum**				*Total Credits*	: **03**
Evaluation Scheme (Marks)	:	**CIE = (50) SEE = 50**	**IPE= NA IOE= 50 EPE= NA**	: : :	**Grand Total=150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **Dec 2018**

Pre-requisites **:** Set and Information Theory, Signals and Transforms.

Type of Course **:** Theory

Course Domain **:** Elective

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 understand the basics of image formation and acquisition.
2. To study color and gray image conversion.
3. To understand image enhancement algorithms.
4. To understand morphological image processing algorithms.
5. To study image representation and segmentation algorithms.

Course Outcomes:

1. Compare color and gray image representation techniques
2. Acquire knowledge of various transforms used in image processing.
3. Apply mathematical treatment to digital image using image enhancement algorithms.
4. Apply image compression technique on image.
5. Apply various morphological image processing algorithms on Digital Image.
6. Apply different segmentation, representation and descriptors algorithms on digital Image

CURRICULUM CONTENT	**Hours**

UNIT - I DIGITAL IMAGE FUNDAMENTALS **06**

Introduction, Image sensing and acquisition, Image perception , light , luminance , brightness and contrast , Fundamental steps in digital image processing, pixels, image processing components , visibility function , monochrome vision models. Image sampling and quantization, Two dimensional sampling theory, reconstruction of images from its samples, Practical limits in sampling reconstruction. Image quantization. *Color Image:* Color Image representation, Chromaticity, color Models: RGB, HIS, CYM, CYMK, Conversion.

UNIT - 2 IMAGE TRANSFORMS **04**

Image transforms, two dimensional orthogonal and unitary transforms, properties of unitary transforms, one dimensional DFT, cosine, sine, Hadamad and Haar transforms.

UNIT – 3 IMAGE ENHANCEMENT **06**

Image enhancement: Point operations, contrast stretching, clipping and thresholding , negative image, intensity level slicing , bit extraction. Histogram modeling, histogram equalisation, modification. Spatial operations, sharpening and smoothing techniques. Transform operations. Color image enhancement.

UNIT - 4 IMAGE COMPRESSION

Image Compression Fundamentals, Image compression models, Elements of Information Theory, Error free Compression Techniques, Lossy Compression Techniques, Image compression standards, JPEG 2000, MPEG 4. **06**

UNIT- 5 MORPHOLOGICAL IMAGE PROCESSING

Dilation and erosion**,** opening and closing, hit or miss transformation, morphological algorithms, extensions to grey scale images. **06**

UNIT 6 IMAGE SEGMENTATION AND REPRESENTATION

Edge detection, Thresholding and Region based segmentation algorithms. Representation: Boundary and shape based representation and descriptors, Texture and Texture based Descriptors. **08**

Text Books **:**

1. Gonzalez, Rafel C. and Woods, Richard E., "Digital Image Processing", Second Edition, Prentice Hall, 2006.
2. Jain, Anil K., "Fundamentals of Digital Image Processing", Prentice Hall of India, New Delhi.

Reference Books **:**

1. Rosenfield, Azriel and Kak, Avinash C., "Digital Picture Processing", Academic Press Inc, New York, 1982.
2. Salomon, David., "Data Compression: The Complete Reference", Second Edition, Springer Verlag, New York, 2001.
3. Pratt, William K., "Digital Image Processing", John Wiley & Sons, New York, 2003.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Digital Image Processing Tutorial**				*Course Code*:	: **EC 425L**
Teaching Scheme (Hours)	:					*Total Credits*	: **01**
		Tutorial= 01 hour/week					
		Practical= NA					
Evaluation Scheme (Marks)	:	**CIE = Nil** **SEE = Nil**	**IPE= NA** **IOE= 50** **EPE= NA**	: :	**Grand Total=50**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **December 2018**

Pre-requisites **:** Fundamental knowledge of MATLAB.

Type of Course **:** Tutorial

Course Domain **:** Elective

Skills Imbibed **:** Affective : Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Internal Oral Examination.

Course Objectives:

6. To understand the basics of image formation and acquisition.
7. To study color and gray image conversion.
8. To understand image enhancement algorithms.
9. To understand morphological image processing algorithms.
10. To study image representation and segmentation algorithms.

Course Outcomes:

1. Compare color and gray image representation techniques
2. Acquire knowledge of various transforms used in image processing.
3. Apply mathematical treatment to digital image using image enhancement algorithms.
4. Apply image compression technique on image.
5. Apply various morphological image processing algorithms on Digital Image.
6. Apply different segmentation, representation and descriptors algorithms on digital Image

Tutorials: **:** Minimum eight Tutorials based on theory preferably using Simulation tools.

Text Books **:** 1. Gonzalez, Rafel C. and Woods, Richard E., "Digital Image Processing", Second Edition, Prentice Hall, 2006.

Reference Books **:** 1. Pratt, William K., "Digital Image Processing", John Wiley & Sons, New York, 2003.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Biomedical Instrumentation and Technology**			*Course Code*:	:	EC 425
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 03** **Tutorial= 01 hour/week** **Practical= 00 hours/week**			*Total Credits*	:	**03+01 +00 =04**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE =50**	**IPE=Nil** **IOE=50** **EOE= Nil**	: : :	**Grand Total= 150**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **December 2018**

Pre-requisites **:** Analog electronics, Digital electronics, microcontrollers, measurement and instrumentation

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, Internal Oral evaluation.

Course Objectives:

1. Study of bioelectronics signals
2. Study of recording and monitoring instruments
3. Study of audio meters
4. Study of imaging systems
5. Study of biomedical equipment
6. Study of patient safety issues

Course Outcomes:

1. Understand the properties of biomedical signals
2. Understand the working principle of recording and monitoring instruments.

3. Understand the working principle of audio meters
4. Understand the working principle of imaging systems
5. Understand the construction and working principle of X-ray machine.
6. Understand issues involved in patient safety

Curriculum Content

hours

Unit 1. Bioelectronics signal:
Origins of Bioelectric signals, Electrocardiogram (ECG), Electromyogram (EMG). Recording Electrodes: Silver-silver Electrodes, Electrodes for ECG, EEG and EMG. Physiological Transducers: Pressure Transducers, Temperature sensors, Pulse sensors.

Unit 2. Recording and monitoring instruments: 7
Biomedical Recorders: Block diagrams of electrocardiogram phonocardiograph, Electroencephalograph, Electromyography. Monitoring system, block diagram of patient monitor, measurement of heart rate, blood pressure measurement, and temperature measurement respiration rate. Basic Arrhythmia Monitoring system: Block diagram, Foetal Monitoring 8
System: Methods of monitoring Foetal Heart Rate, Abdomen Foetal Electrocardiogram and Foetal Phonocardiogram. Biomedical Telemetry: Introduction, block diagram and description of single channel/multi-channel telemetry systems.

Unit 3. Audio meters: 5
Mechanism of hearting, measurement of sound, basic audiometer, pure tone audiometer, sped audiometer.

Unit 4. Image systems: 8
Introduction, Basic principle and block diagram of x-ray machine-ray computed topography (C.T. Scanner) and Nuclear Magnetic resonance (NMR) Topography, Ultrasonic Imaging System: Introduction, medical ultrasound, block diagram of pulse echo-system, A-Scan, M- 8
mode, B-scanner and real time ultrasound imaging systems.

Unit 5. Biomedical equipment:
Therapeutic: Type of cardiac Pacemakers. Cardiac Defibrillator, Kidney Machine. Physiotheraphy: Short-wave Diathermy, Microwave Diathermy, Ultrasound Therapy unit, X- 3
ray machines – types, components and circuits, table shooting and maintenance.

Unit 6 Patient safety:
Electric shock hazard, leakage currents, Test Instruments for checking safety parameters of Biomedical Equipment.

Text Books **:**

1. Handbook of Biomedical Instrumentation by R.S.Khandpur.
2. Biomedical Instruments: Theory and Design by Walter Welko- Witiz and Sid Doutsch

Reference Books **:**

1. John. G. Webster," Medical Instrumentation" John Wiley publication.
2. Goddes & Baker," Principles of Applied Biomedical Instrumentation" John Wiley publication.
3. Carr & Brown," Biomedical Instrumentation & Measurement" Pearson Education
4. Cromwell, " Biomedical Instrument" Prentice Hall of India, New Delhi
5. R.S. Khandpur, " Hand book of Medical instruments" TMH, New Delhi
6. Sanjay Guha ,"Medical Electronics and Instrumentation" University press Publication
7. Edwand J. Bukstein," Introduction to Biomedical electronics"sane and Co. Inc.USA

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VIII**									
Course Title	:	**Biomedical Instrumentation and Technology Tutorial**							*Course Code*:	:	**EC 425L**
Teaching Scheme (Hours)	:	**1 hr /week= 1 x12= 12 hours**							*Credits*	:	**01**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **50**	**EPE** **EOE**	: :	**Nil** **Nil**		*Duration of SEE*	:	**03 hours**
Revision:	:	**Third**							*Month*	:	**December 2018**

Pre-requisites **:** Analog electronics, Digital electronics, microcontrollers, measurement and instrumentation

Type of Course **:** Theory

Course Domain **:** Core

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

Course Assessment Methods:

Tutorial, Internal Oral Examination, case study

Course Objectives:

1. Study of bioelectronics signals
2. Study of recording and monitoring instruments
3. Study of audio meters
4. Study of imaging systems
5. Study of biomedical equipment
6. Study of patient safety issues

Course Outcomes:

1. Understand the properties of biomedical signals
2. Understand the working principle of recording and monitoring instruments.
3. Understand the working principle of audio meters
4. Understand the working principle of imaging systems
5. Understand the construction and working principle of X-ray machine.
6. Understand issues involved in patient safety

Tutorial List **:**

Minimum 8 tutorials / case studies based on above syllabus

Lab Manual **:**

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

Reference **:**

Books

1. John. G. Webster," Medical Instrumentation" John Wiley publication.
2. Goddes & Baker," Principles of Applied Biomedical Instrumentation" John Wiley publication.
3. Carr & Brown," Biomedical Instrumentation & Measurement" Pearson Education
4. Cromwell, " Biomedical Instrument" Prentice Hall of India, New Delhi
5. R.S. Khandpur, " Hand book of Medical instruments" TMH, New Delhi
6. Sanjay Guha ,"Medical Electronics and Instrumentation" University press Publication
7. Edward J. Bukstein," Introduction to Biomedical electronics"sane and Co. Inc.USA

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="6">Final Year B.Tech (Electronics & Communication Technology)
Part II, Semester VIII</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">RF circuit design</td><td>Course Code:</td><td>:</td><td>EC 425</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3">Lectures hours/weeks = 03</td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">03+01 +00 =04</td></tr>
<tr><td colspan="3">Tutorial= 01 hour/week</td></tr>
<tr><td colspan="3">Practical= 00 hours/week</td></tr>
<tr><td>Evaluation Scheme (Marks)</td><td>:</td><td>CIE = (25+25) =50
SEE =50</td><td>IPE=Nil
IOE=50
EPE= Nil</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>December 2018</td></tr>
</table>

Pre-requisites **:** Analog Electronics, digital electronics, electromagnetic fields

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 RF design issues.
2. Study of different types of RF filter design.
3. Study of RF components
4. Study of RF amplifiers

5. Study of RF oscillators and mixers
6. Familiarity of RF issues

Course Outcomes:

1. Discuss RF design issues
2. Analyze electronic components considering RF issues
3. Analyze and design different types of RF filters
4. Discuss different RF components
5. Describe RF amplifiers, mixers and oscillators
6. Design RF circuits

Curriculum Content

hours

UNIT-I: RF ISSUES **4**

Importance of RF design, Electromagnetic Spectrum, RF behavior of passive components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.

UNIT II: RF FILTER DESIGN **6**

Filter types and parameters, Low pass filter, High pass filter, Bandpass and Bandstop filter, Insertion Loss. **Special Filter Realizations:** Butterworth type filter, Chebyshev type filters, Denormalization of standard low pass design.

UNIT III: COUPLED FILTERS: **6**

Odd and Even Mode Excitation, Bandpass Filter Design, Cascading band pass filter elements, Design examples.

UNIT IV: ACTIVE RF COMPONENTS & APPLICATIONS **6**

RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks –Impedance matching using discrete components, Microstripline matching networks, Amplifier class's of operation and biasing networks.

UNIT V: RF AMPLIFIER **7**

Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, high power and multistage amplifiers.

UNIT VI: OSCILLATORS AND MIXERS **7**

Basic Oscillator model, High frequency oscillator configuration, Balanced modulators, Basic characteristics of Mixers, Phase Locked Loops, RF directional couplers and hybrid couplers , Detector and demodulator circuits.

Text Books **:**

1. Reinhold Ludwig and Powel Bretchko, RF Circuit Design ,Theory and Applications, Pearson Education Asia, First Edition, 2001.
2. James Hardy, "High Frequency Circuit Design ", Resto Publishing Co., NewYork,

Reference Books **:**

1. Joseph. J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition, 2000.
2. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002.
3. Ulrich L. Rohde and David P. NewKirk, RF / Microwave Circuit Design, John Wiley & Sons USA 2000.

4. Roland E. Best, Phase - Locked Loops : Design, simulation and applications, McGraw Hill Publishers 5TH edition 2003.
5. Ian Hickman, " RF HandBook ", Butter Worth Heinemann Ltd., Oxford, 1993.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology), Part II, Semester VIII**									
Course Title	:	**RF Circuit Design Tutorial**							*Course Code*:	:	**EC 425L**
Teaching Scheme (Hours)	:	**1 hr /week= 1 x12= 12 hours**							*Credits*	:	**1**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **50**	**EPE** **EOE**	: :	**Nil** **Nil**		*Duration of SEE*	:	**03 hours**
Revision:	:	**Third**							*Month*	:	**December 2018**

Pre-requisites **:** Analog Electronics, digital electronics, electromagnetic fields

Type of Course **:** Tutorial

Course Domain **:** Core

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

Course Assessment Methods:

Assessment based on tutorials, internal oral examinations

Course Objectives:

1. Study and understand RF design issues.
2. Study of different types of RF filter design.
3. Study of RF components
4. Study of RF amplifiers
5. Study of RF oscillators and mixers
6. Familiarity of RF issues

Course Outcomes:

1. Describe RF design issues
2. Analyze components considering RF issues
3. Design different types of RF filters
4. Explain different RF components
5. Describe RF amplifiers, mixers and oscillators
6. Design RF circuits

Practical List **:**

Minimum 8 Tutorials based on syllabus contents

Lab Manual **:**

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

Reference **:**

Books

1. Joseph. J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition, 2000.
2. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002.
3. Ulrich L. Rohde and David P. NewKirk, RF / Microwave Circuit Design, John Wiley & Sons USA 2000.
4. Roland E. Best, Phase - Locked Loops : Design, simulation and applications, McGraw Hill Publishers 5TH edition 2003.
5. Ian Hickman, " RF HandBook ", Butter Worth Heinemann Ltd., Oxford, 1993.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Software Defined Radio**			*Course Code*:	:	EC 425
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks = 3 x 12 weeks= 36 hours** **Tutorial= 01 hour/week**			*Total Credits*	:	**03+01 +00 =04**
Evaluation Scheme (Marks)	:	**CIE = 50** **SEE = 50**	**IPE=Nil** **IOE=50** **EPE=Nil**	: : :	**Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**December 2018**

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

Type of Course **:** Theory & Tutorial

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, Tutorials
2. Semester End Examination.

Course Objectives:

1. To understand "Modern Radio Communication System " that can be reconfigured To understand GNU Radio
2. To understand how SDR platform provides easy access to wireless network system
3. To understand the concept of Cognitive Radio and Spectrum sharing

Course Outcomes:

1. Compare SDR with traditional Hardware Radio HDR
2. Implement modern wireless system based on OFDM, MIMO & Smart Antenna
3. Build experiment with real wireless waveform and applications, accessing both PHY and MAC, Compare SDR versus MATLAB and Hardware Radio
4. Work on open projects and explore their capability to build their own communication system.

Curriculum Content

Hours

UNIT I : Software Defined Radio fundamentals **06**

Introduction to SDR, Need of SDR, Principles of SDR , Basic Principle and difference in Analog radio and SDR , SDR characteristics, required hardware specifications, Software/Hardware platform, GNU radio -What is GNU radio, GNU Radio Architecture, Hardware Block of GNU, GNU software , MATLAB in SDR , Radio Frequency Implementation issues, Purpose of RF front End, Dynamic Range ,RF receiver Front End topologies, Flexibility of RF chain with software radio, Duplexer ,Diplexer ,RF filter ,LNA ,Image reject filters , IF filters , RF Mixers Local Oscillator , AGC, Transmitter Architecture and their issues, Sampling theorem in ADC, Noise and distortion in *RF chain, Pre-distortion*

UNIT II. SDR Architecture

Architecture of SDR-Open Architecture, Software Communication Architecture, Transmitter , Receiver Homodyne/heterodyne architecture, RF front End, ADC, DAC, DAC/ADC Noise Budget, ADC and DAC Distortion, Role of FPGA/CPU/GPU in SDR, Applications of FPGA in SDR, Design Principles using FPGA, Trade –offs in using DSP, FPGA and ASIC, Power Management Issues in DSP,ASIC,FPGA **06**

UNIT III. Multi Rate Signal Processing

Sample timing algorithms, Frequency offset estimation and correction, Channel Estimation, Basics of Multi Rate, Multi Rate DSP, Multi Rate Algorithm, DSP techniques in SDR, OFDM in SDR **06**

UNIT IV. Smart/MIMO Antennas using Software Radio

Smart Antenna Architecture, Vector Channel Modeling , Benefits of Smart Antenna Phased Antenna Array Theory, Adaptive Arrays, DOA Arrays, Applying Software Radio Principles to Antenna Systems, Beam forming for systems-Multiple Fixed Beam Antenna Array, Fully Adaptive Array , Relative Benefits and Trade-offs OF Switched Beam and Adaptive Array, Smart Antenna Algorithms , Hardware Implementation of Smart Antennas, MIMO -frequency, time, sample Synchronization, Space time block coding-Space Time Filtering, Space Time Trellis Coding . **06**

UNIT V. Cognitive Radio

Cognitive Radio Architecture, Dynamic Access Spectrum, Spectrum Efficiency, Spectrum Efficiency gain in SDR and CR ,Spectrum Usage, SDR as a platform for CR, OFDM as PHY layer ,OFDM Modulator, OFDM Demodulator, OFDM Bandwidth, Benefits of OFDM in CR, Spectrum Sensing in CR, CR Network **06**

UNIT VI. Applications of SDR

Applications of SDR in advance communication systems, challenges and issues, Implementation, Parameter estimation – environment, location , other factors, vertical handoff, network interpretability **06**

***Text Books* :**

1. Jeffrey. H. Reed ,Software Radio : 'A Modern Approach to Radio Engineering '-Pearson , LPE

***Reference Books* :**

1. Markus Dillinger , KambizMadani ,Nancy Alonistioti, Software Defined Radio : Architectures , Systems and Functions ,Wiley
2.Tony .J. Rouphael , RF and DSP for SDR, Elsevier Newness Press ,2008
3.Dr.TajStruman ,Evaluation of SDR –Main Document
4.SDR –Handbook , 8thEdition , PENTEK
5.Bruce a. Fette , Cognitive Radio Technology, Newness, Elsevier

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology), Part II, Semester VIII**									
Course Title	:	**Software Defined Radio Tutorial**						*Course Code*:	:	**EC 425L**	
Teaching Scheme (Hours)	:	**1 hr /week= 1 x12= 12 hours**						*Credits*	:	**1**	
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **50**	**EPE** **EOE**	: :	**Nil** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**	
Revision:	:	**Third**						*Month*	:	**December 2018**	

***Pre-requisites* :** Analog Electronics, digital electronics, electromagnetic fields

***Type of Course* :** Tutorial

***Course Domain* :** Core

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

Course Assessment Methods:

Assessment based on tutorials, internal oral examinations

Course Objectives:

1. To understand "Modern Radio Communication System " that can be reconfigured To understand GNU Radio

2. To understand how SDR platform provides easy access to wireless network system
3. To understand the concept of Cognitive Radio and Spectrum sharing

Course Outcomes:

1. Compare SDR with traditional Hardware Radio HDR
2. Implement modern wireless system based on OFDM, MIMO & Smart Antenna
3. Build experiment with real wireless waveform and applications, accessing both PHY and MAC, Compare SDR versus MATLAB and Hardware Radio
4. Work on open projects and explore their capability to build their own communication system.

Practical List **:**

Minimum 8 Tutorials based on syllabus contents

Lab Manual **:**

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

Reference **:**

Books

1. Markus Dillinger , KambizMadani ,Nancy Alonistioti, Software Defined Radio : Architectures , Systems and Functions ,Wiley
2.Tony .J. Rouphael , RF and DSP for SDR, Elsevier Newness Press ,2008
3.Dr.TajStruman ,Evaluation of SDR –Main Document
4.SDR –Handbook , 8thEdition , PENTEK
5.Bruce a. Fette , Cognitive Radio Technology, Newness, Elsevier

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Remote Sensing and GIS**			*Course Code*:	:	**EC 425**
Teaching Scheme (Hours)	:	**Lectures 3 hours/weeks=3 x 12 weeks= 36 hours minimum** **Tutorial= 01 hour/week** **Practical= Nil**			*Total Credits*	:	**03+00+01 =04**
Evaluation Scheme (Marks)	:	**CIE = 50** **(20+20+10)** **SEE = 50**	**IPE=Nil** **IOE=50** **EPE= Nil**	: : :	**Grand Total=150**	*Duration of SEE* :	**3 hours**
Revision:	:	**Third**			*Month*	:	**December 2018**

Pre-requisites **:** Computer Network & Data Communication, Image processing

Type of Course **:** Theory

Course Domain **:** Elective.

Skills Imbibed **:** Cognitive: Recall, Understand, Apply, Analyze, Evaluate
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: The course is designed to fulfill the following objectives
1 To provide exposure to students in gaining knowledge on concepts and applications leading to modeling of earth resources management using Remote Sensing.
2. To acquire skills in storing, managing digital data for planning and development.

Course Outcomes: Upon completion of the course student will be able to

1. Describe Remote Sensing concepts, physical fundaments and components and adequately use vocabulary, terminology and nomenclature of the discipline
2. Understand main concepts that define Geographic Information Systems.
3. Classify & interpret GIS data sources, types & data standards.
4.Understand analysis, planning & implementation of GIS
5. Understand working and segments of GPS
6. Understand integration of GIS - RS & use of them to solve real world problems

Curriculum Content

Hours

Unit 1: of Remote Sensing Fundamentals & Development **06**

Definition,Types , Chronological Development, International Remote Sensing Centres , Indian Remote Sensing Centres & their Activities,Satellite Programs of India, Elements Of EMR - Wavelength Regions , Energy Interaction in Atmosphere – Absorption , Scattering ,Atmospheric Windows,Terrestrial Interaction , Spectral Reflectance Curves, Active & Passive Remote Sensing, Classification of Remotely Sensed Data

2. GIS (Geographic Information System) Introduction **06**

Definition of GIS, The Origins of GIS, What Is CADD? What Is AM/FM? What Is GIS? Applications, GIS Industry & GIS Software: GIS Software Vendors, GIS Products, GIS Users, GIS Services, Benefits of GIS, Map Data Security, Elimination of Redundancy, Map Revisions, Search & Analysis of Map Data, Productivity of Employees, Integration of Map Data.

3. GIS Data **06**

Sources, Collection & Entry, Digitizing, GPS Surveying, Digital Ortho Photography, Satellite Imagery, GIS Data Formats & Standards, Vector Data, Raster Data, Raster Images, DOD Spatial Data Standards (SDS), Spatial Data Transfer Standard (SDTS), Open Geo-Data Interoperability Specification (OGIS).

4. GIS Analysis, Planning and Implementation **06**

Network Analysis, Digital Terrain Modeling & Analysis, Grid Cell GIS Modeling &Analysis, GIS Plan,Components of GIS Plan, Phases – Planning, Analysis, Implementation, Successful Implementation of GIS, Management Support, Leadership & Vision, Data Conversion & Maintenance, Hardware And Software, User Training, Data Communication, Software Customization, User Support, Funding

5. Introduction to Global positioning system: **06**

GPS Satellite Constellations, GPS Segments: Space, Control, User, Signals & Codes, GPS

Receivers. Operating Principle & Sources Of Errors in GPS, Modes of Measurements & Post Processing of Data, Accuracy of GPS Observation. GPS Applications in Various Fields, Indian Regional Navigation Satellite System (IRNSS) – NAVIC

6. Integration of Remote sensing and GIS **06**

Remote Sensing And GIS Synergy, Need For Integration, Facilities for Integration, General View on Applications, Case Studies- Land Record, Utility Management, Oil And Gas, Global Change.

Text Books **:**

1. The GIS Handbook – By G.B.Korte 5th Edn. Oxford press.
2. An Introduction to Geological Information System – By Ian wood, Sarah Cornelius, Steve Carver, Pearson Education
3. Remote Sensing and Geographical Information Systems – By M.Anji Reddy, B S Publications

Reference Books **:**

1. Remote Sensing Application and Geographic Information Systems Recent Trends – By Muralikrishna I.V. ,TMH
2. Principles of Geographical Information Systems (Spatial Information Systems) - by Peter A. Burrough (Author), Rachael A. McDonnell , Oxford university Press
3. Remote Sensing & Image Interpretation – By thomas M.Linnesand, R.W.Kiefer,Jonathan W. Chipman, Wiley Publications.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Remote Sensing and GIS Tutorial**			*Course Code*:	:	**EC 425L**
Teaching Scheme (Hours)	:				*Total Credits*	:	**01**
		Tutorial= 01 hour/week					
		Practical= NA					
Evaluation Scheme (Marks)	:	**CIE = Nil** **SEE = Nil**	**IPE= NA** **IOE= 50** **EPE= NA**	: : :	**Grand Total=50**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**				*Month*	: **December 2018**

Pre-requisites **:** Computer Network & Data Communication, Image processing

Type of Course **:** Tutorial

Course Domain **:** Elective

Skills Imbibed **:** Affective : Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Internal Oral Examination.

Course Objectives:

1. To provide exposure to students in gaining knowledge on concepts and applications leading to modeling of earth resources management using Remote Sensing.
2. To acquire skills in storing, managing digital data for planning and development.

Course Outcomes:

1. Describe Remote Sensing concepts, physical fundaments and components and adequately use vocabulary, terminology and nomenclature of the discipline
2. Understand main concepts that define Geographic Information Systems.
3. Classify & interpret GIS data sources, types & data standards.
4. Understand analysis, planning & implementation of GIS
5. Understand working and segments of GPS
6. Understand integration of GIS - RS & use of them to solve real world problems

Tutorials: **:** Minimum eight Tutorials based on theory.

Text Books **:**

1. Remote Sensing and Geographical Information Systems – By M.Anji Reddy, B S Publications

Reference Books **:** Remote Sensing & Image Interpretation – By thomas M.Linnesand, R.W.Kiefer,Jonathan W. Chipman, Wiley Publications.

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Machine Learning**			*Course Code*:	:	**EC 425**
Teaching Scheme (Hours)	:	**Lectures** **3 hours/weeks=3 x 12 weeks= 36 hours minimum**			*Total Credits*	:	**03**
Evaluation Scheme (Marks)	:	**CIE = (50)** **SEE = 50**	**IPE= NA** **IOE= 50** **EPE= NA**	: : :	**Grand Total=150**	*Duration of SEE*	:	**3 hours**
Revision:	:	**Third**				*Month*	:	**Dec 2018**

Pre-requisites **:** Basics of Set and probability Theory.

Type of Course **:** Theory

Course Domain **:** Elective

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:

The course is designed to learn different algorithm in machine learning and understand use of machine learning in variety of applications.

Course Outcomes:

7. Compare types of Machine learning
8. Understand instance based learning.
9. Describe support vector machine and different kernel functions
10. Understand multilayer network and back proposition.
11. Use of algorithm for clustering

CURRICULUM CONTENT **Hours**

UNIT 1: Introduction **07**

Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation.

UNIT 2:Decision Tree and Instance based learning **07**

Linear regression, Decision trees, overfitting, Instance based learning, Feature reduction, Collaborative filtering based recommendation

UNIT 3: Bayesian Learning **07**

Probability and Bayes learning, Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM.

UNIT 4: Deep Learning **08**

Neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network. Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning.

UNIT 5: Clustering **07**

Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model.

Text Books **:**

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.

Reference Books **:**

1. Introduction to Machine Learning Edition 2, by Ethem Alpaydin
2. Pattern Recognition And Machine Learning By Bishop, Springer 2006

<table>
<tr><td>Class & Semester</td><td>:</td><td colspan="5">Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td>Course Title</td><td>:</td><td colspan="3">Machine Learning Tutorial</td><td>Course Code:</td><td>EC 425L</td></tr>
<tr><td rowspan="3">Teaching Scheme (Hours)</td><td rowspan="3">:</td><td colspan="3"></td><td rowspan="3">Total Credits</td><td rowspan="3">:</td><td rowspan="3">01</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 =
Nil
SEE =
Nil</td><td>IPE= NA
IOE= 50
EPE= NA</td><td>:
:
:</td><td>Grand Total=50</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>December 2018</td></tr>
</table>

Pre-requisites **:** Programming Knowledge

Type of Course **:** Laboratory

Course Domain **:** Core

Skills Imbibed **:** Affective : Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Internal Oral Examination.

Course Objectives:

The course is designed to learn different algorithm in machine learning and understand use of machine learning in variety of applications.

Course Outcomes:

1. Compare types of Machine learning
2. Understand instance based learning.
3. Describe support vector machine and different kernel functions
4. Understand multilayer network and back proposition.
5. Use of algorithm for clustering

Tutorials **:** Minimum eight Tutorials based on theory.

Text Book **:**

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.

Reference Book **:**

1. Pattern Recognition And Machine Learning By Bishop, Springer 2006

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology), Part IV, Semester VIII**								
Course Title	:	**Major project- Phase II Laboratory**						*Course Code*:	:	**EC 426L**
Teaching Scheme (Hours)	:	**2 hr /week= 2 x12= 24 hours**						*Credits*	:	**5**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **Nil**	**EPE** **EOE**	: :	**50** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**
Revision:	:	**Third**						*Month*	:	**December 2018**

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

Type of Course **:** Practical

Course Domain **:** Core

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

Course Assessment Methods:

Weekly supervision, External Practical Examination

Course Objectives:

1. Understand basic stages in electronic system design
2. Surveying the problem and finding technological solution.
3. Designing electronics systems.
4. Learning and using circuit simulation and development tools
5. Working in team to accomplish task
6. Project management and life-long learning

Course Outcomes:

1. Identify social, environmental, market needs and solutions.
2. Illustrate design and development stages in electronics engineering projects.
3. Apply engineering knowledge for solving real world problems.
4. Manage project and finance.
5. Provide technological solutions on recent problems and lifelong learning.
6. Work in team, follow ethical practices, and prepare documentation and presentation.

Course Contents

The project selected and approved in semester VII has to be continued in semester VIII. Students have to complete the project in all respects and submit the written project report of the same.

External examiner from Industry or faculty member from out of the University has to be called for project assessment.

Practical List **:**

Lab Manual **:**

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

Reference **:**

Books

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

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**								
Course Title	:	**Broadband Communication Tutorial**						*Course Code*:	:	**ECT 422L**
Teaching Scheme (Hours)	:	**1 hr /week= 1 x12= 12 hours**						*Credits*	:	**1**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	50	**Nil** **Nil**	**EPE** **EOE**	: :	**Nil** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**
Revision:	:	**Third**						*Month*	:	**December 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:

1. Discuss different switching networks and evolution of switching technique.
2. Illustrate ISDN architecture, transmission structure and its interworking.
3. Explain ISDN physical, data link and network layer and its services.
4. Differentiate between broadband and narrowband ISDN with it's protocol interface model.
5. Explain ATM architecture, virtual connections and switching types.

6. Describe frame relay architecture and congestion control mechanism.

Course Assessment Methods:

Tutorial Assessment, Internal Oral Examination

Note : Minimum 8 Tutorials should be conducted on basis of above mention list or Syllabus

***Reference Books* :**

1. Balaji Kumar," Broadcast Communications", McGraw Hill Publication.
2. W. Stallings, "ISDN-An Introduction", McGraw Hill Publishing company.
3. M. Schwartz, " Telecommunication Network "Addison Wesley publication.
4. M. Schwartz," Computer Communication network – Design & Analysis" Prentice Hall India Publication.

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VIII**									
Course Title	:	**Satellite and Radar Engineering Laboratory**						*Course Code*:	:	**EC 422L**	
Teaching Scheme (Hours)	:	**2 hr /week= 2 x12= 24 hours**						*Credits*	:	**1**	
Evaluation Scheme (Marks)	:	**IPE** **IOE**	: :	**Nil** **Nil**	**EPE** **EOE**	: :	**Nil** **50**	*Duration of Exam (in case of External Evaluation)*	:	**2 Hrs**	
Revision:	:	**Third**						*Month*	:	**Dec 2018**	

Pre-requisites **:** Handling lab equipment and measuring instruments

Type of Course **:** Practical

Course Domain **:** Core

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

Course Assessment Methods:

Practical Journal Assessment, Internal Practical Examination

Practical List **:** Minimum 8 experiments should be carried out by from following list :

1. Study of Satellite communication System
2. Establishment of a Direct Communication Link.
3. Verification of Direct Communication Link.
4. Demonstration of transmission & reception of Function Generator Waveforms through Direct Link.

5. Demonstration of transmission & reception of multiple Signals simultaneously through Direct link.
6. Establishment of an Active Satellite Link.
7. Verification of Satellite Communication Link.
8. Demonstration of transmission & reception of Function Generator Waveforms through Satellite Link.
9. Demonstration of transmission & reception of multiple Signals simultaneously through Satellite link.
10. Study of Global Positioning System & IRNSS.
11. Study of Doppler Radar
12. Measurement of Velocity and Vibrations using RADAR
13. Study of Radar based alarm system and object detection

Lab Manual **:**

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

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**								
Course Title	:	**Optical Fiber Communication Laboratory**						*Course Code*:	:	**423L**
Teaching Scheme (Hours)	:	**2 hr /week= 2 x12= 24 hours**						*Credits*	:	**1**
Evaluation Scheme (Marks)	:	**IPE** **IOE**	**50**	**Nil** **Nil**	**EPE** **EOE**	: :	**Nil** **Nil**	*Duration of Exam (in case of External Evaluation)*	:	**03 hours**
Revision:	:	**Third**						*Month*	:	**December 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:

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

4 To acquire the basic knowledge of networking and hands on network

devices.

Course Outcomes:

1. Determine charactristics of optical fiber
2. Describe fiber materials, properties and fabrication methods.
3. Explain dispersion and its types also evaluate attenuation and scattering losses of optical fiber.
4. Discuss fiber splicing, connectors and calculate losses in fiber
5. Classify and compare different optical sources and detectors.
6. Understand working of different optical networks.

Course Assessment Methods:

Practical Journal Assessment, internal Practical Examination

Practical List:

1. Setting up Fiber optic analog link
2. Setting up Fiber optic digital link
3. Intensity Modulation system using analog input signal
4. Intensity Modulation system using digital input signal
5. Frequency modulation system
6. Pulse width modulation system
7. Study of propagation loss in optical fiber
8. Study of Bending loss
9. Measurement of propagation Numerical Aperture
10. Setting up Fiber optic voice link using Frequency intensity and PWM

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 **:**

1. S.C .Gupta, Text Book on Optical Fiber Communication and its Applications", PHI

Class & Semester	:	**Final Year B.Tech (Electronics and Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Mobile Communication Laboratory**			*Course Code*:	:	**EC 424L**
Teaching Scheme (Hours)	:				*Total Credits*	:	**01**
		Tutorial= Nil					
		Practical= 02 hour/week					
Evaluation Scheme (Marks)	:	**CIE = Nil** **SEE = Nil**	**IPE= Nil** **IOE= Nil** **EOE= 50**	: : :	**Grand Total=50**	*Duration of SEE*	: **3 hours**
Revision:	:	**Third**			*Month*	:	**December 2018**

Pre-requisites : Analog & Digital Communication, Computer Network & Data Communication, Electromagnetic Wave Propagation

Type of Course : Practical

Course Domain : Core

Skills Imbibed : Affective : Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Practical Journal Assessment, External Oral Examination.

Course Objectives: The course is designed to fulfill the following objectives:
1. To study the concept of cellular system design with frequency-reuse, cell sectoring and handoff techniques.
2. Study of evolution of mobile communication generations 1G, 2G, 2.5G, 3G & 4G with their characteristics and limitations.

Course Outcomes: Upon completion of the course student will be able to:
1. Understand the basic concepts of Cellular System and the design requirements.
2. Have in-depth understanding of the architecture & design consideration of GSM.
3. Analyze CDMA system functioning with knowledge of forward and reverse channel details.
4. Gain insights into various mobile radio propagation phenomenon.
5. Understand 2.5 G & 3G Network technologies.
6. Understand emerging technologies for fourth generation mobile systems.

Practicals: : Minimum 8 experiments based on above on syllabus but not limited to list only.

List of Experiments:

1. Study of sections of 2 G mobile phone trainer
2. Study and analysis of vibrator in GSM handset.
3. Study and measurement of PWM signal of vibrator.
4. Study of row and column computation of matrix keypad.
5. Study and analysis of LCD module.

6. Study of sections of 3G mobile phone trainer
7. Study of 3G network AT commands
8. Study of sections of 3G mobile phone trainer
9. Study and observe Transmitted/Received RF signals
10. Study of Battery section & Battery Charging phenomena
11. Study of Power Management unit
12. Study of SIM Interface section
13. Study of User Interface section
14. Study of Real Time Clock
15. Study of modes of mobile phone

Text Books **:** 1. T.S.Rappaport, "Wireless Communications Principles and Practice", Pearson.

: 2. Jochen Schiller,"Mobile Communications",Pearson.

Reference Books

1. Andrea Goldsmith, "Wireless Communications", Cambridge University Press
2. William C.Y.Lee, "Mobile Communications Engineering Theory & Applications", TMH.
3. Gary J. Mullett, "Wireless Telecommunications Systems & Networks", CENGAGE Learning
4. V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education.
5. V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education

Class & Semester	:	**Final Year B.Tech (Electronics & Communication Technology) Part IV, Semester VIII**					
Course Title	:	**Introduction to Indian Constitution**			*Course Code*:	:	HS 421
Teaching Scheme (Hours)	:	**Lectures hours/weeks = 02** **Tutorial= 00 hour/week**			*Total Credits*	:	**00+00+00 =00**
Evaluation Scheme (Marks)	:	**CIE = Nil SEE =Nil**	**IPE=Nil IOE=Nil EPE= Nil**	: : :	Course auditor will conduct written exam of 50 marks and will give grade	*Duration of SEE* :	**Nil**
Revision:	:	**Third**				*Month* :	**December 2018**

Pre-requisites **:** -------

Type of Course **:** Theory

Course Domain **:** Audit course

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

Course Assessment Methods:

Course auditor will conduct theory examination of 50 marks at the end of the semester. After assessment grade will be given to the students.

Course Objectives:

5. Familiarity with preamble
6. Study the fundamental rights and duties of citizens
7. Study the union and state executives
8. Study the constitutional provisions
9. Study the electoral process

Course Outcomes:

1) Associate with constitution of India
2) State fundamental duties.
3) Describe union and state executives.
4) Discuss constitutional provisions
5) Illustrate electoral process
6) Report the role of democracy in welfare of society

Curriculum Content

UNIT 1 04
Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases.

UNIT 2 04
Relevance of Directive principles of State Policy under Part – IV. Fundamental duties & their significance.

UNIT 3 04
Union Executive – President, Prime Minister, Parliament & the Supreme Court of India.

UNIT 4 04
State executive – Governors, Chief Minister, State Legislator and High Courts.

UNIT 5 04
Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions.

UNIT 6 04
Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments.

Text Books **:**

1. Durga Das Basu: "Introduction to the Constitution of India"(Students Edn.) Prentice – Hall EEE, 19th/20th Edn., 2001.

2. R.C.Agarwal, "Indian Political System", (1997) S.Chand and Company, New Delhi.
Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi.
3. K.L.Sharma, "Social Stratification in India: Issues and Themes",(1997), Jawaharlal Nehru University, New Delhi.

Practical List : NIL

Reference Books :

1. An Introduction to Constitution of India" by M.V.Pylee, Vikas Publishing, 2002.
Sharma, Brij Kishore, "Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "(1998) Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, "(1997) Social Stratification and Charge in India ", Manohar, New Delhi.

Lab manual NIL