DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

Revised Syllabus of

B.E. (EC/ECT/E&C)

[Effective from -2014 – 2015]

BOS Chairman

Dr.Ulhas B Shinde

FINAL YEAR DEGREE COURSE IN ENGINEERING (REVISED)

(Applicable from the Academic Year 2014- 2015)

1. All the Rules and Regulations, hereinafter specified shall be read as a whole for the purpose of interpretation.

ADMISSION

1. Admission to final year engineering shall be carried out as per the rules and regulations prescribed by the competent authority as appointed by the Government of Maharashtra and Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, from time to time.

DURATION AND COURSES OF STUDY

1. The duration of the course is four years. Each of the four academic years shall be divided into two semesters herein after referred to as the semester I and semester II in chronological order. Each semester shall comprise

Instructions …… 15 weeks

Preparation holiday …… 2 weeks or 15 days (Includes practical exams)

2. **Candidate who fails to fulfill all the requirements for the award of the degree as specified hereinafter within eight academic years from the time of admission, will forfeit his/her seat in the course and his/her admission will stand cancelled.**

RULES AND REGULATION OF ATTENDANCE

1. Candidates admitted to a particular course of study are required to pursue a "Regular course of study" as prescribed by the University before they are permitted to appear for the University Examination.

2. "A regular course of study" means putting in attendance not less than 75% for individual subject.

3. a) In special cases and for sufficient causes shown, the Principal of the institute may, on the specific recommendation the Head of the Department, condone the deficiency in attendance to the extent of 15 % on medical ground subject to submission of medical certificate.

b) However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Principal may condone the deficiency in attendance to the extent of 25 % (as against 15 % Condonation for other) on medical grounds subject to submission of medical certificate to this effect. Such condonation be availed twice during the entire course of study leading to degree in Engineering and Technology.

4. "Active Participation in N.C.C/N.S.S. Camps or Inter collegiate or Inter University or Inter State or International matches or debates of Educational Excursions or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not be counted as absence. However, such 'absence shall not exceed (4) weeks per semester of the total period of instructions. Such leave should not be availed more than twice during the entire course of study.

5. The attendance shall be calculated on individual papers/subjects from the date of commencement of the semester.

6. In case of the candidates who fail to put in the required attendance in a course of study, he/she shall be detained in the same class and will not be recommended to appear for the University examination.

7. A candidate detained in semester I should take readmission in next academic year as a regular student and shall have to complete all the theory and practicals as a regular student.

8. In case a candidate is detained in semester II, he/she should take admission to Semester II of next academic year and complete all the theory and practicals as a regular student of semester II

9. In case of change of syllabus the candidate even if detained in semester II should take readmission in next academic year for Semester I and II as a regular student and complete all the theory and practical's as a regular student.

SCHEME OF INSTRUCTIONS AND EXAMINATION

1. Instructions about the curriculum in the various subjects in each semester of all the four years shall be provided by the University.

2. The details of instruction period, examination schedule, vacations etc. shall be notified by the Principal of the College as per the University academic calendar

3. The medium of instruction and examination shall be English.

4. At the end of each semester, University examinations shall be held as prescribed in the respective schemes of examination.

5. The examinations prescribed may include written papers, practical and oral, tests, inspection of certified sessional work in Drawing and Laboratories and work done by students in each practical examination, along with other materials prepared or collected as part of Lab work/Project.

6. All the rules for examinations prescribed by the University from time to time shall be adhered to.

7. A candidate shall be deemed to have fully passed the Examination of a semester, if he/she secures not less than the minimum marks/grade as prescribed.

8. Institutions will be encouraged to adopt modern tools in classroom/labs to deliver the course contents.

9. Institutions will be encouraged to conduct online class tests.

Q.874

The Final Year Examination in Engineering will be held in two parts B.E. semester-I and B. E. semester- II. No candidate will be admitted to B.E. semester-I examination unless he/she produce testimonials of having kept one term, for the subject under T.E. semester-I and II satisfactorily in a college of engineering affiliated to this University after passing the Third year examination of engineering other examination recognized as equivalent thereto as per the admission rules to Final year engineering prescribed by the Government of Maharashtra and Dr. B.A.M.University from time to time.

R.1861

i. In case a candidate fails in one or more heads of passing at the B.E. semester-I Examination after taking that examination at the end of first term as a regular student, he/she will be allowed to appear again for only those heads of passing in which he/she has failed at his/her immediately subsequent semester-I examination.

ii. That the marks obtained by the candidate at semester-I Examination shall be carried forward unless the candidate desires to appear for a paper in which he has failed and then gracing of marks should be done as a whole for semester-I and semester-II examination taken together.

R.1862

a) Candidates who secure 45% or more but less than 50% marks in the aggregate and pass the examination will be declared to have passed the examination in Pass Division.

b) Candidates who secure 50% or more but less than 60% marks in the aggregate and pass the examination will be declared to have passed the examination in Second Division.

c) Candidates who secure 60% or more but less than 66% marks in the aggregate and pass the examination will be declared to have passed the examination in first Division.

d) Candidates who secure 66% or more marks in the aggregate and pass the examination will be declared to

have passed the examination in First Division with Distinction.

e) For calculating the percentage for the purpose of giving weightage while awarding division in Final Examination to the students admitted to first year engineering, the maximum marks prescribed and the marks obtained by the examinee in the particular examinations shall be taken into consideration with the following weightages.

F.E. - 10%, S.E. - 10%, T.E. –
40% , B. E. – 40%

This shall be applicable for the students admitted in first year from academic year 2011-2012 onwards.

f) In case of the students directly admitted to the second year, the weightage while awarding Division in Final Examination the maximum marks prescribed and the marks obtained by the Examinee in the particular examinations shall be taken in to consideration

S.E. - 20%, T.E. – 40%

B. E. – 40%

This shall be applicable for the students admitted in second year from academic year 2012-2013 onwards.

R.1863

In case a candidate fails in the examination but desires to appear again thereat.

a) He may, at his option, claim exemption from appearing in the head or heads of passing in which he has passed.

b) Such exemption, if claimed, shall cover all the heads of passing- in which it can be claimed.

c) Such exemption, if not availed of at the immediately subsequent appearance of the candidate at the examination, shall be deemed to have lapsed.

d) He /She may, at his option claim exemption from appearing in head or heads of passing of his choice and appear in the remaining head or head/s of passing to make-up the deficiency in the aggregate, if he has passed in all the heads of passing but has failed to secure a minimum of 45% of the aggregate marks.

e) The Marks obtained by a candidate for such term work as separately assessed will be carried over unless fresh term work is presented by him. A candidate whose marks are thus carried over shall be eligible for a division provided he/she does not avail himself of exemption in any head of passing excepting term work.

f) For the purpose of deciding whether a candidate claiming exemption in accordance with (a), (b), (c) above or (d) and (e) above has as required by R.260 secures 45% of the total marks obtainable in the whole examination the marks at his/ her previous examination/examination in the head or heads of passing in which he/she is exempted will be carried over. Candidates passing the examination in this manner shall not be eligible for a division or prizes or scholarships at the examination.

R.1864

RULE FOR COMBINED PASSING

1) To pass the examination a candidate must obtain minimum 40% of Marks in each Theory Paper &class test taken together however the candidate must obtain minimum 35% of Marks at the University theory Examination. The candidate must obtain a minimum aggregate of 45% of the total Marks obtainable at the T.E. Semester -I & II Examination taken together.

To pass a subject where there is no provision of class test, the candidate must obtain 40% of Marks in the University Examination.

Gracing should be done for the performance at University Examination or University Examination and class test taken together.

Minimum two-class tests should be conducted in a semester for the theory subject if provided. The average performance of the Two-class tests should be forwarded to the University by the college along with the term work marks.

If candidate fails to secure 40% of marks at university theory examination and class test taken together at the regular semester examination, then he/she shall have to appear for university examination from subsequent examination onwards and secure 40% of marks at university examination and earlier obtained class test marks taken together. The improved performance at the university examination should not be considered for the Merit/Medal/Prize etc.

If the candidate remains absent for the class-test, his performance should be treated as 'Zero' Marks. Minimum

marks required for passing in term work and practical shall be 40%. If a candidate secures less than 40% in any of

the term work or fails to submit term work shall be detained in the same class.

R.1865

GENERAL RULES OF EXAMINATION

1. Application for permission to appear at every examination shall be made in the prescribed format accompanied by one passport size full face photograph (not profile) along with the necessary certificates and the prescribed fee, should be submitted to the Principal of the institute on or before the date fixed for this purpose.

2. When a candidate's application is found in order and he/she is eligible to appear at an Examination,

the Principal of the institute is empowered to furnish him/her with a Hall-Ticket with the photograph affixed to it, enabling the candidate to appear in the Examination, and this Hall- Ticket shall have to be produced by the Candidate before he/she is admitted to the premises where the Examination is being held.

3. A Candidate who does not present himself/herself for the examination for any reason whatsoever, excepting shortage of attendance, shall not be entitled to claim refund of the whole or part of the examination fee, for subsequent Examination(s).

4. As engineering is a full time course, no candidate shall be allowed to put in attendance for a course or appear at examinations for different degrees and different faculties at one and the same time.

5. Students who have appeared once at any examination of the course need not put in fresh attendance, if they wish to reappear at the corresponding examination, notwithstanding the fact that the College may have introduced new subject. They will, however, have to appear at the examinations according to the scheme of examination and syllabi in force

R.1866

EQUIVALENCE OF THE SUBJECTS

Whenever a course or scheme of instruction is changed in a particular year, three more examinations immediately following thereafter shall be conducted according to the old syllabi/regulations. Also candidates not appearing at the examinations or failing in them shall take the examination subsequently according to the changed syllabi/ regulations as per the equivalence of the subjects as prescribed by the University.

Proposed Coding System of Subject/Paper

Six digit code for a subject (UG course)

Batch	Year	Subject no
CED	1. First Year UG	**Semester-I**
MED	2. Second Year UG	1-20 Theory
EEP	3. Third Year UG	
ECE	4. Fourth Year UG	21-30 practical
EXE	5. Fifth Year UG	31-40 Service Courses
ETC		41-49 Electives
IEX		
PED		**Semester-II**
CSE		51-70 Theory
CTD		
COE		71-80 Practical
ITD		81-90 Service Courses
EED		
EEE		91-99 Electives
ARH		
BSH		
BTD		

Structure of syllabus of subject Code No: **Title:**

Teaching Scheme **Examination Scheme**

Theory: hours/week **Class Test: Marks**

Tutorial: hours/week **Theory examination: Maximum hours**
Practical/ TermWork : hours/week **Theory examination: Maximum Marks**
Practical/ Oral examination: Maximum Marks

Objectives: 1
2
3

Unit 1:
Unit 2:
Unit 3:
Unit 4:
Unit 5:
Unit 6:

Text Books: 1

2

Reference Books: 1

2

3

4

Pattern of Question Paper:

The six units in the syllabus shall be divided in two equal parts i.e 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each , will be compulsory.
4. Two questions from remaining questions from each section A and Band students are supposed to solve two questions from each section having weightage of 15 marks

For 40 marks Paper:

1. Minimum eight questions
2. Four questions in each section
3. Question no 1 from section A and Question no 5 from section B be made compulsory and should have at least five bits of two marks out of which three to be solved.
4. Two questions from remaining questions from each section be asked to solve having weightage of 7 marks.

0.95 G R A C E MARKS FOR PASSING IN EACH HEAD OF PASSING (THEROY / PRACTICAL / ORAL / SESSIONAL) (EXTERNAL / INTERNAL)

The examinee shall be given the benefit of grace marks only for passing in each head of passing (Theory/practical/Oral/ Sessional) in external or Internal examination as follows:- Head of

passing	Grace Marks upto
Up to 50	2
051 to 100	3
101 to 150	4
151 to 200	5
201 to 250	6
251 to 300	7
301 to 350	8
351 to 400	9
And 401 and above	10

Provided that the benefit of such gracing marks given in different heads of passing shall not exceed 01 (one) percent of the aggregate marks in that examination.

Provided, further that the benefit of gracing of marks under this ordinance shall be applicable only if the candidate passes the entire examination of semester/year.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar Council, CCIM, CCIH, NCTE, UGC etc.

0.96 GRACE MARKS FOR GETTING HIGHER CLASS

A candidate who passes in all the subjects and heads of passing in the examination without the benefit of either gracing is condonation rules and whose total number of marks falls short for securing Second Class/Higher Second class of First Class by marks not more than 01 percent of the aggregate marks of that examination or up to 10 marks, whichever is less, shall be given the required marks to get the next higher class or grade as the case may be.

Provided that benefit of the above mentioned grace marks shall not be given, if the candidate fails to secure necessary passing marks in the aggregate head of passing also, if prescribed in the examination concerned.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar Council, CCIM, CCIH, NCTE etc.

0.97 GRACE MARKS FOR GETTING DISTINCTION IN THE SUBJECT ONLY.

A candidate who passes in all the subject/heads of passing in the examination without benefit of either gracing or condonation rules and whose total number of marks in the subject/s falls short by not more than three marks for getting distinction in the subject/s shall be given necessary grace marks up to three in maximum two subjects, subject to maximum 01(one) percent of the total marks of that head of passing whichever is more, in a given

examination.

Provided that benefit of the above mentioned grace marks shall be given to the candidate only for such examination/s of which provision for distinction in a subject has been prescribed.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar council, CCIM, CCIH, NCTE etc.

0.98 CONDONATION

If a candidate fails in only one head of passing, having passed in all other heads of passing, his/her deficiency of marks in such head of passing may be condoned by not more than 01 percent of the aggregate marks of the examination or 10 percent of the total number of marks of the head of passing in which he/she is failing, whichever is less. However, condonation, whether in one head of passing or aggregate head of passing be restricted to maximum upto 10 marks only.

Condonation of deficiency of marks be shown in the statement of marks in the form of asterisk and ordinance number.

Provided that this condonation of marks is concurrent with the rules and guidelines of

Professional statutory bodies at the all india level such as AICTE, MCI, Bar council, CCIM,CCIH,NCTE etc.

0.106 (A) UNFAIR MEANS COMMITTED BY THE STUDENT

1. The Board of Examinations shall be the competent authority to take disciplinary action against a student for his misconduct due to his unfair means committed by him at the examination conducted by the University.

2. The Principal, of the college or Head of the recognized Institution shall be the competent authority to take disciplinary action against a student for his misconduct due to his unfair means committed by him at the examination conducted by the University, recognized Institution of behalf of the University.

3. Definition- Unless the context otherwise requires

(a) Student means and includes a person who is enrolled as such by the University/college/Institution for receiving instruction qualifying for any degree, diploma or

certificate awarded by the University. It includes ex-student and student registered as candidate (examinee) for any of the Degree, Diploma or Certificate examinations.

(b) Unfair Means includes one or more of the following acts or omissions on the part of student/s during the examination period.

i. Possessing unfair means material and or copying there from.

ii. Transcribing any unauthorized material or any other use thereof.

iii. Intimidating or using obscene language or threatening or use of violence against invigilator or person on duty for the conduct of examination or man-handling him/her or leaving the examination hall without permission of the supervisor or causing disturbances in any manner in the examination proceedings.

iv. Unauthorized communicating with other examinees or any one else inside or out side the examination hall.

v. Mutual/Mass copying

vi. Smuggling out, either blank or written or smuggling in of answer books as copying material.

vii. Smuggling in blank or written answer book, forging and forging signature of the Jr. Supervisor therein.

viii. Interfering with or counterfeiting of University/College Institution seal or answer books or office stationary used in the examination.

ix. Impersonation at the University/college/Institution examination.

x. Revealing identity in any form in the answer written or in any other part of the answer book by the student at the University or College or Institution examination.

xi. Or any other similar act/s omission/s which may be considered as unfair means by the competent authority.

(c) "Unfair means relating to examination" means and includes directly or indirectly communicating or attempting to commit or threatening to commit any act or coercion, undue influence or fraud or malpractice with a view to obtaining wrongful gain to him or to any other person or causing wrongful loss to other person/s.

(d) "Unfair means material" means and includes any material whatsoever, related to the subject of the examination, printed, typed, handwritten or otherwise on the person or on clothes, or body of the student (examinee) or on wood or other material, in any manner or in the form of chart, diagram, map or drawing or electronic aid etc. which is not allowed in the examination hall.

(e) "Possession of unfair means material by a student" means having any unauthorized material on his/her person or desk or chair or table or at any place within his/ her reach, in the examination centre and its environs or premises at any time from the commencement of the examination till its conclusion.

(f) " Student found in possession" means a student reported in writing as having been found in possession of unfair means material by Jr. Supervisor, Sr. Supervisor, member of the Vigilance committee or Examination squad or any other person authorized for this purpose in this behalf, even if the unfair means material is not produced as evidence because of its being reported as swallowed or destroyed or snatched away or otherwise taken away or spoiled by the student or by any other person acting on his behalf to such an extent that it has become illegible.

Provided that report to that effect is submitted by the Sr. Supervisor or chief Conductor or any other authorized person to the Controller of Examinations, Principal or Head of the Institutions concerned or any officer authorized in this behalf.

(g) Material related to the subject of Examination means and includes, if the material is produced as evidence any

material certified as related to the subject of examination by a competent person and if the material is not produced as evidence or has become illegible for any of the reasons referred to in clause (f) above, the presumption shall be that the material did relate to the subject of the examination.

(h) "Chief Conductor", means and includes, Principal of the College concerned, or Head of the recognized institution concerned where concerned examination is being conducted and any other person duly authorized by him or person appointed as In charge of examination, by the authority competent to make appointment to such post.

4. Where the examination of the University courses are conducted by the constituent college/recognized Institute on behalf of the University, the Principal/Head of the concerned college/recognized Institution on receipt of a report regarding use of unfair means by any student at any such examination including breach of the rules laid down by the Management council or by the College/recognized institution for proper conduct of examination, shall have power at any time to institute inquiry and to punish such unfair means or breach of any of the rules by exclusion of such a student from any such examination or any University course in any college/Institution either permanently or for a specified period or by cancellation of the result of the student in the college/recognized Institution examination for which he/she appeared or by deprivation of any college/Institution scholarship or by cancellation of the award of any college/Institution prize or medal to him/her or by imposition of fine not exceeding Rs.300/- or in any two or more of the aforesaid ways.

5. During examination, examinees and other students shall be under disciplinary control of the Chief Conductors.

6. Chief Conductor/s of the examination centre shall in the case of unfair means, follow the procedure as under:-

(a) The student shall be called upon to surrender to the Chief Conductor, the unfair means material found in his or her possession, if any, and his/her answer-book.

(b) Signature of the concerned student shall be obtained on the relevant materials and list thereon. Concerned Senior Supervisor and the Chief Conductor shall also sign on all the relevant materials and documents.

(c) Statement of the student and his undertaking in the prescribed format and the statement of the concerned Jr. Supervisor and Sr. Supervisor shall be recorded in writing by the Chief Conductor (Appendix-III). If the student refuses to make statement or to give undertaking the concerned Sr. Supervisor and / or Chief Conductor shall record accordingly under their signature.

(d) Chief Conductor shall take one or more of the following decisions depending upon seriousness/gravity of the case:-

i) In the case of impersonation or violence, expel the concerned student from the examination and not allow him/her to appear for remaining examination.

ii) Obtain undertaking from the student to the effect that the decision of the concerned competent authority in his/her case shall be final and binding and allow him/ her to continue with his/ her examination.

iii) May report the case to the concerned Police Station as per the provision of Maharashtra Act No. XXXI 1982 – An act to provide for preventing Malpractice's at University Board and other specified examinations (Appendix-III) (Performa A& B).

iv) Confiscate his / her answer books, mark it as suspected unfair means case and issue him/her fresh answer books duly marked.

v) All the material and list of material mentioned in sub-clause (a) and the undertaking with the statement of the student and that of the Jr. Supervisor as mentioned in clause no. (b) & (c) and the answer-book/s shall be forwarded by the Chief conductor along with his report to the concerned Controller of Examinations/Principal/Head of the Institution, as the case may be, in a separate and confidential sealed envelope marked " suspected unfair means case"

vi) In case of unfair means of oral type, the Jr. Supervisor and the Sr. Supervisor or concerned authorized person shall record the facts in writing and shall report the same to the concerned Controller of Examinations/Principal/Head of the Institutions, as the case may be.

PUNISHMENT

The competent authority concerned i.e. the Board of Examinations in the case of University examination, the concerned Principal in the case of college examinations held by the recognized Institutions, after

taking into consideration the report of the committee shall pass such orders as it deem fit including granting the student benefit of doubt, issuing warning or exonerating him/her from the charges and shall impose any one or more of the following punishment on the student/s found guilty of using unfair means:-

(a) Annulment of performance of the student in full or in part in the examination he/she has appeared for.

(b) Debarring student from appearing for any examination of the University or college Institution for a stipulated period not exceeding five year.

(c) Debarring student from appearing for any examination of the University or college Institution for a stipulated period not exceeding five year.

(d) Cancellation of the University or College or Institution scholarship/s or award/s prize or medal etc. awarded to him/her in that examination.

(e) In addition to the above mentioned punishment, the competent authority may impose a fine not exceeding Rs.300/- on the student declared guilty. If the student concerned fails to pay the fine within a stipulated period, the competent authority may impose on such a student additional punishment/penalty as it may deem fit.

(f) The student concerned be informed of the punishment finally imposed on him/her in writing by the competent authority or by the officer authorized by it in this behalf, under intimation to the College/Institution

he/ she belongs to.

(g) An appeal against the findings of the committee shall lie with the concerned competent authority whose decision shall be final and binding.

(h) An appeal made in writing within a period of 30 days from the date imposition of the punishment shall be considered by the competent authority on merit and shall be decided on the basis of the evidence available in the case and shall be heard in person in deserving cases, if the competent authority finds substance in the appeal, the competent authority shall supply a typed copy of the relevant extract of fact-finding report of the inquiry committee, as well as documents relied upon (if not strictly confidential). Decision in the appeal shall be informed to the student concerned accordingly.

(i) The court matters in respect of the unfair means cases should be dealt with by the respective competent authority.

(j) As far as possible the quantum of punishment should be as prescribed (Category-wise in Appendix- I

APPENDIX-I

THE BROAD CATEGORIES OF UNFAIR MEANS ADOPTED BY STUDENTS AT THE UNIVERSITY/ COLLEGE/ INSTITUTION EXAMIANTION AND THE QUANTUM OF PUNISHMEN T FOR EACH CATEGORY THEREOF.

Sr. No.	**Nature of Malpractices**	**Quantum of Punishment**
1.	Possession of copying material	(Note:- This quantum of punishment Shall apply also ot the following categories of malpractices at Sr. No. 2, to Sr. No.12 in addition to the Punishment prescribed thereat)
2.	Actual copying from the copying material	Exclusion of the student from university or College or Institution examination for one additional examination.
3.	Possession of another students Answer Book	Exclusion of the student from University or College or Intuition examination for one additional examination (Both the students)
4.	Possession of another students Answer book+ actual evidence of Copying	Exclusion of the student from University or College or Institution examination for two additional examination (Both the Students)
5.	Mutual / Mass copying.	Exclusion of the student from University or College or Institution examination for two additional examinations.

6 (a)	Smuggling out or smuggling in of Answer book as copying material.	Exclusion of the student from University or College or Institution examination for two additional examinations.
(b)	Smuggling in of written answer book based on the question paper set at the examination	Exclusion of the student from University or College or Institution examination for three additional examinations
(c)	(c) Smuggling in of written answer book and forging signature of Jt, Supervisor thereon	Exclusion of the student from University or College or Institution. Examination for four additional examinations.

7.	Attempt to forge the signature of the Jr. Supervisor on the answer book or Supplement.	Exclusion of the student from the University or College or Institution examination for four additional examinations.
8	Interfering with or counterfeiting of University / College/ Institution seal or Answer books or office stationary used in the examination	Exclusion of the student from University or College or Institution examination for four additional examinations.
9.	Answer book main or supplement written outside the examination hall or any other insertion in answer book.	Exclusion of the student from University or College or Institution examination for four additional examinations.
10.	Insertion of currency notes/to bribe or attempting to bribe any of the persons/s connected with the conduct of Examination	Exclusion of the student from University or College or Institution Examination for four additional examinations. (Note:- This money shall be created to the Vice-Chancellor's Fund)
11.	Using obscene language/violence/ threat at the examination centre by a student at the University/ College / Institution Examination to Jr./ Sr. Supervisor/ Chief Conductor or Examiners.	Exclusion of the student from University or College or Institution examination for four additional Examinations.
12.(a)	Impersonation at the University/ College / Institution examination	Exclusion of the Student from University or College or Institution examination for five additional examinations, (Both the students if impersonator is University or College or Institute student)

(b)	Impersonation by a University/ College/ Institute student at S.S.C./ H.S.C./ any other Examinations.	Exclusion of the Student from University or College or Institution examination for five additional examinations
13.	Revealing identity in any form in the answer written or in any other part of the Answer book by the student at the University or College or Institution Examination	Annulment of the performance of the student at the University or College or Institution Examination in full.
14.	Student found having written on palms or on the Body, or on the clothes while in the	Annulment of the performance of the student at University or College or

	Examination	Institution Examination in full.
15.	All other mal-practices not covered in the aforesaid categories.	Annulment of the performance of the student at the University or college or Institution Examination in full and severe punishment depending upon the gravity or the offence.
16.	If on previous occasion a disciplinary action was taken against a student for malpractice used at examination and he/she is caught 'again for malpractices used at the examinations, in this event he/she shall be dealt with severely. Enhanced punishment can be imposed on such student. This enhanced punishment may extend to double the punishment provided for the offence when committed at the second or subsequent examination.	
17.	**PRACTICAL/DISSERTATION/PROJECT REPORT EXAMS.**	
	Student involved in malpractices at practical/ dissertation/ project report examination shall be dealt with as per the punishment provided for the theory examination.	
18.	The competent authority in addition to the above mentioned punishments may impose a fine not exceeding Rs. 300/- on the student declared guilty.	
	Note:- The term annulment of performance in full' includes performance of the student of the theory as well as annual practical examination, but does not include performance at term work, project work and dissertation examination unless malpractice used thereat.	

DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERITY, AURANGABAD

FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR SYALLBUS FOR (EC/ECT/E&C) ENGINEERING

Sr.No.	Semester - I	Contact Hrs/Week				Examination Scheme (Marks)					
Sub Code	Subject	L	T	P	Total	CT	TH	TW	P	Total	Duration of Theory Examinatio
Part- I											
EXD401	Digital Image Processing	4	-		4	20	80	-	-	100	3 hrs.
EXD402	Embedded Systems	4	-		4	20	80	-	-	100	3 hrs.
EXD403	VLSI Design	4	-		4	20	80	-	-	100	3 hrs.
EXD404	Microwave & Radar Engineering (ECT/E & C)	4	-		4	20	80	-	-	100	3 hrs.
EXD405	Robotics (EC)	4	-		4	20	80	-	-	100	3 hrs.
EXD441-4	EL-1	4	-		4	20	80	-	-	100	3 hrs.
EXD421	Lab-1- Digital Image Processing	-	-	2	2	-	-	-	50	50	
EXD422	Lab-2- Embedded Systems	-	-	2	2	-	-	-	50	50	
EXD423	Lab-3- VLSI Design	-	-	2	2	-	-	-	50	50	
EXD424	Lab-4-Microwave & Radar Engineering (ECT/E & C)	-	-	2	2	-	-	25		25	
EXD425	Lab-5-Robotics (EC)	-	-	2	2	-	-	25		25	
EXD426	Lab-6-EL-I	-	-	2	2	-	-	25		25	
EXD427	Lab-7- Project -I	-	-	2	2	-	-		50	50	
Total of Part-I		**20**	**-**	**12**	**32**	**100**	**400**	**50**	**200**	**750**	

Elective –I

ECT

EXD 441 - Artificial Neural Network& Fuzzy Logic
EXD 442 - Wireless Mobile Communication
EXD 443 -Biomedical Electronics
EXD 444 -Advanced Industrial Automation
EXD 445 -Open Elective-I

EC

EXD 441 -Advanced PowerE
EXD 442 -Consumer Electronics
EXD 443- Biomedical Electronic
EXD 444 - Advanced Industrial Automation
EXD 445 - Open Elective-I

Electronics & Communication

EXD 441 -Artificial NeuralNetwork & Fuzzy Logic
EXD 442 -Wireless Mobile Communication
EXD 443 -Biomedical Electronics
EXD 444 - Advanced Industrial Automation
EXD 445-Open Elective-I

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Sr.No.	Semester - II	Contact Hrs/Week				Examination Scheme (Marks)					
Sub Code	Subject	L	T	P	Total	CT	TH	TW	P	Total	Duration of Theory Examinatio
	Part- II										
EXD451	Computer Communication Network	4	-		4	20	80	-	-	100	3 hrs.
EXD452	Optical Fiber Communication	4	-		4	20	80	-	-	100	3 hrs.
EXD453	Consumer Electronics(ECT/E& C)	4	-		4	20	80	-	-	100	3 hrs.
EXD454	Applied Digital Signal Processing (EC)	4	-		4	20	80	-	-	100	3 hrs.
EXD491-4	EL- II	4	-		4	20	80	-	-	100	3 hrs.
EXD471	Lab 1- Computer Communication Network	-	-	2	2	-	-	-	50	50	
EXD472	Lab 2 - Optical Fiber Communication	-	-	2	2	-	-	-	50	50	
EXD473	Lab 3-Consumer Electronics(ECT/E& C)	-	-	2	2	-	-	-	50	50	
EXD474	Lab 4- Applied Digital Signal Processing (EC)	-	-	2	2	-	-	-	50	50	
EXD475	LAB-5-EL-II	-	-	2	2	-	-	50	-	50	
EXD476	Lab 6- Project II	-	-	6	2	-	-	50	100	150	
	Total of Part-II	16	-	14	30	80	320	100	250	750	
	Total of Part-I & II	**36**		**26**	**62**	**180**	**720**	**150**	**450**	**1500**	

Note: 1. Minimum two tests should be conducted for each theory subject and average of best two tests should be considered. **2.** If feasible, all the students shall undergo In-plant Training of two to four weeks in concerned Industry, during summer vacation. They should submit a report and give presentation on the same during Final Year.

L: Lecture Hours per week T: Tutorial Hours per week P: Practical Hours per week CT: Class Test

TH: University Theory Examination TW: Term Work P: Practical /Oral Examination

Elective –II

ECT

EXD 491- Antenna Theory & Wave Propogation
EXD 492- ADSP
EXD 493 -Robotics
EXD 494 -Satellite Communication
EXD 495 -Open Elective-II

EC/IE

EXD491 -Microwave and R
EXD 492-Mobile Com
EXD 493- Satellite Commun
EXD 494 -Industrial Drives &
EXD 495 -Open Elective-II

Electronics & Communication

EXD 491 -Antenna Theory & Wave
EXD 492 -ADSP
EXD 493- Robotics
EXD 494 -Satellite Communication
EXD 495 -Open Elective-II

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-401 – Digital Image Processing	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : 50 Marks** **Term Work: -----**

Objective:

1. This course gives the knowledge of fundamentals of Digital Image Processing.
2. Students will learn proper image representation, enhancement, filtering, restoration, analysis, reconstruction.
3. Students will learn advanced digital image processing techniques, and various image transformations, image reconstruction from incomplete information, image segmentation and recognition.

Unit-1 **Introduction to Digital Image Processing:** Digital Image, Digital image from analog image, Digital image representation, fundamental steps in image processing, elements of digital image processing systems, hardware for image processing system, image digitizer, Types of digitizer, Image digitizing components, Image Acquisition. Acquisition component, classification of image, Types of image, Different file format used. Digital image fundamentals: Elements of visual perception, a simple image model Sampling and quantization some basic relationship between pixels, image Geometry, Basic transformations, perspective transformation camera model and Calibration, stereo imaging.	08
Unit-2 **Image Transform:** 2-D Fourier transform, Fast Fourier transform, Properties, Other separable transforms, Walsh Transform, Hadamard Transform, Slant Transform, Discrete Cosine Transform, Haar function,with simple numerical based on transformation.	06
Unit-3 **Image Enhancement :** Image enhancement in spatial domain, enhancement through point processing, Basic grey level Transformations, Histogram Processing, Enhancement using arithmetic and logic operations. Enhancement by point Processing Spatial Domain Filtering-smoothing and sharpening filters Frequency Domain Filtering- smoothing and sharpening filters with simple programs, numerical based on above.	06
Unit-4 **Image Segmentation:** Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region based segmentation, Use of watershed, Image representation- Chain codes, Boundary and Regional Descriptors. with simple programs, numerical based on above	06
Unit-5 **Image Compression:** Need for image compression, Redundancies, classification of redundancies ,Fidelity criteria, Error free compression, image compression models, classification of image compression scheme ,elements of information theory, error free compression variable length coding, Huffman coding,Arithmatic coding bit plane coding, lossless predictive	08

coding, lossy compression, predictive coding, transform coding, image compression standards- JPEG, MPEG. with simple programs, numerical based on above	
Unit-6 **Morphological Image Processing & IP Applications:** Basic operations dilation and erosion, opening and closing operations, Basic processing such as region filling, thinning, thickening,pruning,skeletons , convex hull for binary and grey scale images with simple programs, numerical based on above Applications: Biometric,Security,Communication, Medical imaging such as MRI,CT, X-ray, morphological in grey and binary images-ray,morphological in grey and binary images	06

Text Books/Reference Books:

1. "Digital Image Processing", Gonzalez, Woods, PHI, 2nd edition.
2. "Digital Image Processing", Milan Sonka,Castleman k.r. printicehall 1996.
3. "An introduction to DIP", Bill Silver.
4. "An introduction to DIP", A.K. Jain.
5. "Digital Image Processing",S Jayaraman,S Esakkiranjan,McGraw Hill Education Private Limited.
6. Digital Image Processing PIKS Scientific Inside, 4ed, w/cd Wiley Publications

Practical Examination:

The students should do the MATLAB programming based on syllabus at least ten programmes in practical write-up.

EXD-421 List of Experiments:

1. Write a program to extract different attributes of an image
2. Write a program for Image negation, power Law correction
3. Write a program for Histogram mapping & equalization, stretching
4. Write a program for Image smoothing , sharpening
5. Write a program for Edge detection – use of Sobel, Prewitt and Roberts operators
6. Write a program for Morphological operations on binary images
7. Write a program for Morphological operations on Gray scale images
8. Write a program for Pseudo coloring
9. Write a program for Chain coding
10. Write a program for Image statistics
11. Write a program for DCT/IDCT computation
12. Write a program for Transform application assignment.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks Papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-402 – Embedded Systems	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : 50 Marks** **Term Work: -----**

Objective:

1. To get students familiar with the typical problems and constraints that arise while designing and developing embedded systems**.**
2. To make students capable to design and implement an embedded system, following the model-centric design.
3. To introduce theoretical and practical solutions to typical problems that the students are expected to master.

Unit-1 **Embedded system Introduction:** Introduction to Embedded System, Definition, overview, Design challenges, optimizing design metrics, common design metrics, applications of embedded systems and recent trends in embedded systems, hardware and software design and testing, communication protocols like SPI, I2C, CAN etc	06
Unit-2 **System Architecture:** RISC &CISC Processor comparison, Introduction to ARM7 core architecture, ARM7core extensions, ARM Processor families, Pipeline, memory management, Bus architecture.	06
Unit-3 **ARM instruction set & On chip Peripherals:** ARM instruction set, thumb Instruction set, Study of on-chip peripherals like I / O ports, timers, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, USB,I2C etc. (Use 2148/2368/2378 as reference micro-controllers)	08
Unit-4 **Interfacing and Programming:** Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays including LEDs, Graphic LCD, interfacing of input devices including Key board, touch screen etc.	08
Unit-5 **Real Time Operating System Concept:** RTOS services in contrast with Traditional OS, Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, events, and memory management.	06
Unit-6 **Introduction to UCOS II:** Introduction to Ucos II RTOS, Use of UCOSII, UCOS service functions like time delay functions, semaphore related functions etc., porting of RTOS. Case study of Digital Thermometer, Smart cards	06

Text/Reference Books:

1. "Embedded Systems", Rajkamal, TMH
2. "Embedded systems software primer", David Simon , Pearson
3. "ARM System-on-Chip Architecture", Steve Furber, Pearson
4. "MicroC / OS-II", Jean J Labrose, Indian Low Price Edition
5. "Embedded / real time system", DR.K.V.K.K. Prasad, Dreamtech
6. "Embedded real systems Programming", Iyer, Gupta, TMH
7. "Embedded System Design", Steve Heath, Neuwans
8. " ARM System Developers Guide", Andrew Sloss
9. "Introduction to Embedded Systems", KV Shibu TMH
10. Embedded System Design: A Unified Hardware / Software Introduction Wiley Publications

Practical :

EXD-422 List of Experiments.

The practical examination will be of three hours duration. It will consist of one experiment conducted during the course and an Oral examination based on the syllabus.

1. LED Patterns: Generate any four random patterns on LED Matrix.
2. Square wave Generation: ARM using timer function.
3. ARM to PC Communication via UART Transmit a message via UART of ARM and display it on Terminal of PC.
4. Decimal Counter and Multiplexing the Output: Implement a decimal counter, which counts from 0 to 99 on SSD?
5. Keyboard interfacing Sense key and display the appropriate code on SSD.
6. Steeper Motor Interfacing
7. Implementing I2C Communication Protocols: Interface EEPROM using I2C Communication protocols.
8. LCD Interface: Interface LCD with ARM using only 4 pins
9. IR Remote Control Receiver: Implement IR remote control receiver using ARM
10. Implementation of simple calculator using ARM 7TDMI: with keyboard and LCD display Interface.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-403 – VLSI Design	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : 50 Marks** **Term Work: -----**

Objective:

1. To make the students able to understand the concepts of VLSI design and to design various analog systems including data converters- CMOS.
2. Amplifiers- Comparators and Switched Capacitor Circuits and optimize them with respect to different constraints: size (cost), speed, power dissipation, and reliability.
3. To acquaint the Students with bottom-up and a top-down design view of Mixed Signal Electronic Systems by the use of modern Computer Aided.

Unit-1 **Introduction to VHDL:** Introduction to integrated circuit technology, The integrated circuit era, Moore's law, VLSI Design flow, Introduction to EDA tools, VHDL Design Units, Basic language Elements, Architecture modeling styles: Behavioural modeling, Dataflow modeling, Structural modeling. Comparison of various Hardware Description Languages.	08
Unit-2 **Circuit Design using CPLD & FPGA:** Function, procedures, Attributes, Test benches, Packages and configurations, The State diagram, modeling in VHDL with examples such as counters, Registers and Bidirectional bus. CPLD, FPGA, Comparison of CPLD & FPGA, Architecture of XC9500 CPLD Family and XC4000 FPGA Family.	08
Unit-3 **Fault Tolerance and Testability:** Types of fault, stuck-Open and Stuck-short faults, stuck at 1& 0 fault, Fault coverage, Need of Design for testability, Testability, Design-for -testability, controllability and absorbability, Boundary Scan check, JTAG technology, TAP controller and TAP controller state diagram, Scan path, Full and partial scan.	04
Unit-4 **Introduction to CMOS:** Introduction to MOS Technology, I – V Characteristics of NMOS and PMOS, CMOS Inverter, voltage transfer curve, Velocity saturation & Mobility degradation, Channel Length Modulation, body effect, Subthreshold Conduction, velocity saturation, junction leakage, Tunneling. Static and dynamic dissipations, Power delay product. Noise margin, Detailed analysis of CMOS Inverter with parasitic.	08
Unit-5 **CMOS Design:** CMOS Logic families: Static & Dynamic, Ratio Circuits, Pass transistor logic. CPL, Combinational logic design, Transmission gate, design using pass transistor logic, design using TGs.	06
Unit-6 **Fabrication and Layout:** Basic CMOS Technology: Self aligned CMOS process, N well, P well, Twin tub, Layout of CMOS Inverter, CMOS Layout and Design rules.	06

Text Books

1. Doulas Perry, VHDL, Third Edition, Tata McGraw Hill.
2. Neil H. E. Weste,Devid Harris and Ayan Banerjee, CMOS VLSI Design, Third Edition, Pearson.
3. Kang S. M.,CMOS Digital Integrated Circuits,TMH 3rd 2003
4. J. Rabaey, Digital Integrated Circuits: A Design Perspective, Second Edition Prentice Hall India, 2003.
5. John P. Uyemura, Introduction to VLSI Circuits and Systems, Wiley Student Edition
6. Douglas Pucknell & Kamran Eshraghian, Basic VLSI Design, Third Edition, PHI.
7. VLSI Design Black Book, Prasad Wiley Publications

Reference Books

1. J. Bhasker, VHDL PRIMER, Third Edition, PHI.
2. Boyce and Baker "CMOS" EEE Press.
3. Xilinx FPGA /CPLD Data Book

Practical Examination :

EXD-423 List of Experiments

The practical examination will be of three hours duration. It will consist of one experiment Conducted during the course and an Oral examination based on the syllabus.

1. Introduction to VLSI Lab (XILINX ISE,Microwind Tools,VHDL,Verolog code)
2. Design and implementation of logic gates (AND,OR,NOT,NAND,XOR,XNOR)
3. Design and implementation of Adder (H.A,Full adder by H.A, 4 Bit adder)
4. Design and implementation of MUX, DEMUX, and DECODER using data flow modeling.
5. Design and implementation of DECODER using data flow modeling.
6. Design and implementation of FF (SR,JK,)
7. Design and implementation of FF (D,T)
8. Design and implementation of COUNTER
9. Layout design of PMOS, NMOS using microwind

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-404 – Microwave and Radar Engineering (ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**

Objective:

1. Basic concepts of microwave communication and transmission line.
2. Building blocks of microwave communication.

Unit-1 **Introduction to Microwave Transmission Lines and Components:** History of Microwaves, Microwave Frequency bands. WAVEGUIDES: Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular wave guide, TEM mode in rectangular wave guide, cut off frequency, characteristic impedance, introduction to circular waveguides and planar transmission lines. Introduction to Scattering Parameters. **Microwave Passive Components:** Directional Coupler, Power Divider, tees, attenuator, resonator, Isolators, circulators along with S matrix.	08
Unit-2 **Active Microwave Semiconductor Devices and Tubes:** **Microwave Semiconductor Devices:** Gunn Diodes (Gunn Effect, operation, modes of operation, microwave generation and amplification), tunnel diode (Tunneling, tunnel diode Amplifier and Oscillator), IMPATT diodes, Varactor diodes, Parametric Amplifiers **Microwave Tubes:** Klystron (Two and multi cavity klystron), reflex klystron, traveling wave tube, microwave crossed field tubes - magnetron (operation, characteristics and applications)	08
Unit-3 **Modern Trends in Microwaves Engineering:** Effect of Microwaves on human body. Medical and Civil applications of microwaves. Electromagnetic interference / Electromagnetic Compatibility (EMI / EMC). Monolithic Microwave IC fabrication. RFMEMS for microwave components. Microwave Imaging.	04
Unit-4 **Fundamentals of Radar:** Block diagram of radar, radar equation, radar frequencies, applications of radar, Detection of Signals in Noise, Probability of Detection and false alarm, Integration of pulses, Radar cross-section of targets, cross-section fluctuations, PRFs and Range Ambiguities, Antenna parameters, System losses and propagation effects. Noise figure, radar mixers, Duplexers, A scope and PPI display, Matched Filters	08
Unit-5 **MTI and Pulse Doppler Radar:** Introduction to Doppler and MTI radar, Delay line cancellers, MTI Improvement factor, Staggered PRFs, Doppler Filter banks, Digital MTI processing, Limitations to MTI	08

performance, AMTI, Pulse Doppler Radar, Sub clutter Visibility, Non-coherent MTI radar.	
Unit-6 **Antenna Scanning and Tracking:** Mono pulse tracking, conical scan and sequential lobbing, low angle tracking, phased array, planner array, Limitations to tracking accuracy.	04

Text Books:

1. Liao S. Y., "'Microwave devices and Circuits", Prentice Hall of India
2. Skolnik , Introduction to radar system, Tata Mc-Graw Hill pub.

Reference Books:

1. Rizzi P.A., "Microwave Engineering, Passive Circuits Hall of India
2. Pozar D.M., "Microwave Engineering", John Wiley
3. M.Kulkarni., "Microwave devices and Radar Engg."Umesh Publications
4. Chatterji R., *Microwave Engineering*, Special topics, East West Press
5. Peyton Z. Peebles, Jr., "RADAR PRINCIPLES", Wiley Publications

EXD-424 List of Experiments: *Any 8 out of the following experiments;*

1. Study of microwave components.
2. To plot modes (characteristics) of reflex klystron.
3. Study of microwave Tee's.
4. Plot V/I characteristics of Gunn oscillator.
5. Study of characteristics of Isolator and Circulator
6. Measurement of guide wavelength & frequency in Rectangular Waveguide.
7. Microwave power (Low/High) measurement
8. Measurement of vibrations of tuning fork using Radar.
9. Measurement of velocity of moving object using Radar.
10. Measurement of RPM of moving Fan using Radar.
11. Measurement of frequency and time of moving object using Radar.

Section A: Unit 1, 2, 3
Section B: Unit 4,5,6
PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10
4. Marks.
5. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-405 – Robotics (EC)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**

Objective:

1. To study Basic concept of robotics.
2. Building block of robotics for transformation.

Unit-1 **Introduction:** Automation and Robotics, Definition, Basic Structure of Robots, Classification of Robots based on co-ordinate system, Present trends and future trends in robotics, Overview of robot subsystems, Components of Robot system- Manipulator, Controller, Power conversion unit etc, Specifications of robot.	08
Unit-2 **Dynamics:** Dynamic constraints, velocity & acceleration of moving frames, Robotic Mass Distribution & Inertia, Tension, Newton's equation, Euler equations, Dynamic Modeling of Robotic Manipulators.	04
Unit-3 **Kinematics:** Homogeneous co-ordinate vector operations, matrix operations, co-ordinate reference frames, Homogeneous transformation and manipulator orientation relative points reference frames, forward solutions- Link co-ordinate frames, D-H matrix, Inverse or back solutions- problem of obtaining inverse solution, techniques of using direct & geometric approach.	08
Unit-4 **End Effectors and Actuators:** Different types of grippers, vacuum & other methods of gripping, overview of actuators, Internal & External sensors, position, relocking and acceleration sensors, proximity sensors, force sensors, touch slip laser range tinder, camera.	08
Unit-5 **Motion Planning and Controllers:** On-off trajectory, relocking and acceleration profile, Cartesian motion of manipulator, joint interpolated control, Jacobian in terms of D-H matrix, Obstacle avoidance, Basic control system, control loops of robotic system, Fuzzy controllers.	06
Unit-6 **Robot Vision:** Machine Vision system, description, sensing, Digitizing, Image Processing and Analysis and Application of Machine Vision System, Robotic assembly sensors & Intelligent Sensors. Object recognition.	06

Text Books:

1. Fundamentals of Robotics: Analysis and Control – Robert J Schilling, PHI, NewDelhi
2. Robotic Engineering – Klafter, Thomas, Negin, PHI, New Delhi
3. Introduction to Robotics: Analysis, Control, Applications, 2ed, Niku, Wiely Publication

Reference Books:

1. Robotics for Engineers – Yoram Koren, McGraw Hill, New York
2. Fundamentals of Robotics – T.C. Manjunath, Nandu Publishers, Mumbai
3. Robotics and Control- R. K. Mittal, I. J. Nagrath, TMH, NewDelhi
4. MEMS and Microsystems Design and Manufacture- HSU, TMH, NewDelhi

Practical Examination:

The practical examination will be of three hours duration. It will consist of one experiment Conducted during the course and an Oral examination based on the syllabus.

Term work:

Term work will consist of record of minimum 8 experiments out of the following list

EXD-425 List of Experiments:

1. Study of motion conversion (rotary to rotary, rotary to linear) using mechanical components.
2. To build robot arms using mechanical components and applying motor drive.
3. To build robot for given configuration and degrees of freedom.
4. Motion of robot for each degree of freedom. Teaching a sequence to robot using
5. Teach Pendant.
6. To perform pick and place operation using Simulation Control Software.
7. Robot path planning using Simulation & Control Software.
8. Study of Pneumatic Robot OR Study of Robot Vision System.
9. 2D simulation of a 3 DOF robot arm. (C / C++ OR MATLAB)
10. Direct Kinematics analysis of 4-axis robot. (C / C++ OR MATLAB)

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-441 – Artificial Neural Network & Fuzzy Logic(EL-I For ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**

Objective:

1. To teach the students about the concepts of artificial neural networks.
2. To study basic networks in supervised learning
3. To study basic networks in unsupervised learning
4. To teach the concept of fuzziness involved in various systems.
5. To provide adequate knowledge about fuzzy set theory.
6. To provide comprehensive knowledge of fuzzy logic control

Unit-1 **Artificial Neural Network:** Fundamental concept, Basic models of ANN, Terminologies, McCulloch-Pitts Neuron, Linear Separability	04
Unit-2 **Supervised Learning Network:** Perceptron, Adaptive Linear Neuron, Back Propagation Network Time delay Neural network **Associative Memory Networks:** Training Algorithms for pattern Association, Autoassociative Memory Network, Bidirectional Associative Memory, Hopfield networks	08
Unit-3 **Unsupervised Learning Networks:** Fixed Weight Competitive nets, Kohonen Self Organizing Feature maps ,Learning vector quantization, Counter propagation networks, Adaptive resonance theory network	08
Unit-4 **Fuzzy Logic:** Introduction, Classical sets, Fuzzy sets, Classical relations, Fuzzy relations Membership Functions :Features, Fuzzification, Methods of Membership Value Assignments	08
Unit-5 **Defuzzification:** Lambda cuts for Fuzzy sets and Fuzzy relations, Defuzzification methods Fuzzy arithmetic: Fuzzy arithmetic ,Extension principle, Measures of Fuzziness Fuzzy Rule Base: Truth values and Tables in Fuzzy logic, Fuzzy Propositions ,Formation of rules, Decomposition of rules ,Fuzzy reasoning, Fuzzy Inference systems	08
Unit-6 **Fuzzy Decision making:** Individual Decision making ,Multiperson decision making Fuzzy Logic Control Systems	04

Text Books

1. S.N Sivanandam, S.N Deepa ‘Principles of Soft Computing’ Second Edition Wiley India
2. Timothy J. Ross, ‘Fuzzy Logic with Engineering Applications’ ,Third Edition Wiley India

Reference Books

1. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home
2. Simon Haykin, 'Neural Networks And Learning Machines', 3rd Edition PHI Learning

EXD-426 List of Experiments:

1. Program to implement AND function using ADALINE with bipolar inputs and outputs
2. Program to construct and test auto associative network for input vector using HEBB rule
3. Program to implement Discrete Hopfield Network and test input pattern
4. Program to implement Kohonen self organizing feature maps for given input pattern
5. Program to implement fuzzy set operations and properties
6. Program to implement composition of Fuzzy and Crisp relations
7. Program to find union, intersection and complement of Fuzzy sets
8. Program to depict membership functions

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-441 – Advanced Power Electronics(EL-I For EC)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**

Objective:

1. To impart knowledge of recent and advanced developments in PE area
2. To learn the advanced applications in PE converters.
3. To introduce the topologies of energy conversion in PE.

Unit-1 **Modern semiconductor devices and practical design consideration:** Thyristor, GTOs, IGBT, MCT their basic characteristics, power integrated circuits. Gate and base drive circuits-Design consideration for different circuits, DC-coupled circuits, isolated drive circuits and protection in drive circuits. Snubber circuit design. Temperature control and Heat sink design.	08
Unit-2 **Advanced DC-DC Power Converters:** Introduction, Step-Down (Buck) converters, Step-Up (Boost) Converters Buck-Boost Converters, Cuck converters Control principals. DC-DC Converter operation in DCM/CCM mode. Multi-phase and multilevel DC-DC converter operation. Applications of DC-DC Converters. Isolated and non isolated converter topology.	08
Unit-3 **Switching DC Power Supplies:** Linear power supplies, switching power supplies, Fly back converters, Half bridge and Full bridge Converters, Forward converters, Push-Pull Converters. Protection, isolation and design criteria for SMPS.	04
Unit-4 **Advanced DC-AC Power Converters:** Resonant Converters, DC-AC Converter control and their various PWM techniques. Multilevel and multiphase DC-AC Converters. Design and modeling of converters with their performance parameters.	08
Unit-5 **Power Electronics Applications:** Electronic Ballasts, UPSs, Power Electronic in capacitor charging, Power Electronics for Renewable Energy sources, Automotive Applications of Power Electronics. Power conditioners and their Applications. Power Quality IEEE standards, Thyristor controlled Reactor (TCR), Thyristor switched capacitors (TSC).	08
Unit-6 **Computer Simulation of power Electronics and Control Methods:** Use of simulation tools for design and analysis, simulation of Power Electronics Circuits with Pspice, PSIM, Matlab-Simulink, Control Methods for Power Converters using sliding mode control, Fuzzy Logic control.	04

Text Books/Reference Books:

1. M.H.Rashid, "Power Electronics, Circuit, Devices and Applications'', Third Edition, 2000, PHI.
2. Lender C.W., "Power Electronics'' Third Edition, 1989, McGraw Hill.
3. M.D.Singh, Khanchandani K.B., "Power Electronics'', 2001, Tata McGraw Hill.
4. M.H.Rashid, "Introduction to Pspice Using ORCAD for Circuits and Electronics'',Third Edition, 2006, PHI.
5. Mohan, Power Electronics: Converters Applications and Design, Media Enhanced, 3ed, w/cd, Wiely Publication

EXD-426 List of Experiments:

Minimum eight experiments based on above syllabus should be carried out with Hardware experiments to understand advanced power converters and developing prototype of power converters.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

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4. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-442 – Wireless Mobile Communication(EL-I For ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**

Objective:

1. Basic concepts of Cellular communication
2. Building blocks of Mobile communication
3. Traffic Routing and Grade of Service
4. Wireless Systems and Standards

Unit-1 **Wireless Communication Fundamentals:** Introduction & Fundamental terms of communication, Evolution of Mobile Radio communication, Frequencies for radio transmission, Overview of existing technologies around the world, Cellular system, its architecture & operation. Overview of Multiple access schemes for wireless communication -TDMA, FDMA, CDMA, SDMA.	06
Unit-2 **Wireless System Design Concepts**: Concept of Frequency reuse & its analysis, Channel Assignment Strategies, Hand-off, its necessity & advantages, roaming, co-channel & adjacent channel interference, Trunking and Grade of Service, Improving coverage and capacity in cellular systems.	08
Unit-3 **Wireless Networks**: Overview of 1G, 2G, 3G, 4G wireless networks, Traffic Routing in Wireless Networks, Wireless Data Services, ISDN, SS-7, PCS/PCNs, GPRS , DECT , UMTS , IMT-2000, Blue tooth, DTH.	08
Unit-4 **Digital Cellular Systems: GSM** Features & mobile services, architecture & interfacing, signal processing, frame structure, Channels-TCH & CCH, Messaging & call processing, Message flow for MTC and MOC, Types of handover in GSM, process of Intra-MSC handover in GSM.	06
Unit-5 **Wireless Protocols & Standards**: Protocols for network access-PRMA, Mobile IP, WAP, Wireless LAN IEEE 802.11& its Architecture, IEEE 802.11a, 802.11b standards, IEEE802.15.4 & Zigbee.	06
Unit-6 **CDMA & Mobile OS:** CDMA Architecture, Features & mobile services, CDMA & GSM comparison, Architecture, Mobile Operating systems- Symbian, RIM, iOS& Android features & different versions- KitKat, Jelly-Bean, Ice Cream Sandwich etc.	06

Text Books/Reference Books:

1. Joschen Schiller, "Mobile Communication", Pearson Education 2003.
2. T.S. Rappaport, "Wireless Communications: Principles and Practice", Second Edition, Pearson Education.
3. William Lee, "Mobile Cellular Tele-communication", Tata McGraw Hill.

4. William Stalling, "Wireless Communication & networking" Pearson.
5. Upena Dalal,"Wireless communication", Oxford university press.
6. Prashant Krishna Murthy & Kavehpahlavan, "Principles of Wireless networks" PHI.
7. Hansmann,Principles of Mobile Computing, 2ed, Wiely Publication

EXD-426 List of Experiments:

Perform any seven Experiments out of 1 to 9. Experiment No.10 is Compulsory.

1. To Study different Multiple access techniques.
2. To Demonstrate & performs installation of GSM trainer kit.
3. To Perform Call generation and termination using AT commands.
4. To Perform sending and reading of SMS using AT command.
5. To check network availability using AT command.
6. To measure signal strength using AT commands.
7. To Demonstrate & perform installation of CDMA trainer kit.
8. To generate and transmit data with PN sequence using CDMA trainer kit.
9. To separate data and PN sequence at receiver using CDMA trainer kit.
10. To perform mini project on the basis of any one mobile OS from chapter no. 6.

Section A: Unit 1, 2, 3
Section B: Unit 4,5,6
PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-442 – Consumer Electronics (EL-I For EC)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral :** **Term Work: 25Marks**

Objective:

1. To acquaint students with the practical knowledge of designing and developing consumer electronic systems and products and introduce the latest trends and technologies.

Unit-1 **Communication devices:** Mobile handsets, Android technology, 2G,3G Mobiles, i-phone, EPABX	06
Unit-2 **Mass Communication devices:** Colour Television, Antenna, HDTV, LCD TV,LED TV, 3D Technology In TV Interactive TV, DTH TV, Plasma TV, Video Conferencing, FAX Machine, PA System, Dolby Digital Systems, Gesture Technology In TV	08
Unit-3 **Household electronics devices:** Washing Machine, Microwave Oven, Types Applications, Electronics Weighing Balance, Air Conditioner, Vacuum Cleaner	06
Unit-4 **Printing and recording devices:** LASER printer, Inkjet Printers, Photocopiers, Scanner, DVD/ CD Player, Blue ray DVD Player	04
Unit-5 **Special purpose machines:** Electronic Voting Machine, CFL, LED Lamps, Application and Advantages. Solar Lamp, Water Purifier, Electronic Calculator, DVD Player, ATM **Security devices:** Biometric Attendance Monitoring System, Working, Biometric Sensors, Home Automation System	08
Unit-6 **Compliance :** Product safety and liability issues; standards related to electrical safety and standards related to fire hazards, e.g., UL and VDE. EMI/EMC requirements and design techniques for compliance, e.g. ESD, RF interference and immunity, line current harmonics and mains voltage surge.	08

Text Book:

1. Television & Video Engineering-A. M. Dhake, TMH Publication.
2. Monochrome & Colour TV-R. R. Gulati, Wuley Eastern publication.
3. Video Demisified –Kelth Jack, PI publication

4. Audio & Video Systems-R.G.Gupta
5. Audio and Video system – Principles, maintenance and Troubleshooting by R.Gupta
6. Arora C.P., "Refrigeration and Air conditioning", Tata McGraw-Hill, New Delhi, 1994

Reference Book:

1. Colour TV Theory & Practice –S.P.Bali, TMG Hill Publication.
2. Basic TV & Video Systems-Bernard Grobb.
3. Electronic Communication Systems, Kennedy, TMH.
4. Principles of Communication Engineering-Anokh Singh-TMH.
5. C.M. Wintzer, International Commercial EMC Standards, Interference Control Technologies, 1988.
6. P.A. Chatterton and M. A. Houlden, EMC: Electromagnetic Theory to Practical Design, Wiley, 1992.
7. J.A.S. Angus, Electronic Product Design, Chapman and Hall, 1996.
8. Y.J. Wind, Product Policy: Concepts, Methods, and Strategy, Addison-Wesley Pub. Co., 1982

Term Work : (Minimum 8 tutorials)

EXD-426 List of Experiments

Minimum 8 tutorials / assignments based on above syllabus covering all units.

1. Study of CD/DVD Player.
2. Study of LED/LCD Color Television.
3. Fault Finding In Color Television Receiver.
4. Study of Cordless Telephone.
5. Study of Close Circuit Television.
6. Study of Mobile Handset Trainer.
7. Study of EPBAX System.
8. Study of PA system.
9. Study of Laser Printer.
10. Study of ATM Machine.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-443 – Biomedical Electronics(EL-I For ECT/E&C/EC)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**
Objective:	
Unit-1 **Transducers For Biomedical Applications:** Resistive transducers - Muscle force and Stress (Strain gauge), spirometry (Potentiont) , humidity, (Gamstrers), Respiration (Thermistor) Inductive Transducers - Flow measurements, muscle movement (LVDT) Capacitive Transducers - Heart sound measurement, Pulse pick up Photoelectric Transducers - Pulse transducers, Blood pressure, Piezoelectric Transducers - , ultrasonic blood	07
Unit-2 **Bioelectric Signals, Their Recording & Machines:** Bioelectric signals (ECG, EMG, ECG, EOG & ERG) and their characteristics, Bio-electrodes, electrodes tissue interface, contact impedance, effects of high contact impedance, types of electrodes, electrodes for ECG, EEG and EMG. Physiological pre-amplifier and instrumentation amplifiers, ECG lead systems details of ECG, EMG, and EEG machines.	07
Unit-3 **Modern Imaging Systems:** Introduction, Basic principle & Block diagram of x-ray machine, x- ray Computed Tomography (CT), Magnetic resonance imaging system (NMR) , ultrasonic imaging system.	06
Unit-4 **Patient Monitoring Systems & Audiometers:** Cardiac monitor, Bedside patient monitor, measurement of heart rate, blood pressure, temperature, respiration rate, Arrhythmia monitor, Methods of monitoring fetal heart rate, Monitoring labor activity .	08
Unit-5 **Therapeutic Equipments:** Cardiac pacemakers, cardiac defibrillators, Hemodialysis machine, Surgical diathermy machine, Physiotherapy: microwave Diathermy, Ultrasound therapy unit. Electrotherapy Equipments, Ventilators.	06
Unit-6 **Safety Aspects Of Medical & Computer Applications:** Gross current, Micro Current shock, safety standards rays and considerations, safety testing instruments, biological effects of X-rays and precautions, Use of microprocessors in medical instruments , Microcontrollers , PC based medical instruments , Computerized Critical care units, Planning & designing a computerized critical care unit.	06

Text/ Reference Books:

1. John. G. Webster," Medical Instrumentation" John Wiley publication.
2. R.S. Khandpur, " Hand book of Medical instruments" TMH, New Delhi
3. A.K Sawney, "Electronis and Electrical Instrumentaion"
4. V.K. Mehta, "Electronis and Electrical Instrumentaion"
5. Biomedical Instrumentation & Measurements by Lesile Cromwell , PHI

Term Work : (Minimum 8 tutorials)
EXD-426 List of Experiments

Minimum 8 tutorials / assignments based on above syllabus covering all units.

1- To find characteristics of thermistor and its linearization.
2- To find characteristics of LVDT.
3- To design and find gain of instrumentation amplifier.
4-To desgin and test ECG amplifier circuit.
5- To study X-RAY machine.
6- To design notch filter for EMG signals.
7-To study hemodialysis machine.
8- To study CT SCAN machine.

Section A: Unit 1, 2, 3
Section B: Unit 4,5,6
PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-444 – Advanced Industrial Automation(EL-I For EC/ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**

Objective:

1. The trend in the Industry for automation is changing one and student will able to develop the skill set for latest development of automation.

Unit-1 **Basic of Automation:** Introduction of sensors, actuators, control loop, concept of process variables, set point, controlled variable, manipulated variable, load variable. Representation of process loop components using standard symbols (basic with reference to control loop), and Examples of process loops like temperature, flow, level, pressure etc. Hierarchical levels of automation, introduction to plant automation.	06
Unit-2 **Transmitters and Converter:** Need of transmitter (concept of field area & control room area), Need for standardization of signals, current, voltage and pneumatic signal standards, concept of live & dead zero, DPT, span & zero adjustment, Two wire transmitters, SMART transmitter: Comparison with conventional transmitter, Block schematic. Converters: Difference between converter & transmitter, Pneumatic to current converter, Current to pneumatic converter. **Switches:** Temperature, pressure, Level switch, Proximity switch, Reed switch, Contactors	08
Unit-3 **Actuators:** Types of Control Valve, Control valve terminology Range ability, turndown, valve capacity, Air to open, Air to close, valve gain etc. Control valve characteristics: Inherent & installed Control valve accessories. Positioners: Application/Need, Types, Effect on performance of control valves. Volume boosters, Pressure Boosters, Reversing relay, Solenoid valves, Air lock, position indicating switches, Electro pneumatic converter, hand wheel. Brief of stepper motor, servo-motor, Motor control circuits, AC Drives, DC Drives, VF Drives, PWM Techniques	06
Unit-4 **Programmable Logic Controller (PLC):** Continuous versus Discrete Process Control, ladder diagram using standard symbols, Architecture of PLC, Types of Input & Output modules (AI, DI, AO, DO), Types of Timer, Counters, Interfacing pneumatic & Hydraulic systems, Fixed & Modular PLC (Rack, Slot, Grouping), Specifications, manufacturers, PLC ladder diagram and instructions, PLC Programming for process applications. Supervisory control system and data acquisition (SCADA): Introduction to SCADA, SCADA architecture, creation of data base, interfacing with PLC.	08

Unit-5 **Industry Standard Protocols:** HART Protocol introduction, frame structure, programming, implementation examples, Benefits, Advantages and Limitations. Introduction to Foundation Fieldbus H which includes structure, programming, FDS configuration, implementation examples, benefits, advantages and limitations. Comparison with other fieldbus standards like Devicenet, Profibus, Profinet, Controlnet, CAN, Industrial Ethernet etc.	06
Unit-6 **Distributed Control Systems Basics:** DCS introduction, functions, advantages and limitations, DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, Latest trends and developments. DCS detail engineering, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control and display	06

References Books / Handbooks

1. Programmable Logic Controller, 5th Edition,by W. Bolton,ELSEVIER
2. Programmable Logic Controller Principles and Applications by Webb and Reis, PHI Publications
3. Distributed Computer Control for Industrial Automations by Poppovik Bhatkar, Dekkar Publications
4. Computer based Process Control by Krishna Kant , PHI Publications
5. Introduction to Programmable Logic Controller by Garry Dunning, Thomson Learning Publications.
6. Allen Bradley's PLC Programming Handbook.
7. Siemens PLC Programming Handbook.

Term Work:

1. Continuous assessment of the students in the semester
2. Satisfactory performance of laboratory experiments
3. Internal oral for the students

EXD-426 List of Experiments:

1. Study of PLC and PLC programming
2. Study of PLC timers and counters
3. Solenoid valve sequential control using PLC.
4. Servo and Stepper Motor control using PLC systems.
5. Pneumatic control using PLC for air/gas control system.
6. PLC programming for distribution station.
7. PLC programming for PID block
8. Develop SCADA system for given application
9. Interfacing PLC to hydraulic & Pneumatic circuits.
10. Interfacing of VFD to PLC

Section A: Unit 1, 2, 3
Section B: Unit 4,5,6
PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
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FACULTY OF ENGINEERING AND TECHNOLOGY
FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-445 – Open Elective -I(EL-I For EC/ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 25 Marks**

This open elective subject syllabus can be select as per the requirement of the industry and institute with proper permission of competent authority

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FACULTY OF ENGINEERING AND TECHNOLOGY
FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-427- Project Part-I	
Teaching Scheme: - **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : -** **Class Test : -** **Practical/Oral : 50 Marks** **Term Work: ----**

The project work will be carried out by a batch of at the most 3 students (preferably 2 students) working on a topic related to the electronics and allied branches. The topic may be from one of the following.

1. Laboratory work involving constructional theoretical and design aspects of the project/ system.
2. Modification aspect of existing electronics systems.
3. It can be practical need of the industry, which should involve system design aspect.
4. Survey of latest development in Electronics and allied fields. It shall consist of the term work in the form of hand written typed report not less than 25 pages.

This should include the literature survey technical details related data that is collected & design that are required for project work part-I.

The candidate shall give a seminar on the subject chosen above in the presence of Guide and External examiner preferably from industry or the university.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-451 – Computer Communication Network	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : 50 Marks** **Term Work: ----**

Objective:

1. To interpret the layering concepts in computer networks.
2. To understand internals of protocols such as HTTP, FTP, SMTP, TCP, UDP, IP
3. To study different security techniques & its algorithms.

Unit-1 **Introduction:** The computer-Communications Revolution, From communications to computer, From computer to communications. **Communication Networks:** Switching Techniques, circuit switching, Routing for circuit switching network, Packet switching, comparision of Circuit and Packet switching. **Computer Networking:** Networking Hardware, Network topologies, Network software, LAN,MAN, WAN . Overview of network model: ISO-OSI and TCP/IP. Network design issues, layered architecture.	08
Unit-2 **Link Perspective and Network Perspective :** DATA LINK LAYER DESIGN ISSUES, Error detection and correction , Elementary data link protocols: A simplex stop and wait protocol, sliding window protocols. Network layer design issues, Routing algorithm, Congestion control algorithm, Quality of service	06
Unit-3 **The Transport Layer and Application Layer:** The transport service, Elements of transport protocols, A simple transport protocol, The internet transport protocols: UDP, TCP. DNS, Electronic mail, WWW	06
Unit-4 **ISDN** : ISDN overview, ISDN Interfaces and Functions, ISDN physical layer, ISDN Data Link Layer, ISDN Network Layer, ISDN services, Broadband ISDN	06
Unit-5 **Frame Relay and ATM** Frame Relay Protocols and Services, Frame Relay Congestion Control, ATM Protocols, ATM Traffic and Congestion Control, ATM Protocols, ATM traffic and congestion control.	06

Unit-6	
Cryptography And Network Security: Introduction, Basic Terms, Ancient Cryptography, Encryption, Process in the Encryption, Stream Cipher, Data Encryption Standard(DES), Steganography: Steganography and Cryptography, Basic Terms in Steganography, challenges in Steganography, Applications	08

Text Books :

1. Andrew Tenenbaum, "Computer Networks, 3rd and 4th Edition, Prentice Hall
2. Behrouz A. Forouzan, "Data Communication and Networking, 4th Edition, McGraw Hill
3. Willam Stallings, "ISDN, Frame Relay, ATM", Prentice Hall
4. Bansod,Computer Networks, Wiley Publication

Reference Books :

1. D.Comer, " Computer Networks and Internet TCP/IP
2. Willam Stallings, "Computer Networks", Prentice Hall
3. Willam Stallings, "Data and Computer Communications", 7th Edition Prentice Hall
4. Tularam M. Bansod, "Computer Networks",Dreamtech

EXD-471 List of Experiments :

1. Study of ISO-OSI reference model
2. Study of TCP/IP reference model
3. Study of Topologies and Interconnection devices
4. Study of LAN, MAN, WANS.
5. Study of Errors and error correction techniques
6. Study of sliding window protocol
7. Study of UDP, TCP.
8. Study of DNS,WWW,Electronic mail
9. Study of architecture of ISDN
10. Study of Frame relay
11. Study ofATM
12. Write a program for encryption and description using monoalphabetic substitution or polyalphabetic substitution.
13. Write a program for PC to PC communication using RS232 port.

Section A: Unit 1, 2, 3
Section B: Unit 4,5,6
PATTERN OF QUESTION PAPER

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For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II

EXD452 – Optical Fibre Communication

Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : 50 Marks** **Term Work: ----**

Objective:

1. Building blocks of Fiber communication
2. Traffic Routing and Grade of Service
3. Different networks Systems and Standards

Unit-1 **Introduction:** Optical Fiber Communication Technique, and its advantages. Types of optical fibers and construction. Fiber materials. Propagation in optical fibers. Modulation techniques. Related numerical on above topics.	08
Unit-2 **Light Sources and Light Detectors:** LED and LASER. Photodiode and Phototransistor. Photodetector parameters. Optoisolators. Related numerical on above topics.	06
Unit-3 **Optical Fiber Losses:** Attenuation/Absorption, Scattering, Dispersion. Coupling losses. Splices and Connectors. Related numerical on above topics.	06
Unit-4 **Digital FOC System:** Introduction and System Design Consideration. Noise Penalties, System Margin. WDM. Link Power Budget and Rise Time Budget. Related numerical on above topics.	06
Unit-5 **Optical Networks:** Network Concepet, Network Topologies, SONET; SDH Tracking. Photonic switching and Sensor applications. OTDR measurements, WDM network, Passive optical Networks, optical Ethernet. Related numerical on above topics.	06
Unit-6 **Performance Measurement and Monitoring** Measurement Standards, Basic Test Equipment, Optical Power Measurement, Optical fibre characteristics, Eye Design Test, Optical Time Domain Reflectometer,optical Performance Monitoring, optical Fiber System Performance Measurement	08

Text/Reference Books:

1. Optical Fiber Communication- Keiser (McGraw Hill)
2. Fiber Optic Communication- Agrawal (Khanna)
3. Optical Fiber Communication- Senior (PHI)
4. Optical Fibers and Fiber Optic Communication System- Sarkar (S. Chand)
5. Optical Communications- Barapte (Technova)
6. Mishra, Fiber-Optic Communication: Systems and Components, Wiley Publication

EXD-472 List of Experiments

It will consist of a record of 07 experiments based on above syllabus.

1. Measurement of insertion loss and isolation loss of three port circulator.
2. To plot electrical characteristics of source and Detector
3. Numerical Aperture measurement of fiber
4. Attenuation Measurement of fiber
5. Eye pattern Measurement
6. BER measurement.
7. Losses measurement in optical fiber

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-I	
EXD-453 – Consumer Electronics (ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : 50 Marks** **Term Work: ----**

Objective:

2. To acquaint students with the practical knowledge of designing and developing consumer electronic systems and products and introduce the latest trends and technologies.

Unit-1 **Communication devices:** Mobile handsets, Android technology, 2G,3G Mobiles, i-phone, EPABX	06
Unit-2 **Mass Communication devices:** Colour Television, Antenna, HDTV, LCD TV,LED TV, 3D Technology In TV Interactive TV, DTH TV, Plasma TV, Video Conferencing, FAX Machine, PA System, Dolby Digital Systems, Gesture Technology In TV	08
Unit-3 **Household electronics devices:** Washing Machine, Microwave Oven, Types Applications, Electronics Weighing Balance, Air Conditioner, Vacuum Cleaner	06
Unit-4 **Printing and recording devices:** LASER printer, Inkjet Printers, Photocopiers, Scanner, DVD/ CD Player, Blue ray DVD Player	04
Unit-5 **Special purpose machines:** Electronic Voting Machine, CFL, LED Lamps, Application and Advantages. Solar Lamp, Water Purifier, Electronic Calculator, DVD Player, ATM **Security devices:** Biometric Attendance Monitoring System, Working, Biometric Sensors, Home Automation System	08
Unit-6 **Compliance :** Product safety and liability issues; standards related to electrical safety and standards related to fire hazards, e.g., UL and VDE. EMI/EMC requirements and design techniques for compliance, e.g. ESD, RF interference and immunity, line current harmonics and mains voltage surge.	08

Text Book:

1. Television & Video Engineering-A. M. Dhake, TMH Publication.
2. Monochrome & Colour TV-R. R. Gulati, Wiley Eastern publication.
3. Video Demisified –Kelth Jack, PI publication

4. Audio & Video Systems-R.G.Gupta
5. Audio and Video system – Principles, maintenance and Troubleshooting by R.Gupta
6. Arora C.P., "Refrigeration and Air conditioning", Tata McGraw-Hill, New Delhi, 1994

Reference Book:

1. Colour TV Theory & Practice –S.P.Bali, TMG Hill Publication.
2. Basic TV & Video Systems-Bernard Grobb.
3. Electronic Communication Systems, Kennedy, TMH.
4. Principles of Communication Engineering-Anokh Singh-TMH.
5. C.M. Wintzer, International Commercial EMC Standards, Interference Control Technologies, 1988.
6. P.A. Chatterton and M. A. Houlden, EMC: Electromagnetic Theory to Practical Design, Wiley, 1992.
7. J.A.S. Angus, Electronic Product Design, Chapman and Hall, 1996.
8. Y.J. Wind, Product Policy: Concepts, Methods, and Strategy, Addison-Wesley Pub. Co., 1982

Term Work : (Minimum 8 tutorials)

EXD-473 List of Experiments

Minimum 8 tutorials / assignments based on above syllabus covering all units.

1. Study of CD/DVD Player.
2. Study of LED/LCD Color Television.
3. Fault Finding In Color Television Receiver.
4. Study of Cordless Telephone.
5. Study of Close Circuit Television.
6. Study of Mobile Handset Trainer.
7. Study of EPBAX System.
8. Study of PA system.
9. Study of Laser Printer.
10. Study of ATM Machine.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

5. Section A & Section B should be of 40 marks each.
6. Five questions in each section.
7. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
8. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-454 – Applied Digital Signal Processing (EC)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : 50 Marks** **Term Work: ---**

Objective:

1) To study different digital signal and filter techniques & its algorithms

2)To enhance the knowledge of digital signal which is broad area of research and development

Unit-1 **Multirate Signal processing:** Sampling rate reduction: decimation by integer factors, Sampling rate increase: interpolation by integer factors, sampling rate conversion by non integer factors, Multistage decimation and multistage interpolation, polyphase filter structures, two channel quadrature mirror filter bank.	08
Unit-2 **Adaptive filters:** Need of adaptive filters, adaptive filters as noise cancellation, configuration of adaptive filters, main components of adaptive filters, Adaptive Algorithms: LMS adaptive algorithm and implementation, recursive least square algorithms.	08
Unit-3 **Linear prediction and optimum linear filters:** Lattice structures, AR, MA & ARMA, forward & backward linear prediction, Different approaches for LPCs: Autocorrelation method, Covariance method, Lattice structure method.	04
Unit-4 **Power Spectrum Estimation:** Characterization of random signals: review of deterministic signals, random signals, correlation function, power spectra, DT random signals. Estimation of autocorrelation and power spectrum of random signal, Non parametric methods for power spectrum estimation- Bartlett window and Welch method.	08
Unit-5 **Architectures for DSPs:** Different types of Architectures for DSPs, Circular buffering , MAC unit, Barrel shifter, special instructions , on chip memory, Fixed and Floating point representations, Selection of DSPs, case study of TMS320c54XX, Implementation of basic algorithms like FIR, IIR Filters. Introduction to SHARC processor, VLSI architecture of DSP algorithms.	06
Unit-6 **Applications of DSP:** Applications of multirate signal processing, applications of adaptive filters in biomedical (EEG,ECG), radar, speech and telephone. Applications of DSP in audio systems, image processing and communication.	06

Text Books:-

1. E. C. Ifleachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education.
2. John G. Proakis, Manolakis, "Digital Signal Processing, Principles, Algorithms and
3. Applications", Pearson education.
4. Avtar Singh, S. Srinivasan, "Digital Signal Processing Implementation using DSP,

5. Microprocessors with examples from TMS 320C54XX", Thomas Publication.
6. Rabinar and Gold, "Speech Signal Processing".

Reference Books:

1. P. P. Vaidyanathan, "Multirate Systems and filter banks", PHI.
2. B. Venkatramani, M. Bhaskar, "Digital Signal Processors, Architecture, Programming &
3. Applications", TMH.
4. "A Handbook of Digital Image Processing", IEEE Press.
5. Simon Haykins, "Adaptive Filter Theory", 4th Edition, Pearson Education, 2002,
6. "Texas Manual for DSP Processors & Starter kit".
7. www.dspguide.com
8. C.Britton, Rorabaugh, " DSP Primer", by Tata McGraw Hill.
9. Sanjit.K mitra, "Digital Signal Processing" ,Tata McGraw Hill
10. Dr. Shaila Apte, "Advanced Digital Signal Processing", Wiley Precise Textbook series.
11. Applications to DSP Using Matlab by Proakis

EXD-474 List of Experiments:

Practical exam will consist of record of minimum 8 practicals out of the following using matlab.

1. Generate random signals and plot their realization.
2. Implementation of Least Mean Square (LMS) Algorithm.
3. Determination of FIR prediction filters using Forward and Backward prediction.
4. To implement Levinson Durbin Algorithm for solution of Normal equations.
5. Realization of cascade Lattice of FIR Filter.
6. Power Spectrum Estimation using any one non-parametric method.
7. Demonstration of Hardware and Software utilities for DSP starter kits (Texas, ADSP or Motorola).
8. Implementation of any one application of the following DSP Algorithms on DSP processors or Matlab: Implementation of FIR Filter. Implementation of IIR Filter

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10
4. Marks.
5. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY
FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-491 – Antenna Theory & Wave Propagation (EL-II For ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 50 Marks**
Objective:	
Unit-1 **Fundamental Concepts:** Definition of antenna And classification of antennas, Physical concept of radiation, Radiation pattern, near-and far-field regions, reciprocity, beam width and band width, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.	08
Unit-2 **Radiation from Wires and Loops:** Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.	06
Unit-3 **Aperture and Reflector Antennas:** Huygens' Principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.	06
Unit-4 **Broadband Antennas:** Log-periodic and Yagi antennas, frequency independent antennas, broadcast antennas, necessity and working ,feeding techniques of Antenna Arrays and basic concepts of Smart Antennas.	06
Unit-5 **Microstrip Antennas:** Basic characteristics of microstrip antennas, different feeding methods, methods of analysis, design of rectangular, traingular and circular patch antennas. Excitation modes of patch antenna, Radiation mechanism of patch antennas.Advantages & Limitations of Patch antenna, numericals based on design equations	06
Unit-6 **Radio Wave Propagation:** **Sky Wave Propagation:** Structure of the ionosphere – Effective dielectric constant of ionized region – Mechanism of refraction – Refractive index – Critical frequency – Skip distance – Effect of earth‘s magnetic field – Energy loss in the ionosphere due to collisions – Maximum usable frequency (numerical) – Fading and diversity reception. **Space Wave Propagation:** Reflection from ground for vertically and horizontally polarized waves – Reflection characteristics of earth – Resultant of direct and reflectedray at the receiver – Duct propagation. **Ground Wave Propagation:** Attenuation characteristics for ground wave propagation –Calculation of field strength at a distance.	08

TEXT/REFERENCE BOOKS:

1. Balanis, ―Antenna Theory‖, 2nd Edition, John Wiley & Sons, 2003.
2. Roddy Colin, "Electronics Communication", PHI, 2000, 3rd edition
3. Kennedy, "Electronics Communication System", McGraw Hill, 1995, 2nd edition
4. K. D. Prasad, "Antenna and Wave Propagation", 1995, 2nd edition
5. John D. Kraus, "Antenna", Tata McGraw Hill, 1998, 2nd edition
6. Sineon R Suanders ,"Antenna & Propagation for Wireless Communication System", John
7. Wiley, 2003
8. Collins R. E., ―Antennas and Radio Propagation‖, TMH, 1987.

TERM WORK : (Minimum 8 tutorials)

EXD-475 List of Experiments:

Minimum 8 tutorials / assignments based on above syllabus covering all units.

1. To Study the variation of field strength of radiated wave, with distance from transmitting antenna.
2. To plot the radiation pattern of an Omni-directional antenna.
3. To plot the radiation pattern of a directional antenna.
4. To Study the phenomenon of linear and circular polarization of antennas.
5. To study the difference between resonant and non-resonant antennas, calculate the resonant frequency and estimate the VSWR of a resonant antenna.
6. To demonstrate that the transmitting and receiving radiation patterns of an antenna are equal and hence confirm the reciprocity of antennas
7. To plot the radiation pattern of dipole antenna in Azimuth & Elevation planes, to measure the beam width (-3dB),side lobe level and its angular position, plane of polarization and directivity and gain of the dipole antenna
8. To study antenna resonance and measure VSWR, impedance & bandwidth,to measure the gain bandwidth of the dipole using log-periodic antenna. Study the difference between Folded dipole and dipole antennas.
9. To plot the radiation pattern of yagi antenna in Azimuth & Elevation planes, to measure the beam width (-3dB), front to back ratio, side lobe level and its angular position, plane of polarization, directivity & gain of the yagi antenna
10. To study antenna resonance and measure VSWR, to study the difference between a 3el & 4el yagi. To find the gain bandwidth of yagi a ntenna using a log-periodic antenna.
11. To plot the radiation pattern of Monopole antenna in Azimuth & Elevation planes, To measure the beam width (-3dB), front to back ratio, side lobe level and its angular position, plane of polarization, directivity & gain of the Monopole antenna
12. To plot the radiation pattern of Crossed dipole in Azimuth & Elevation plane, To measure the beam width (-3dB), front to back ratio, side lobe level and its angular position, plane of polarization, directivity & gain of the Crossed dipole antenna.
13. To plot the radiation pattern of Vee in Azimuth & Elevation planes, To measure the beam width (-3dB), front to back ratio, side lobe level and its angular position, plane of polarization, directivity & gain of the Vee antenna
14. To plot the radiation pattern of monofiliar axial mode helix antenna in Azimuth & Elevation planes, To measure the beam width (-3dB), front to back ratio, side lobe level and its angular position, plane of polarization and directive gain of the helix antenna
15. To plot the radiation pattern of Patch in Azimuth & Elevation planes, to measure the beam width (-3dB), front to back ratio, side lobe level and its angular position, plane of polarization, directivity & gain of the Patch antenna to study antenna resonance and measure VSWR

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on

first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

<table>
<tr><th colspan="2">SEMESTER-II</th></tr>
<tr><th colspan="2">EXD-491 – Microwave and Radar Engineering (Elective-II EC)</th></tr>
<tr><td>Teaching Scheme: 4Hrs/week
Practical: 2Hrs/week</td><td>Examination Scheme
Theory Examination : 80 Marks
Class Test : 20 Marks
Practical/Oral : ---
Term Work: 25 Marks</td></tr>
<tr><td colspan="2">Objective:
3. Basic concepts of microwave communication and transmission line.
4. Building blocks of microwave communication.</td></tr>
<tr><td>Unit-1
Introduction to Microwave Transmission Lines and Components:
History of Microwaves, Microwave Frequency bands. WAVEGUIDES: Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular wave guide, TEM mode in rectangular wave guide, cut off frequency, characteristic impedance, introduction to circular waveguides and planar transmission lines. Introduction to Scattering Parameters.
Microwave Passive Components:
Directional Coupler, Power Divider, tees, attenuator, resonator, Isolators, circulators along with S matrix.</td><td>08</td></tr>
<tr><td>Unit-2
Active Microwave Semiconductor Devices and Tubes:
Microwave Semiconductor Devices:
Gunn Diodes (Gunn Effect, operation, modes of operation, microwave generation and amplification), tunnel diode (Tunneling, tunnel diode Amplifier and Oscillator), IMPATT diodes, Varactor diodes, Parametric Amplifiers
Microwave Tubes:
Klystron (Two and multi cavity klystron), reflex klystron, traveling wave tube, microwave crossed field tubes - magnetron (operation, characteristics and applications)</td><td>08</td></tr>
<tr><td>Unit-3
Modern Trends in Microwaves Engineering:
Effect of Microwaves on human body. Medical and Civil applications of microwaves. Electromagnetic interference / Electromagnetic Compatibility (EMI / EMC). Monolithic Microwave IC fabrication. RFMEMS for microwave components. Microwave Imaging.</td><td>04</td></tr>
<tr><td>Unit-4
Fundamentals of Radar:
Block diagram of radar, radar equation, radar frequencies, applications of radar, Detection of Signals in Noise, Probability of Detection and false alarm, Integration of pulses, Radar cross-section of targets, cross-section fluctuations, PRFs and Range Ambiguities, Antenna parameters, System losses and propagation effects. Noise figure, radar mixers, Duplexers, A scope and PPI display, Matched Filters</td><td>08</td></tr>
</table>

Unit-5 **MTI and Pulse Doppler Radar:** Introduction to Doppler and MTI radar, Delay line cancellers, MTI Improvement factor, Staggered PRFs, Doppler Filter banks, Digital MTI processing, Limitations to MTI performance, AMTI, Pulse Doppler Radar, Sub clutter Visibility, Non-coherent MTI radar.	08
Unit-6 **Antenna Scanning and Tracking:** Mono pulse tracking, conical scan and sequential lobbing, low angle tracking, phased array, planner array, Limitations to tracking accuracy.	04

Text Books:

1. Liao S. Y., ""Microwave devices and Circuits", Prentice Hall of India
2. Skolnik , Introduction to radar system, Tata Mc-Graw Hill pub.

Reference Books:

1. Rizzi P.A., "Microwave Engineering, Passive Circuits Hall of India
2. Pozar D.M., "Microwave Engineering", John Wiley
3. M.Kulkarni., "Microwave devices and Radar Engg."Umesh Publications
4. Chatterji R., *Microwave Engineering*, Special topics, East West Press
5. Peyton Z. Peebles, Jr., "RADAR PRINCIPLES", Wiley Publications

EXD-475 List of Experiments: *Any 8 out of the following experiments;*

1. Study of microwave components.
2. To plot modes (characteristics) of reflex klystron.
3. Study of microwave Tee's.
4. Plot V/I characteristics of Gunn oscillator.
5. Study of characteristics of Isolator and Circulator
6. Measurement of guide wavelength & frequency in Rectangular Waveguide.
7. Microwave power (Low/High) measurement
8. Measurement of vibrations of tuning fork using Radar.
9. Measurement of velocity of moving object using Radar.
10. Measurement of RPM of moving Fan using Radar.
11. Measurement of frequency and time of moving object using Radar.

Section A: Unit 1, 2, 3
Section B: Unit 4,5,6
PATTERN OF QUESTION PAPER
Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.
For 80 Marks papers:

6. Section A & Section B should be of 40 marks each.
7. Five questions in each section.
8. Out of five four questions asked should be of 15 Marks & one question asked should be 10
9. Marks.
10. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-492 – Applied Digital Signal Processing (EL-II for ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 50 Marks**
Objective:	
Unit-1 **Multirate Signal processing:** Sampling rate reduction: decimation by integer factors, Sampling rate increase: interpolation by integer factors, sampling rate conversion by non integer factors, Multistage decimation and multistage interpolation, polyphase filter structures, two channel quadrature mirror filter bank.	08
Unit-2 **Adaptive filters:** Need of adaptive filters, adaptive filters as noise cancellation, configuration of adaptive filters, main components of adaptive filters, Adaptive Algorithms: LMS adaptive algorithm and implementation, recursive least square algorithms.	08
Unit-3 **Linear prediction and optimum linear filters:** Lattice structures, AR, MA & ARMA, forward & backward linear prediction, Different approaches for LPCs: Autocorrelation method, Covariance method, Lattice structure method.	04
Unit-4 **Power Spectrum Estimation:** Characterization of random signals: review of deterministic signals, random signals, correlation function, power spectra, DT random signals. Estimation of autocorrelation and power spectrum of random signal, Non parametric methods for power spectrum estimation- Bartlett window and Welch method.	08
Unit-5 **Architectures for DSPs:** Different types of Architectures for DSPs, Circular buffering , MAC unit, Barrel shifter, special instructions , on chip memory, Fixed and Floating point representations, Selection of DSPs, case study of TMS320c54XX, Implementation of basic algorithms like FIR, IIR Filters.	06
Unit-6 **Applications of DSP:** Applications of multirate signal processing, applications of adaptive filters in biomedical (EEG,ECG), radar, speech and telephone. Applications of DSP in audio systems, image processing and communication.	06
Text Books:- 1. E. C. Ifleachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education.	

2. John G. Proakis, Manolakis, “Digital Signal Processing, Principles, Algorithms and
3. Applications”, Pearson education.
4. Avtar Singh, S. Srinivasan, “Digital Signal Processing Implementation using DSP,
5. Microprocessors with examples from TMS 320C54XX”, Thomas Publication.
6. Rabinar and Gold, “Speech Signal Processing”.
7. Dr. Shaila Apte, “Advanced Digital Signal Processing”, Wiley Precise Textbook series

Reference Books:

1. P. P. Vaidyanathan, “Multirate Systems and filter banks”, PHI.
2. B. Venkatramani, M. Bhaskar, “Digital Signal Processors, Architecture, Programming & Applications”, TMH.
3. “A Handbook of Digital Image Processing”, IEEE Press.
4. Simon Haykins, “Adaptive Filter Theory”, 4th Edition, Pearson Education, 2002,
5. “Texas Manual for DSP Processors & Starter kit”.
6. www.dspguide.com
7. C.Britton, Rorabaugh, “ DSP Primer”, by Tata McGraw Hill.
8. Sanjit.K mitra, “Digital Signal Processing” ,Tata McGraw Hill
9. Applications to DSP Using Matlab by Proakis

EXD-475 List of Experiments:

Practical exam will consist of record of minimum 8 practicals out of the following using matlab.

1. Generate random signals and plot their realization.
2. Implementation of Least Mean Square (LMS) Algorithm.
3. Determination of FIR prediction filters using Forward and Backward prediction.
4. To implement Levinson Durbin Algorithm for solution of Normal equations.
5. Realization of cascade Lattice of FIR Filter.
6. Power Spectrum Estimation using any one non-parametric method.
7. Demonstration of Hardware and Software utilities for DSP starter kits (Texas, ADSP or Motorola).
8. Implementation of any one application of the following DSP Algorithms on DSP processors or Matlab: Implementation of FIR Filter.
9. Implementation of IIR Filter

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-492 – Wireless Mobile Communication(EL-II For EC)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 50 Marks**
Objective:	
Unit-1 **Wireless Communication Fundamentals:** Introduction & Fundamental terms of communication, Evolution of Mobile Radio communication, Frequencies for radio transmission, Overview of existing technologies around the world, Cellular system, its architecture & operation. Overview of Multiple access schemes for wireless communication -TDMA, FDMA, CDMA, SDMA.	05
Unit-2 **Wireless System Design Concepts** : Concept of Frequency reuse & its analysis, Channel Assignment Strategies, Hand-off, its necessity & advantages, roaming, co-channel & adjacent channel interference, Trunking and Grade of Service, Improving coverage and capacity in cellular systems.	08
Unit-3 **Wireless Networks**: Overview of 1G, 2G, 3G, 4G wireless networks, Traffic Routing in Wireless Networks, Wireless Data Services, ISDN, SS-7, PCS/PCNs, GPRS , DECT , UMTS , IMT-2000, Blue tooth, DTH.	08
Unit-4 **Digital Cellular Systems: GSM** Features & mobile services, architecture & interfacing, signal processing, frame structure, Channels-TCH & CCH, Messaging & call processing, Message flow for MTC and MOC, Types of handover in GSM, process of Intra-MSC handover in GSM.	08
Unit-5 **Wireless Protocols & Standards**: Protocols for network access-PRMA, Mobile IP, WAP, Wireless LAN IEEE 802.11& its Architecture, IEEE 802.11a, 802.11b standards, IEEE802.15.4 & Zigbee.	06
Unit-6 **CDMA & Mobile OS:** CDMA Architecture, Features & mobile services, CDMA & GSM comparison, Architecture, Mobile Operating systems- Symbian, RIM, iOS& Android features & different versions-KitKat, JellyBean, Ice Cream Sandwich etc.	05
Reference Books: 1. JoschenSchiller , "*Mobile Communication*", Pearson Education 2003. 2. T.S.Rappaport, "*Wireless Communications: Principles and Practice*", Second Edition,	

Pearson Education.
3. William Lee,"Mobile Cellular Tele-communication", Tata McGraw Hill.
4. William Stalling, "Wireless Communication & networking" Pearson.
5. UpenaDalal *"Wireless communication"*, Oxford university press.
6. PrashantKrishna Murthy&Kavehpahlavan *"Principles of Wireless networks"* PHI.

EXD-475 List of Experiments:

Perform any seven Experiments out of 1 to 9. Experiment No.10 is Compulsory.

1. To Study different Multiple access techniques.
2. To Demonstrate & performs installation of GSM trainer kit.
3. To Perform Call generation and termination using AT commands.
4. To Perform sending and reading of SMS using AT command.
5. To check network availability using AT command.
6. To measure signal strength using AT commands.
7. To Demonstrate & perform installation of CDMA trainer kit.
8. To generate and transmit data with PN sequence using CDMA trainer kit.
9. To separate data and PN sequence at receiver using CDMA trainer kit.
10. To perform mini project on the basis of any one mobile OS from chapter no. 6.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

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1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
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4. 10 marks question will be compulsory.

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FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-493 – Robotics (EL-II For ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 50 Marks**
Objective: 1. To study Basic concept of robotics. 2. Building block of robotics for transformation.	
Unit-1 **Introduction:** Automation and Robotics, Definition, Basic Structure of Robots, Classification of Robots based on co-ordinate system, Present trends and future trends in robotics, Overview of robot subsystems, Components of Robot system- Manipulator, Controller, Power conversion unit etc, Specifications of robot.	08
Unit-2 **Dynamics:** Dynamic constraints, velocity & acceleration of moving frames, Robotic Mass Distribution & Inertia, Tension, Newton's equation, Euler equations, Dynamic Modeling of Robotic Manipulators.	04
Unit-3 **Kinematics:** Homogeneous co-ordinate vector operations, matrix operations, co-ordinate reference frames, Homogeneous transformation and manipulator orientation relative points reference frames, forward solutions- Link co-ordinate frames, D-H matrix, Inverse or back solutions- problem of obtaining inverse solution, techniques of using direct & geometric approach.	08
Unit-4 **End Effectors and Actuators:** Different types of grippers, vacuum & other methods of gripping, overview of actuators, Internal & External sensors, position, relocking and acceleration sensors, proximity sensors, force sensors, touch slip laser range tinder, camera.	08
Unit-5 **Motion Planning and Controllers:** On-off trajectory, relocking and acceleration profile, Cartesian motion of manipulator, joint interpolated control, Jacobian in terms of D-H matrix, Obstacle avoidance, Basic control system, control loops of robotic system, Fuzzy controllers.	06
Unit-6 **Robot Vision:** Machine Vision system, description, sensing, Digitizing, Image Processing and Analysis and Application of Machine Vision System, Robotic assembly sensors & Intelligent Sensors. Object recognition.	06
Text Books/ Reference Books: 1. Fundamentals of Robotics: Analysis and Control – Robert J Schilling, PHI, NewDelhi 2. Robotic Engineering – Klafter, Thomas, Negin, PHI, New Delhi	

3. Robotics for Engineers – Yoram Koren, McGraw Hill, New York
4. Fundamentals of Robotics – T.C. Manjunath, Nandu Publishers, Mumbai
5. Robotics and Control- R. K. Mittal, I. J. Nagrath, TMH, NewDelhi
6. MEMS and Microsystems Design and Manufacture- HSU, TMH, NewDelhi

Practical Examination :

The practical examination will be of three hours duration. It will consist of one experiment conducted during the course and an Oral examination based on the syllabus.

Term work :

Term work will consist of record of minimum 8 experiments out of the following list

EXD-475 List of Experiments:

1. Study of motion conversion (rotary to rotary, rotary to linear) using mechanical components.
2. To build robot arms using mechanical components and applying motor drive.
3. To build robot for given configuration and degrees of freedom.
4. Motion of robot for each degree of freedom. Teaching a sequence to robot using teach Pendant.
5. To perform pick and place operation using Simulation Control Software.
6. Robot path planning using Simulation & Control Software.
7. Study of Pneumatic Robot OR Study of Robot Vision System.
8. 2D simulation of a 3 DOF robot arm. (C / C++ OR MATLAB)
9. Direct Kinematics analysis of 4-axis robot. (C / C++ OR MATLAB)

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

SEMESTER-II

EXD-493 – Satellite Communication(EL-II For EC)

Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 50 Marks**

Objective:

Unit-1 **Introduction:** An overview of satellite communication, Satellite Orbits, Kepler's three laws of planetary Motion, governing satellite motion, orbital parameters, orbital perturbations, Doppler effects, geostationary orbit, antenna look angles, antenna mount, limits of visibility, Earth eclipse of satellite, sun transit outage, inclined orbits, sun-synchronous orbit, launching of geostationary satellites	06
Unit-2 **Propagation Impairments and Space Link:** Introduction ,atmospheric loss, inospheric effects, rain attenuation, other impairments, Space Link : Introduction, EIRP, transmission losses, link power budget, system noise, CNR, uplink, down link, effects of rain, Combined CNR, Noise figure and Noise Temperature, G/T Ratio.	06
Unit-3 **Satellite Multiple Access:** Single access, Pre-assigned FDMA, Demand Assigned FDMA ,SPADE system, FDMA downlink analysis, SCPC, TDMA, reference burst, frame efficiency and channel capacity, pre-assigned TDMA, Demand Assigned TDMA, Downlink analysis for digital transmission, comparison of uplink power requirements for FDMA and TDMA, CDMA, Direct sequence spread spectrum, PN system ,spread spectrum and dispreading, CDMA throughput, SDMA	08
Unit-4 **Space segment:** Introduction, power supply units, altitude control, station keeping, thermal control, TT&C, Transponders, antenna subsystems.	06
Unit-5 **Earth Stations** : Types of Earth stations, Earth station antennas, Tracking, Equipment for earth stations, Equipment Reliability and Space qualification.	06
Unit-6 **Satellite Applications** : INTELSAT Series ,INSAT, INMARSAT, LEO, MEO,VSAT, DBS Television and Radio, Remote sensing, Mobile satellite services: GSM and GPS, Satellite navigation system, DTH ,GRAMSAT, Weather forecasting satellites, Scientific satellites, An Introduction to Non Geostationary Orbit Satellite Systems	08

Text Books :

1. Dennis Roddy : Satellite Communications-McGraw Hill, Third Edition
2. Timothy Pratt & Charles Bostian : Satellite Communication -John Wiley& Sons,2003,Second
3. Edition
4. Gerard Maral, Michel Bousquet: Satellite Communication Systems- Systems, Techniques and
5. Technology, Wiley, Fifth Edition
6. Tri T. Ha, Digital Satellite communication, McGraw Hill.

Reference Books:

1. M.Richharia -Satellite Communications Systems, McMillan publication, Second Edition
2. D.C.Agarwal: Modern Satellite Communications, Khanna Publisher, Sixth edition,2006.

Practical Examination :

The practical examination will be of three hours duration. It will consist of one experiment conducted during the course and an Oral examination based on the syllabus.

EXD-475 List of Experiments:

1. To set up an active satellite link and demonstrate link fail operation.
2. To communicate voice signal through satellite link.
3. To establish analog /digital Communication link and transmit and receive three
4. Signals (audio, video, tone) simultaneously using satellite communication trainer.
5. To transmit and receive PC data through satellite link.
6. To find the link C/N Ratio
7. Evaluation of SNR in Satellite Links
8. To observe effect of Fading margin of received signal in satellite link
9. Analysis of Link Power Budget Equation.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1. Section A & Section B should be of 40 marks each.
2. Five questions in each section.
3. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
4. 10 marks question will be compulsory.

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-494 – Industrial Drives & Control (EL-II For EC)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 50 Marks**

Objective:

1. To understand the basics of a electrical drive system.
2. To design and analyze simple drive systems
3. To understand concepts of convertors and chopper
4. To understand concepts of invertors and PWM techniques
5. To understand the importance of suppressing current harmonics generated in single phase utility system

Unit-1 **Introduction to Motor Drives :** Classification of Electric Drives, Requirements of Electric Drives, Criteria for selecting drive components	04
Unit-2 **Converters and Control :** Phase controlled converters, Four quadrant operation, Choppers, AC to DC converters	08
Unit-3 **DC motor drives :** Speed-torque characteristics DC shunt, PMDC and series motors, Dynamic model Speed and position control methods	08
Unit-4 **Inverters and PWM techniques :** Voltage Source Inverters , Current Source Inverters , PWM techniques, sine-triangle comparison , harmonic elimination , hysteresis current controllers , space vector PWM	08
Unit-5 **AC motor drives :** d-q model of induction motor , constant flux speed control structure, vector control model , vector control structure	06
Unit-6 **Optimizing the Utility Interface with Power Electronic Systems :** Generation of Current Harmonics Current harmonics and Power factor, Harmonics standards, Improved single phase utility Interface.	06

Text Books:

1. Power Electronics Mohan Undeland Riobbins Wiley India
2. Power Electronics L Umanand Wiley India
3. Modern Power Electronics & AC Drives, Bimal K Bose, Pearson Education

Reference Books:

1. Power Electronic Control of AC motors, Murphy and Turnbull Pergamon Press
2. Fundamentals of Electrical Drives, G.K.Dubey, Narosa- 1995
3. Principles of Electric Machines and Power Electronics', P.C.Sen, John Wiley & Sons

Practical Examination :

The practical examination will be of three hours duration. It will consist of one experiment

conducted during the course and an Oral examination based on the syllabus.

Term work :

Term work will consist of record of minimum 8 experiments out of the following list

EXD-475 List of Experiments:

1.
2.
3.
4.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

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FACULTY OF ENGINEERING AND TECHNOLOGY

FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-494 – Satellite Communication(EL-II For ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: 50 Marks**

Objective:

Unit-1 **Introduction:** An overview of satellite communication, Satellite Orbits, Kepler's three laws of planetary Motion, governing satellite motion, orbital parameters, orbital perturbations, Doppler effects, geostationary orbit, antenna look angles, antenna mount, limits of visibility, Earth eclipse of satellite, sun transit outage, inclined orbits, sun-synchronous orbit, launching of geostationary satellites	06
Unit-2 **Propagation Impairments and Space Link:** Introduction ,atmospheric loss, inospheric effects, rain attenuation, other impairments, Space Link : Introduction, EIRP, transmission losses, link power budget, system noise, CNR, uplink, down link, effects of rain, Combined CNR, Noise figure and Noise Temperature, G/T Ratio.	06
Unit-3 **Satellite Multiple Access:** Single access, Pre-assigned FDMA, Demand Assigned FDMA ,SPADE system, FDMA downlink analysis, SCPC, TDMA, reference burst, frame efficiency and channel capacity, pre-assigned TDMA, Demand Assigned TDMA, Downlink analysis for digital transmission, comparison of uplink power requirements for FDMA and TDMA, CDMA, Direct sequence spread spectrum, PN system ,spread spectrum and dispreading, CDMA throughput, SDMA	08
Unit-4 **Space segment:** Introduction, power supply units, altitude control, station keeping, thermal control, TT&C, Transponders, antenna subsystems.	06
Unit-5 **Earth Stations** : Types of Earth stations, Earth station antennas, Tracking, Equipment for earth stations, Equipment Reliability and Space qualification.	06
Unit-6 **Satellite Applications** : INTELSAT Series ,INSAT, INMARSAT, LEO, MEO,VSAT, DBS Television and Radio, Remote sensing, Mobile satellite services: GSM and GPS, Satellite navigation system, DTH ,GRAMSAT, Weather forecasting satellites, Scientific satellites, An Introduction to Non Geostationary Orbit Satellite Systems	08

Text Books :

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3. Edition
4. Gerard Maral, Michel Bousquet: Satellite Communication Systems- Systems, Techniques and

5. Technology, Wiley, Fifth Edition
6. Tri T. Ha, Digital Satellite communication, McGraw Hill.

Reference Books:

1. M.Richharia -Satellite Communications Systems, McMillan publication, Second Edition
2. D.C.Agarwal: Modern Satellite Communications, Khanna Publisher, Sixth edition,2006.

Practical Examination :

The practical examination will be of three hours duration. It will consist of one experiment conducted during the course and an Oral examination based on the syllabus.

EXD-475 List of Experiments:

1. To set up an active satellite link and demonstrate link fail operation.
2. To communicate voice signal through satellite link.
3. To establish analog /digital Communication link and transmit and receive three
4. Signals (audio, video, tone) simultaneously using satellite communication trainer.
5. To transmit and receive PC data through satellite link.
6. To find the link C/N Ratio
7. Evaluation of SNR in Satellite Links
8. To observe effect of Fading margin of received signal in satellite link
9. Analysis of Link Power Budget Equation.

Section A: Unit 1, 2, 3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

5. Section A & Section B should be of 40 marks each.
6. Five questions in each section.
7. Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
8. 10 marks question will be compulsory.

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FACULTY OF ENGINEERING AND TECHNOLOGY
FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-475 – Open Elective (EL-II For EC/ECT/E&C)	
Teaching Scheme: 4Hrs/week **Practical: 2Hrs/week**	**Examination Scheme** **Theory Examination : 80 Marks** **Class Test : 20 Marks** **Practical/Oral : ---** **Term Work: ---**

This open elective subject syllabus can be select as per the requirement of the industry and institute with proper permission of competent authority

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FACULTY OF ENGINEERING AND TECHNOLOGY
FINAL YEAR (EC/ECT/E&C/IE) ENGINEERING

SEMESTER-II	
EXD-476- Project Part-II	
Teaching Scheme: - **Practical: 6Hrs/week**	**Examination Scheme** **Theory Examination : -** **Class Test : -** **Practical/Oral : 100 Marks** **Term Work: 50**

Term –work:

Project part II will be continuation of project part-I under taken by the candidates in the first term. The term work shall consist of a typed report of about 60 pages on the work carried out by a batch of students in respect of the project assigned during the first term part-I and the second term Part-II .

Practical Examination:

It shall consist of an oral examination based on the report submitted by the candidates and or the demonstration of the fabricated design project. The said examination will be conducted by a panel of two examiners consisting of preferably the guide working as a senior and other external examiner preferably from Industry or the university.

1. Preferably project shall be useful to the general community such as rural, former community and small scale industry etc.
2. If the project is based on software, it shall impart sufficient knowledge of software and its application to the students. The software used should not be among the software recommended in undergraduate curriculum. It should be entirely new to the students.
3. If the project is based on Hardwar or some fabrication, it shall be supported by design and development.
4. It is essential that the student/s should concentrate on need, feasibility, economy, usefulness, effects on environment and global warming.
5. The student/s should get their project topic approved by the project committee under the leadership of project in charge / HOD appointed by Principal.
6. Student has to collect information from hand book, research journals, reference books, proceeding of conference through library or internet.

8. Student/s should prepare a spiral bound report with detail schedule of activities planned for completion of project and its presentation similar to the seminar report and shall be presented by all the partners dividing presentation among them at the time of examination in presence of guide and external examiner.

9. Students shall prepare paper / project to participate in State level / National / International competition. The projects participated shall get additional benefit in final semester based on certificate of participation.

Note:

The candidate must bring the project part-I report and the final report completed in all respect while appearing for practical examination of the project.