

## **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.

#### **O.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)**

<b>Batch</b>	<b>Year</b>	<b>Subject no</b>
CED	1. First Year UG	<b>Semester-I</b>
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		
IEX		41-49 Electives
PED		<b>Semester-II</b>
CSE		
CTD		51-70 Theory
COE		71-80 Practical
ITD		
EED		81-90 Service Courses
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 (THEORY / 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
51 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 outside 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 EXAMINATION AND THE QUANTUM OF PUNISHMENT 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 to 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 Institution 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.	
<b>17.</b>	<b>PRACTICAL/DISSERTATION/PROJECT REPORT EXAMS.</b>	
	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 UNIVERSITY,  
AURANGABAD**



**PROPOSED**  
**SCHEME AND DETAILED SYLLABUS**  
**of**  
**Final Year Engineering of Computer Science & Engineering BE(CSE)**  
**of**  
**FOUR YEAR DEGREE COURSE IN ENGINEERING**  
**With Effect from Academic Year 2014-2015**



**Faculty of Engineering and Technology**  
**Board of Studies in Computer Science and Engineering**  
**Curriculum structure of B.E(Computer Science and Engineering)**

**PART-I**

Sub Code	Semester-I	Contact Hrs/Week				Examination Scheme					
	Subject	L	T	P	Total	CT	TH	TW	PR	Total	Duration of The Theory Examination
CSE401	Datawarehousing & Data Mining	4	--	--	4	20	80	--	--	100	<b>3 Hrs</b>
CSE402	Parallel & Distributed Computing	4	--	--	4	20	80	--	--	100	<b>3 Hrs</b>
CSE403	Principles of Compiler Design	4	--	--	4	20	80	--	--	100	<b>3 Hrs</b>
CSE404	Visual Modeling	4	--	--	4	20	80	--	--	100	<b>3 Hrs</b>
	Elective – I	4	--	--	4	20	80	--	--	100	<b>3 Hrs</b>
CSE421	LAB-I Datawarehousing & Data Mining	--	--	2	2	--	--	--	50	50	
CSE422	LAB-II Principles of Compiler Design	--	--	2	2	--	--	--	50	50	
CSE423	LAB-III Visual Modeling	--	--	2	2	--	--	--	50	50	
CSE424	LAB-IV Elective - I	--	--	2	2	--	--	50	--	50	
CSE425	Project Part-I	--	--	2	2	--	--	25	--	25	
CSE426	Seminar							25	--	25	
	<b>Total</b>	<b>20</b>	<b>--</b>	<b>10</b>	<b>30</b>	<b>100</b>	<b>400</b>	<b>100</b>	<b>150</b>	<b>750</b>	

**Elective –I :**

Code	Subject
CSE441	Cloud Computing
CSE442	Artificial Intelligence
CSE443	MultiCore Computing
CSE444	Open Elective

**PART - II**

Sub Code	Semester-II	Contact Hrs/Week				Examination Scheme					
	Subject	L	T	P	Total	CT	TH	TW	PR	Total	Duration of The Theory Examination
CSE451	Computer System Security and Laws	4	--	--	4	20	80	--	--	100	3 Hrs
CSE452	Mobile Computing	4	--	--	4	20	80	--	--	100	3 Hrs
CSE453	Soft Computing	4	--	--	4	20	80	--	--	100	3 Hrs
	Elective –II	4	--	--	4	20	80	--	--	100	3 Hrs
CSE471	LAB-V Computer System Security and Laws	--	--	2	2	--	--	--	50	50	
CSE472	LAB-VI Mobile Computing	--	--	2	2	--	--	--	50	50	
CSE473	LAB-VII Soft Computing	--	--	2	2	--	--	--	50	50	
CSE474	LAB-VIII Elective – II	--	--	2	2	--	--	50	--	50	
CSE375	Project Part – II	--	--	6	6	--	--	50	100	150	
	<b>Total</b>	<b>16</b>	<b>--</b>	<b>14</b>	<b>30</b>	<b>80</b>	<b>320</b>	<b>100</b>	<b>250</b>	<b>750</b>	
	<b>Total of Semester I &amp; II</b>	<b>36</b>	<b>--</b>	<b>24</b>	<b>60</b>	<b>180</b>	<b>720</b>	<b>250</b>	<b>400</b>	<b>1500</b>	

**Elective –II :**

Code	Subject
CSE491	Remote Sensing & Geographical Information System
CSE492	Green IT
CSE493	Agile Methodology
CSE494	Open Elective

**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

**PR:** Practical/Oral Examination

**Dr Vijaya B. Musande**  
**Chairman Board of Studies**  
**Computer Science & Engineering**

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**Final Year Engineering (CSE/IT)**  
**Semester – I**

**Course Code : CSE401**

**Title : Data Warehousing and Data mining  
(DWDM)**

**Teaching Scheme**

Theory: 04 Hours/Week

**Examination Scheme**

Class Test: 20 Marks

Theory Examination (Marks) : 80 Marks

Theory Examination (Duration) :03 Hours

**Prerequisite:**

Data Base Management System, Discrete Mathematics

**Objectives:**

- To understand data warehouse
- To understand and implement multidimensional model
- To identify the problems, and apply mining algorithms
- To describe the business intelligence (BI) methodology and concepts

**CONTENTS**

**SECTION-A**

**Unit 1:**

**(7 Hrs)**

Introduction to Decision Support System, Data Warehousing and Online Analytical Processing, Data Warehouse: Basic Concepts , Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation.

**Unit 2:**

**(5Hrs)**

Introduction to Data Mining, Integration of Data Mining system with a Database or a Data Warehouse System, Major issues in Data Mining, Applications and Trends in Data Mining .

**Unit 3:**

**(8 Hrs)**

Know your Data - Data objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity , Data Preprocessing – An Overview.

**SECTION-B**

**Unit 4:**

**(5 Hrs)**

Mining Frequent Patterns : Mining Frequent Patterns, Associations: Basic Concepts, Apriori Algorithm, association rules from frequent item sets. Cluster Analysis : Types of data in cluster

analysis, classical Partitioning methods : k-Means and k-Medoids.

**Unit 5:**

**(8 Hrs)**

Introduction to Classification and Prediction, Classification by Decision tree Induction, Bayesian classification, Rule based classification, Prediction: Linear Regression, non-linear regression

**Unit 6:**

**(7Hrs)**

Introduction to Business Intelligence, Changing Business Environments and Computerized Decision Support , The Business Pressures-Responses- Support Model , A Framework for Business Intelligence (BI) , Intelligence Creation and Use and BI Governance , Transaction Processing versus Analytic Processing , Successful BI Implementation , Major Tools and Techniques of Business Intelligence

**Text Books:**

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Third Edition, Elsevier Publication
2. Paulraj Ponniah, Data Warehousing :Fundamentals for IT Professionals, Wiley Publication

**Reference Books:**

1. C.S.R.Prabhu :Data Warehousing Concepts,Techniques,Products and Applications, Prentice Hall of India.
2. Alex Berson,Stephan J.Smith :Data Warehousing ,Data Mining and OLAP, Tata McGraw Hill Edition.
3. Ivan Bayross: SQL, PLSQL:The Programming Language of ORACLE, BPB Publication.
4. Business Intelligence : A Managerial Approach (2nd Ed.) Turban, Sharda, Delen, King , Wiley Publication.

**PATTERN OF QUESTION PAPER:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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. From the remaining questions in section A and B , students are supposed to solve any two questions from each section, 15 marks each.

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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE402**

**Title: Parallel and Distributed Computing**  
**(PDC)**

**Teaching Scheme:**  
Theory: 4 Hours/Week

**Examination Scheme**  
Class Test: 20 Marks  
Theory Examination (Marks): 80 Marks  
Theory Examination (Duration): 03 Hrs

**Prerequisite:**  
Fundamentals of Operating System.

**Objectives:**

- To train the students with the concepts of Parallel Computing because of the need in the availability of growing number of cores on a chip.
- To provide the concept of massive -core GPUs and parallel programming.
- To understand the basic concepts of Distributed Computing.
- To introduce students to one distributed programming framework.

**CONTENTS**

**SECTION-A: Parallel Computing**

**Unit 1:** **(6 Hrs)**

Introduction to Parallel Computing, Scope and applications of Parallel Computing, Parallel Computing Platforms - Implicit Parallelism, limitations of Memory System Performance, Physical organization of Parallel platforms, Communication costs in parallel machines

Introduction to Message Passing Paradigm, Message Passing Interface

**Unit 2:** **(7 Hrs)**

Principles of Parallel Algorithm Design, Granularity, Concurrency and Task interaction, Recursive Decomposition, Data Decomposition, Parallel Algorithm Models --The Data Parallel Model, The Task Graph Model, The Master-Slave Model

Programming Shared Address Space Platforms- Threads, Why threads, The POSIX Thread API, Thread creation-termination, Synchronization primitives in Pthreads--Mutual Exclusion for shared variables

OpenMP standard for Parallel Programming: Basics, specifying concurrent tasks in OpenMP, Use of various Directives

**Unit 3:****(7 Hrs)**

CUDA (Compute Unified Device Architecture) Architecture: Introduction to CUDA GPU (Graphics Processing Unit) architecture, Terms- Grid, Block, Threads. CUDA memory types, CUDA C program structure, CUDA thread organization, Matrix multiplication using multiple blocks Simple programs of merging and sorting

**SECTION-B: Distributed Computing****Unit 4****(7 Hrs)**

Theoretical Foundation for Distributed System: Limitation of Distributed system, Differences between Distributed systems and Parallel systems, Models of distributed computation- Interleaving Model, Happened before Model, Potential Causality Model, Shared memory

Temporal ordering of events, Logical clocks and Vector Clocks (Definition and algorithm)

Mutual Exclusion using Time stamps, Lamport's Algorithm for Mutual exclusion.

**Unit 5****(7 Hrs)**

Distributed Shared Memory (DSM): General architecture of DSM systems, Design and implementation of DSM, Granularity, structure of shared memory space, consistency models, Replacement Strategy, Thrashing, approaches to DSM, and Advantages of DSM

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study

**Unit 6****(6 Hrs)**

Case study- Hadoop - A distributed programming framework, Building blocks of Hadoop, Setting up SSH for Hadoop cluster, Running Hadoop, Working with Files in HDFS, Anatomy of MapReduce program, Writing basic MapReduce programs

**Text Books:**

1. Ananth Grama, Anshal Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", Second Edition, (Pearson Publication)
2. David B. Kirk and Wen-mei W. Hwu, "Programming Massively Parallel Processors - A Hands-on Approach", Second Edition (MK - Morgan Kaufmann Publication)
3. Vijay K. Garg, "Elements of Distributed Computing" (Wiley Publication)
4. Pradeep K Sinha "Distributed Operating Systems : Concepts and design" , Addison Wesley, 2003

**Reference Books:**

1. Chuck Lam, "Hadoop in Action" ( dreamtech Press)

2. **A.D. Kshemkalyani, M. Singhal**, “Distributed Computing: Principles, Algorithms, and Systems”, Cambridge University Press.

### **PATTERN OF QUESTION PAPER:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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.
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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE403**

**Title: Principles of Compiler Design  
(PCD)**

**Teaching Scheme**

Theory: 4 Hours/Week

**Examination Scheme**

Class Test: 20 Marks

Theory Examination (Marks):80 Marks

Theory Examination (Duration):03 Hours

**Prerequisite:**

- Knowledge of Data structures, Discrete Mathematics and Algorithms.
- Basic Knowledge of Theory of Computation.
- Programming skill in any Programming language like C.

**Objectives:**

- To get working knowledge of the major phases of compilation, like lexical analysis, parsing, semantic analysis and code generation.
- To use the formal attributed grammars for specifying the syntax and semantics of programming languages.
- To learn and use tools for compiler construction.
- To understand the structure of a compiler, and how the source and target languages influence various choices in the design.

**CONTENTS**

**SECTION-A**

**Unit 1: Introduction to Compilers**

**(6 Hrs)**

Compilers & translators, the structure of compilers, Bootstrapping, Compiler construction tools, Programming language basics.

**Unit 2: Lexical Analysis**

**(6 Hrs)**

Role of a lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, Finite automata, Design of a lexical analyzer generator.

**Unit 3: Syntax Analysis**

**(8 Hrs)**

Role of Parser, shift reduce parsing, top down parsing, Predictive parsing – Computation of FIRST & FOLLOW functions and construction of parsing table, LR parsers, the canonical collection of LR (O) items, LALR parser, Automatic parser Generator YACC, YACC programs, Error detection and correction with YACC.



## **SECTION-B**

### **Unit 4: Intermediate-Code Generation**

**(6 Hrs)**

Intermediate code: Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples.

### **Unit 5: Syntax Directed Translation**

**(6 Hrs)**

Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, Top Down Translation, Bottom-Up Evaluation of Inherited Attributes, Type Checking: Type Systems, Specification of a Simple Type Checker, Equivalence of Type Expressions, Type Conversions.

### **Unit 6: Code Optimization and Code Generation**

**(8 Hrs)**

Principal sources of optimization, loop optimization - Basic blocks, flow graphs, loops, code motion, induction variables , DAG representation of basic blocks, Application of DAGs, Global Data Flow Analysis, Data Flow equations. Loop unrolling, loop jamming, constant folding, Object programs: the environment of code, generator, run-time addresses for names, Problems in code generation, A machine model, working of a simple code generator in brief, Register allocation and assignments, Peephole optimization.

#### **Text Books:**

1. A V Aho, R. Sethi, J D Ullman, “Compilers: Principles, Techniques, and Tools”, Pearson Education
2. D. M. Dhamdhere, “Compiler Construction – Principles & practices”

#### **Reference Books:**

1. A.V. Aho, J.D. Ullman , “Principles of Compiler Design” – (NAROSA)
2. V Raghavan ,”Principles of Compiler Design”-TMH Publications

#### **PATTERN OF QUESTION PAPER:**

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#### **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. From the remaining questions in section A and B students are supposed to solve any two

questions from each section, 15 marks each.

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE404**

**Title: Visual Modeling  
(VM)**

**Teaching Scheme**

Theory: 04 Hours/Week

**Examination Scheme**

Class Test: 20 Marks

Theory Examination (Marks): 80 Marks

Theory Examination (Duration): 03 Hours

**Prerequisite:**

- Students should have prior knowledge of software engineering.
- Students should have idea of software development life cycle.
- Students should have knowledge of object oriented concepts.

**Objectives:**

- To design a software project using Object Oriented Modeling
- To design a software project using Design Patterns
- To design an Object- Oriented Software

**CONTENTS**

**SECTION-A: Object Oriented Modeling**

**Unit 1: Introduction**

**(6 hrs)**

Complexity of Software, Algorithmic and Object-Oriented Decomposition, Software Modeling : Object-Oriented Methods and the Unified Modeling Language, Software Architectural Design : Method and Notation , UML as a Standard , Multiple Views of Software Architecture , Evolution of Software Modeling and Design Methods , Evolution of Object-Oriented Analysis and Design Methods , Survey of Concurrent, Distributed, and Real-Time Design Methods

**Unit 2: UML Modeling**

**(8 hrs)**

**Functional Modeling:** Basics of Use Cases System, Actors: Finding actors, actors in UML, Relationship between actors , Use case: Finding use cases, use cases in UML, Relationship between use cases, Use Case Description : Types of use cases, elements of use case Description, Guidelines for Creating Use cases descriptions, Organizing use cases, describing use cases, realizing use cases and Use case Diagrams.

**Structural Modeling:** Structural Models: Classes, attributes, operations, Relationship Class Responsibility Collaboration (CRC Cards) , Class Diagram: Elements of Class Diagram

**Unit 3: Behavioral Modeling:**

**(6 hrs)**

Behavioral Models, Interaction Diagrams: Objects, operations and messages, Sequence diagram, Communication diagram.

Activity Diagram: elements of activity diagram, guidelines for creating Activity diagram, Component diagram, deployment diagram

**NOTE: Case Study for Unit 2 & 3:**

- ATM System
- Courseware Management System
- Library Management System

**SECTION-B: Design Patterns**

**Unit 4: Introduction to Design Patterns (8 hrs)**

Introduction to Design Pattern, The Catalog of Design Patterns, Organizing the Catalog , Creational Design Pattern , Intent, applicability, structure, collaborations, consequence, implementations : Abstract Factory, Prototype, Singleton.

**Unit 5: Structural Design Patterns (6 hrs)**

Intent, applicability, structure, collaborations, consequence, implementations: Adapter, Decorator, Proxy

**Unit 6: Behavioral Design Patterns (6 hrs)**

Intent, applicability, structure, collaborations, consequence, implementations: Command, Observer, strategy

**NOTE: Case Study for Unit 4, 5 and 6:**

- Document Editor

**Text Books:**

1. Object-Oriented Analysis and Design by Grady Booch, 2<sup>nd</sup> Edition , Addison Wesley
2. Alan Dennis, Barbara Haley Wixom,David Tegarden ,”System Analysis and Design with UML 2.0 “ Wiley India Edition.
3. Software Modeling and Design UML, Use Cases, Patterns, and Software Architectures by Hassan Gomaa.
4. Design Patterns (ISBN: 81-7808-135-0) by Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides (Pearson Education Inc.) (Gang-of Four)

**Reference Books:**

1. Software Architecture Design – Methodology and Styles ISBN: 1-58874-621-6 Stipes Publishing L.L.C. by Lixin Tao, Xiang Fu and Kai Qian
2. Pattern Oriented Software Architecture (ISBN: 9971-51-421-4) by Frank Buschmann

3. Hank-Erik Eriksson, Magnus Penkar, Brian Lyons, David Fado,” UML 2 Tool Kit”  
OMG Press

**PATTERN OF QUESTION PAPER:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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. From the remaining questions in section A and B, students are supposed to solve any two questions from each section , 15 marks each.

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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE441**

**Title: Elective – I Cloud Computing**

**Teaching Scheme**

Theory: -- 4hrs/week

**Examination Scheme**

Class Test: 20 Marks

Theory Examination(Marks):80Marks

Theory Examination (Duration) :03 Hours

**Prerequisite:**

Computer Network

**Objectives:**

- To learn and understand Cloud Technologies
- To design, develop and deploy Cloud applications
- To get acquainted with the challenges and security aspects of Cloud Computing.
- To study Mobile Cloud Applications

**CONTENTS**

**SECTION-A**

**Unit 1: Evolution of Model Computing**

**(06 Hrs)**

Introduction to Mainframe architecture, Client-server architecture, Cluster Computing, Grid Computing, Parallel Computing and Distributed Computing, Evolution of sharing on the Internet, Introduction of Cloud Computing: Definition of cloud, Cloud Deployment Models, Cloud Service Models, Key Characteristics, Benefits and Risks in Cloud Computing, Service oriented architecture (SOA) and Cloud Computing Reference Architecture by IBM

**Unit 2: Services Delivered from the Cloud**

**(08 Hrs)**

Model architecture, Benefits and Drawbacks: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Business-Process-as-a-service (BPaaS), Identity-as-a-service (IDaaS), Communication-as-a-service (CaaS), Monitoring-as-a-service (MaaS), Storage as a service: Traditional storage versus storage cloud, Cloud Service providers: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Force.com.

**Unit 3: Cloud Technologies**

**(06 Hrs)**

Web services: SOAP and REST, SOAP VS REST, Virtualization: Introduction to virtualization, Types of Virtualization, Pros and cons of virtualization, Virtualization applications in enterprises: Server virtualization, Desktop and Application Virtualization, Storage and Network Virtualization.

## **SECTION-B**

### **Unit 4: Big Data and Analytics**

**(08 Hrs)**

Big Data, Challenges in Big Data, Hadoop: Definition, Architecture, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo, MapReduce and extensions: Parallel computing, The MapReduce model: Parallel efficiency of MapReduce , Relational operations using MapReduce, Projects in Hadoop: Hive, HBase, Pig, Oozie, Flume, Sqoop

### **Unit 5: Security in the Cloud**

**(06 Hrs)**

Security, Cloud Security Challenges, Infrastructure Security: Network, Host and Application level, Data security and Storage, Security Management in the cloud, Data Privacy, Life cycle of Data, Key Privacy concerns in cloud and Disaster Recovery.

### **Unit 6: Using Mobile Cloud**

**(06 Hrs)**

Adopting mobile cloud applications, Feature phones and the cloud, Using Smartphones with the Cloud: Android, Apple iPhone, Research In Motion BlackBerry, Symbian, Windows Mobile, Working with Mobile Web Services: Mobile interoperability, Performing Service Discovery: Context-aware services, MEMS, Location awareness, Push services, Defining WAP and Other Protocols.

#### **Text Books:**

1. Enterprise Cloud Computing: Technology, Architecture, Applications by Gautam Shroff, Cambridge University Press.
2. Cloud Computing Implementation, Management, and Security By John W. Rittinghouse , James F. Ransome , CRC Press.
3. IBM smart storage cloud Red paper by Larry Coyne Mark Bagley Gaurav Chhaunker
4. Cloud Security and Privacy Tim Mather, Subra Kumaraswamy, Shahed Latif

#### **Reference Books:**

1. Cloud computing Bible by Barrie Sosinsky, Wiley India Pvt Ltd (2011)
2. Mastering Cloud Computing Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi

#### **PATTERN OF QUESTION PAPER:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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. From the remaining questions in section A and B students are supposed to solve any two questions from each section, 15 marks each.

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIRVERSITY, AURANGABAD**  
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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE442**

**Title: Elective – I Artificial Intelligence(AI)**

**Teaching Scheme**

Theory: 4 Hours/week

**Examination Scheme**

Class Test: 20 Marks

Theory Examination (Marks): 80 Marks

Theory Examination (Duration): 03 Hours

**Prerequisites:**

Discrete Mathematics, Basic Probability theory and statistics, Knowledge of any programming language and data structures

**Objectives**

- Introduction to the basic principles and applications of Artificial Intelligence.
- Understanding the basic areas of Artificial Intelligence such as problem solving, knowledge representation, reasoning, planning, perception, vision and learning.
- To understand the key components of intelligent agents.
- To design and implement expert systems of moderate complexity in appropriate Language and evaluate their performance

**CONTENTS**

**SECTION-A**

**Unit 1: Introduction**

**(6 Hrs)**

Introduction to AI, Foundation of AI, History, AI Techniques, AI Problems, Production systems, Problem characteristics, AI Intelligent Agents, AI Application (E-Commerce & Medicine), Issues in design of search algorithms, Future scope of AI.

**Unit 2: Heuristic Search Techniques**

**(8 Hrs)**

Heuristic search, Hill Climbing, Best first search, Problem, Reduction, mean and end analysis, Constraint Satisfaction, A\* and AO\* Algorithm, Knowledge Representation: Basic Concepts, Knowledge representation Paradigms, Propositional Logic, Inference Rules in Propositional Logic, Knowledge representation using Predicate logic, Predicate calculus, Predicate and arguments, ISA hierarchy, Frame notation, Resolution, Natural Deduction.

**Unit 3: Logic Programming**

**(6 Hrs)**

Introduction, Logic Programming, Forward and backward reasoning, Forward and backward chaining rules, Knowledge representation using non monotonic logic: TMS (Truth Maintenance system), Matching, Control, fuzzy logic, semantic net, frames, Script, Conceptual dependency.



## **SECTION-B**

### **Unit 4: Planning**

**(6 Hrs)**

Overview, An example domain: The blocks world, component of planning system, goal stack planning, non linear planning using constraint pasting, hierarchical planning, Reactive system

### **Unit 5 : Advanced AI**

**(6 Hrs)**

Game playing: Min max search procedure, Alpha-Beta cutoffs, Natural Language Processing: Introduction, syntactic processing, semantic analysis, Discourse & pragmatic processing,

### **Unit 6: Learning & Expert systems**

**(8 Hrs)**

Introduction to learning, Rote learning, learning by taking advice, learning in problem solving, learning from examples: Induction, explanation based learning , Representing and using Domain knowledge, Architecture of expert systems, knowledge acquisition.

#### **Text Books:**

1. Elaine rich and Kevin Knight, Shivshankar Nair, “Artificial Intelligence”, 3<sup>rd</sup> Edition, Tata McGraw-Hill, ISBN-10-0070087709, ISBN-13-9780070087705
2. Stuart Russell, Peter Norvig, “Artificial Intelligence-A Modern Approach”, 2<sup>nd</sup> Edition, Pearson Education / Prentice Hall of India, ISBN:01379023952

#### **Reference Books:**

- 1.Eugene Charniak, Drew McDermott, “Introduction to Artificial Intelligence”,1. Pearson Education, ISBN 81-7808-033-8
- 2.Ivan Bratco, “PROLONG: Programming for Artificial Intelligence”, Pearson Education, 3<sup>rd</sup> edition, ISBN 10:0-201-40375-7
3. Saroj Kaushik, “Artificial Intelligence”, Cengage learning, ISBN-13:9788131510995
4. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall of India, ISBN: 81-203-0777-1
5. Rjschat-Koft “Artificial Intelligence & Engineering Approach “, Tata Mc-Graw Hill

#### **PATTERN OF QUESTION PAPER:**

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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE443**

**Title: Elective-I Multicore Computing**

**Teaching Scheme**

Theory: 4 Hours/Week

**Examination Scheme**

Class Test: 20 Marks  
Theory Examination (Marks):80 Marks  
Theory Examination (Duration):03 Hours

**Prerequisite:**

Fundamentals of Computer Organization and Operating Systems

**Objectives:**

- To be able to differentiate between computing in mono core and multi core technology .
- To get acquainted with various challenges while writing code for multi core technology.
- To understand different architectures of multicore systems.
- To understand the design issues in parallel algorithms.

**CONTENTS**

**SECTION-A**

**Unit 1:Introduction to multicore computing**

**(5 hrs)**

Single core, Dual core and quad core processor. Introduction to multicore, Multicore Architecture, The software developers view point,Multiprogramming and multiprocessing ,Multicore application design and implementation .

**Unit 2 :Architecture types of multicore systems**

**(5 hrs)**

Symmetric and Asymmetric multiprocessing,SMP scheduling,AMP scheduling,SMP-AMP,hybrid system,multi kernel operating systems for multicore processors.

**Unit 3: Challenges of Multicore programming**

**(7 hrs)**

Introduction to sequential model, Concurrency processor architecture, challenges, software development challenges, The harsh realities of parallelization, parallel programming.

**SECTION-B**

**Unit 4:Foundation of Shared memory**

**(8 hrs)**

Analytical modeling of parallel programming sources of overhead in parallel programming, Performance Metrics for parallel systems .The effect of granularity on performance, Scalability of parallel systems, Asymptotic analysis of parallel programming.

**Unit 5: Principles of parallel algorithm design****( 8 hrs)**

Decomposition , tasks and dependency graphs, granularity concurrency and task interaction. Decomposition techniques, Characteristics of tasks and interaction, Mapping techniques for load balancing.

**Unit 6: Role of Operating system****(7 hrs)**

Decomposition and operating systems's Role, Multicore OS vs multiprocessor OS, Recent Linux OS supporting multicore architecture and Its architecture, Recent Windows OS supporting multi core architecture and its architecture.

**Text books**

- 1.Cameron Huges,Tracy Huges," Professional Multi core programming"Wrox publication,2013.
- 2.Anath Grama,Anshul Gupta,George Karypis,"Introduction to Parrelle computing",Pearson Publication second edition,2013.
- 3.Hardik Joshi,Hushen Savani,"Object Oriented and Multicore Programming,Vishwakarma Publications.

**References**

- 1.Rami Matarneh,"Hybrid system,multi Micro kernel Operating systems for Multicore processors"Journal of Computer Science,5(7),pp.493-500,2009.
- 2.[www.embedded.com/design/mcus-processors-and-socs/4422211/2/...](http://www.embedded.com/design/mcus-processors-and-socs/4422211/2/...)

**PATTERN OF QUESTION PAPER:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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. From the remaining questions in section A and B students are supposed to solve any two questions from each section, 15 marks each.

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**Final Year Engineering (CSE/IT)**  
**Semester – I**

**Course Code : CSE421**

**Title :- LAB-I Data Warehousing and Data Mining**

**Teaching Scheme**

Practical: 2 Hours/Week

**Examination Scheme**

Practical /Oral Examination: 50 Marks  
Practical /Oral Examination (Duration) :- 03 Hours

**List of Practical Assignments:**

**Minimum 8 assignments should be conducted (04 assignments from each set).**

**SET I :**

Implementation assignments should performed using any appropriate language.

1. Implementation of OLAP operations .
2. Implementation of Varying Arrays.
3. Implementation of Nested Tables .
4. Demonstration of any ETL tool.
5. Write a program of apriori algorithm using any programming language.
6. Write a program of naive Bayesian classification using c.
7. Write a program of cluster analysis using simple k-means algorithm using any programming language.
8. A case study of Business Intelligence in Government sector/Social Networking/Business.

**SET II:**

Following assignments should be performed in WEKA with detail analysis.

9. Create data-set in arff file format. Demonstration of preprocessing on WEKA data-set.
10. Demonstration of Association rule process on data-set contact lenses.arff /supermarket using apriori algorithm.
11. Demonstration of classification rule process on WEKA data-set using j48 algorithm.
12. Demonstration of classification rule process on WEKA data-set using id3 algorithm.
13. Demonstration of classification rule process on WEKA data-set using naive bayes algorithm.
14. Demonstration of clustering rule process on data-set iris.arff using simple k-means.

**Practical Examination:**

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.

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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE422**

**Title: LAB-II:Principles of Compiler Design**

**Teaching Scheme**

Practical: 02 Hours/Week

**Examination Scheme**

Practical /Oral Examination: 50 Marks  
Practical /Oral Examination (Duration):- 03 Hours

**List of Practical Assignments:**

**Minimum 8 assignments should be conducted.**

Implementation Assignments should be performed in any appropriate Programming Language.

1. Program to convert Non-deterministic finite automaton(NFA) to Deterministic finite automaton(DFA).
2. Program to generate lexical tokens.
3. Study of LEX/FLEX tool and write LEX program to identify tokens : integer numbers, decimal numbers, identifiers, keywords, arithmetic operators, relational operators.
4. Program to implement LR parser.
5. Study of YACC tool.
6. Program to implement any one code optimization technique.
7. Implementation of any one method of Intermediate Code Generator.
8. Implementation of code generator.

**Practical Examination:**

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.

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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE423**

**Title: LAB-III Visual Modeling**

**Teaching Scheme**

**Examination Scheme**

Practical: 2 Hours/Week

Practical /Oral Examination: 50 Marks

Practical /Oral Examination (Duration):- 03 Hours

**List of Practical Assignments**

**Minimum 8 assignments should be conducted (04 assignments from each set).**

**SET I: Object Oriented Modeling**

**(Make use of any UML tool to perform the following list)**

1. Choose a hypothetical system of significant complexity and write an SRS for the same.
2. Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include template showing description and steps of the Use Case for various scenarios.
3. Draw one or more Package diagram to organize and manage your large and complex systems as well as their complex models.
4. Draw activity diagrams to display either business flows or like flow charts.
5. Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships.
6. Draw advanced class diagrams to depict advanced relationships, other classifiers like interfaces.
7. Draw sequence diagrams OR communication diagrams with advanced notation for your system to show objects and their message exchanges.
8. Draw state machine to model the behavior of a single object, specifying the sequence of events that an object goes through during its lifetime in response to events.
9. Draw component diagrams assuming that you will build your system reusing existing components along with a few new ones.
10. Draw deployment diagrams to model the runtime architecture of your system.

**SET II: Design Patterns**

Write a program in Java to implement the Design patterns of the following

1. Abstract factory
2. Singleton
3. Prototype
4. Adapter
5. Decorator Pattern
6. Observer Patterns
7. Strategy

**Practical Examination:**

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.

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**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code : CSE424**

**Title :- LAB-I Elective-I Cloud Computing**

**Teaching Scheme**

Practical: 2 Hours/Week

**Examination Scheme**

Term Work: 50 Marks

**List of Practical Assignments:**

**Minimum 8 assignments should be conducted.**

1. Introduction to cloud computing.
2. Implementation of SOAP Web services in C#/JAVA Applications.
3. Implementation of RESTful Web services in C#/JAVA Applications.
4. Implementation of Para-Virtualization using VMWare's Workstation/ Oracle's Virtual Box and Guest O.S.
4. Implementation of Full-Virtualization using VMWare's ESXi and Guest O.S.
5. Creating a Warehouse Application in Salesforce.com.
6. Installation and Configuration of Single-Node Setup in Hadoop.
8. Create any Application (Ex: Word Count) Using Hadoop Map/Reduce.
9. To study Cloud security challenges.
10. Case Study: PAAS (Face book, Google App Engine)
11. Case Study : Amazon Web Services.

**Term Work:**

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above.

Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.



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**Semester – I**

**Course Code : CSE424**

**Title :- LAB-I Elective-I Artificial Intelligence**

**Teaching Scheme**

Practical: 2 Hours/Week

**Examination Scheme**

Term Work: 50 Marks

**List of Practical Assignments.**

**Minimum 8 assignments should be conducted.**

1. Study of Prolog
2. Program to generate family tree
3. Program for Water Jug Problem.
4. Program checking a person eligible for voting.
5. Program to calculate factorial of a number
6. Program for generating Fibonacci series
7. Program for generating pyramid
8. Program for Towers of Hanoi puzzle
9. Design an expert system (Ex. Medical Diagnosis System)

**Term Work:**

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above. Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.

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**Semester – I**

**Course Code: CSE424**

**Title: LAB-IV Elective – I Multicore Computing**

**Teaching Scheme**

Practical: 02 Hours/Week

**Examination Scheme**

Term Work : 50 Marks

**List of Practical Assignments:**

**Minimum 8 assignments should be conducted.**

1. Survey the recent products of AMD Athlon series and present pros and cons of the products.
2. Survey the recent products of Intel multicore series and present pros and cons of the products.
3. Find and discuss various features of Windows OS such as memory model, IPC mechanism, Resource management, scheduling policies which support multicore operations.
4. Find and discuss various features of Linux OS such as memory model, IPC mechanism, Resource management, scheduling policies which support multicore operation.
5. Discuss how concurrency issues are handled in multi-core architecture. Implement Test and Set based Spin locks for concurrency in multicore computing.
6. What are challenges a typical resource manager of operating system has to face if it is used for multicore architecture. Do some research from IEEE/ACM/Springer/Elsevier conference/journal papers. Study at least one strategy for resource management in multicore computing.
- 7: Implement at least one strategy for resource management in multicore computing using any appropriate programming language.
8. As the processor's chip is becoming thin and thin, it is affecting on overall reliability of software due to transient faults. Find out the facts through literature survey and suggest the remedy.

**Term Work:**

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above. Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.

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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE425**

**Title: Project Part I**

**Teaching Scheme**

Practical: 02 Hours/Week

**Examination Scheme**

Term Work : 25 Marks

1. Project Group size = maximum 4 students.
2. The project is to be taken up at the start of the semester I and the project must be completed by the end of semester II.
3. While submitting project proposal care is to be taken that project will be completed within the available time of two terms.
4. Project title should be precise and clear. Selection and approval of topic: Topic should be related to real life or commercial application in the field of Computer Engineering

OR

Investigation of the latest development in a specific field of Computer Engineering

OR

Commercial and Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

5. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide. This data should be used for finding the total man hours and estimating the cost of the project

6. The group is expected to complete details Literature Survey, system/problem definition, analysis, design, etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.

7. The guides should regularly monitor the progress of the project work.

8. Assessment of the project for award of term work marks shall be done by the guide and a departmental committee as per the guidelines given in the following table.

9. The suggestive format of the report is as follows:

( Only one report should be submitted per group as a part of term work submission. )

**Title** of the Project:

Names & Roll Numbers of the students:

Name of the guide:

**Chapter 1:** Introduction

**Chapter 2:** Literature Survey

**Chapter 3:** System Development

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT: \_\_\_\_\_

NAME OF THE GUIDE: \_\_\_\_\_

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)				Assessment by Departmental committee (30%)			Grand Total	
			Literature survey	Topic Selection	Docum-entation	Attendance	Total	Evaluation (10%)	Pres-ntaion (20%)		Tota l
			10	05	15	05	35	05	10	15	50

Sign of Guide

Sign. of Committee Members

Sign. of H. O. D.

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**Final Year Engineering (CSE)**  
**Semester – I**

**Course Code: CSE426**

**Title: Seminar**

**Examination Scheme**

Term Work : 25 Marks

All the final year students are informed to present a seminar on a topic related to current trends and technologies. Seminar should be evaluated on the following basis:

- PPT prepared and Presentation skills
- Understanding of Topic
- Report preparation

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**Semester – II**

**Course Code : CSE451**

**Title :- Computer System Security and Laws  
(CSSL)**

**Teaching Scheme**

Theory: 04 Hours/Week

**Examination Scheme**

Class Test: 20 Marks

Theory Examination (Marks) : 80 Marks

Theory Examination (Duration) : 03 Hours

**Prerequisite:**

Fundamentals of Computer Networking

**Objectives:**

- To understand the five security components and apply them when evaluating a given security mechanism.
- To understand basic cryptography including symmetric and asymmetric cryptography, message digests, digital signatures and digital certificates.
- To understand the basics of system security along-with the mechanisms for authentication and authorization.
- To understand the legal aspect and Forensics in the computer system security.

**CONTENTS**

**SECTION-A**

**Unit-1**

**(06hrs)**

**Introduction:** Need for Security, security approaches, principles of security, security attacks, security services, model for network security.

**Unit-2**

**(06 hrs)**

**Authentication and Authorization controls:** User-names and password, certificate based authentication, extensible Authentication protocol(EAP), biometric authentication, role based authentication, access control lists(ACL), rule based authentication.

**Unit-3**

**(08 hrs)**

**Securing Communications:** Cryptography Techniques, Cryptographic keys, cryptographic hash functions, Digital Signatures, Digital Certificates, RSA, Advanced Encryption Standard(AES). Steganography, Authentication Applications: Kerberos, Firewalls, Intrusion detection.

## **SECTION-B**

### **Unit-4**

**(06 hrs)**

**Internet Security Protocols:** Introduction, Basic concepts, SSL, Transport Layer Security(TLS), Secure HTTP, Secure Electronic Transaction(SET), Email Security, Wireless Application Protocol Security, Security in GSM, Security in 3G, IEEE 802.11 security.

### **Unit-5**

**(06 hrs)**

**Incident Handling Basics:** Purpose of Incident Response, Common terms, organizational planning for incident handling, organizational roles, procedures for responding to incidents, types of incidents, stages of incident response, Incident prevention and detection

**Information Technology Act 2000:** Scope, jurisdiction, offense and contraventions, powers of police, adjudication.

### **Unit-6**

**(08 hrs)**

**Cyber Forensics:** History of Cyberforensics, Computer forensics and law, cybercrime examples, forensic Evidence Forensics Casework, Preserving integrity of crime scene, Investigative incident response actions, forensics analysis investigative actions, computer forensic tools.

#### **Textbooks:**

1. Atul Kahate, Cryptography and Network Security, 3e, McGraw Hill Education
2. John W. Rittinghouse, William M. Hancock, "Cyber security Operations Handbook", Elsevier Pub.
3. Roberta Bragg, Mark Rhodes-Ousley, Keith Strassberg, "The Complete reference – Network Security", Tata McGraw Hill publication

#### **Reference Books:**

1. William Stallings, Cryptography and Network Security, Pearson Education.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay, Cryptography and Network Security, McGraw Hill Education.
3. Vivek Sood, 'Cyber Law Simplified', McGraw Hill Education.

#### **PATTERN OF QUESTION PAPER:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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. From the remaining questions in section A and B students are supposed to solve any two questions from each section , 15 marks each.



**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**Final Year Engineering (CSE/IT)**  
**Semester – II**

**Course Code: CSE452**

**Title: Mobile Computing (MOC)**

**Teaching Scheme:**

Theory: Hours/Week

**Examination Scheme**

Class Test:20 Marks

Theory Examination (Marks):80 Marks

Theory Examination (Duration):03 Hours

**Prerequisite:**

- Knowledge of Computer Network

**Objectives:**

- To make students familiarize with Wireless Networking, and mobile OS.
- To understand the mobile IP.
- To know the basics of WAP and WML.
- To understand and use open source tools for Mobile Applications.

**CONTENTS**

**SECTION-A**

**Unit 1: Mobile Operating System**

**(4 Hrs)**

Features and Technology: Windows mobile os , Symbian ,Black berry, Android, Iphone OS.

**Unit 2: Wireless and Mobile Network Architecture**

**(8 Hrs)**

Principle of Cellular Communication, Overview 1G, 2G, 2.5G and 3G and 4G technologies, GSM Architecture and Mobility management hand off management, Network signaling, Mobile Devices: PDA, first generation phone and smart phone

**Unit 3: Medium Access Control**

**(8Hrs)**

Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, SDMA, FDMA, TDMA, CDMA.

## **SECTION-B**

### **Unit4: Mobile IP Protocol Architecture**

**(8 Hrs)**

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations) , Mobile IPv4 and IP v 6 and its application in mobile computing.. CDPD, VOIP, GPRS architecture and Services, Wireless Local Loop-WLL system

### **Unit 5: Wireless Application Protocol (WAP)**

**(4 Hrs)**

The Wireless Application Protocol application environment, wireless application protocol Client software, hardware and websites, wireless application protocol gateways, Implementing enterprise wireless application protocol strategy.

### **Unit 6: Wireless Markup Language**

**(8 Hrs)**

An Introduction to Wireless Technologies, Markup Languages, An Introduction to XML, Fundamentals of WML. Writing and Formatting Text, Navigating Between Cards and Decks, Displaying Images, Tables, Using Variables, Acquiring User Input ,An Introduction to WMLScript, WMLScript Control Structures, Events, Phone.com

### **Text Books:**

1. Yi Bing Lin, “Wireless and Mobile Networks Architecture”, John Wiley
2. JochenSchiller,“MobileCommunications”,Addison-Wesley.

### **Reference Books:**

1. Professional Android™ 4 Application Development by Reto Meier
2. Wrox, “The Beginning WML and WML Script”, Wrox Publication

### **Pattern of Question Paper:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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 eac , will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions from each section, 15 marks each.

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIRVERSITY, AURANGABAD**  
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**Final Year Engineering (CSE)**  
**Semester – II**

**Course Code: CSE453**

**Title: Soft Computing(SC)**

**Teaching Scheme**

**Examination Scheme**

Theory: 4 Hours/week

Class Test: 20 Marks

Theory Examination (Marks): 80 Marks

Theory Examination (Duration): 03 Hours

**Prerequisite:**

Image Processing

**Objectives:**

- To understand the scope of soft computing and pattern recognition tasks that can be performed by some of the basic structures of artificial neural networks
- Analyze feedforward networks and Understand the significance of nonlinear output functions of processing unit in feedback network for pattern storage.
- To describe and explain Core concepts and techniques of fuzzy logic.
- To understand Fuzzy Logic in database System and information. introduction to genetics.

**CONTENTS**

**SECTION-A**

**Unit – 1**

**(7 Hrs)**

Soft Computing : Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Characteristics of Neural Networks, Structure and Working of a biological neural network, Artificial Neural Network Terminology, models of neurons: MP model, Perceptron model, Adaline model, Topology, Basic Learning laws, What is learning, supervised and unsupervised learning, Functional Units of ANN for pattern recognition task: Pattern Recognition Problem, Basic functional units.

**Unit – 2**

**(7 Hrs)**

**Perceptron learning** – single layer and multilayer perceptron, linear and non-linear separability problems, supervised learning algorithms, Error correction and Gradient Decent Rules, FFNN, Architecture of FFNN, Backpropagation learning algorithm, pattern classification, pattern association by FFNN

**Unit-3** (6 Hrs)  
**Pattern association-** auto association and hetero association, feedback NN, architecture of FBNN, energy function, associative memory, bidirectional associative memory. Hopfield network.

## **SECTION-B**

**Unit-4** (7 Hrs)

**Unsupervised learning** – pattern clustering, Self-organization map (SOM), Generalized learning laws, Competitive Learning, examples, learning Vector Quantization, self –organizing feature map, Applications of self-organizing feature map.

**Unit-5** (6 Hrs)

Classical sets, Fuzzy sets, Crisp relations, Fuzzy relations, Examples, Properties of membership functions, fuzzification and Defuzzification to crisp sets, Application of fuzzy control

**Unit-6** (7 Hrs)

Fuzzy logic in database and information systems, Fuzzy relational data models, Operations in fuzzy relational data models, Design theory for fuzzy relational databases. Fuzzy If-Then Rules, . Fuzzy Linear Programming

Fundamentals of Genetic algorithm, Working principle and application of genetic Algorithm.

### **Text Books**

1. S.N.Sivanandam & S.N. Deepa, “Principles of Soft Computing”, Wiley Publications.
2. B. Yegnanarayana, “Artificial Neural Networks”, PHI Publications.
3. John Yen, Reza Langari, “Fuzzy Logic”, Pearson Education.
4. S. Rajasekaran, Vijaylakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic algorithms- Synthesis and Applications”, PHI Publications.

### **Reference Books**

1. Timothy J Ross , “Fuzzy Logic with Engg. Applications”, Wiley Publications.
2. B. Satish Kumar, “Neural Networks - A Classroom Approach”, McGrawHill Publications

### **PATTERN OF QUESTION PAPER:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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
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**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
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**Final Year Engineering (CSE)**  
**Semester – II**

**Course Code: CSE491**

**Title: - Elective II Remote Sensing & GIS**

**Teaching Scheme**

Theory:04 Hours/Week

**Examination Scheme**

Class Test:20 Marks

Theory Examination (Marks) :80 Marks

Theory Examination (Duration) :03 Hours

**Prerequisite:**

Students should have prior knowledge of Image processing and Computer Graphics.

**Objectives:**

- To get acquainted with the concepts of Earth observation and remote data acquisition techniques.
- To understand the concepts of remotely sensed data manipulation, processing, and visualisation.
- To apply data manipulation and visualisation methods.
- To perform appropriate data manipulation and visualisation methods for a number of Earth Science applications, including Geographical Information Systems (GIS).

**CONTENTS**

**SECTION-A**

**Unit 1: Fundamentals of Remote Sensing**

**(7 hrs)**

Principles of Remote sensing, History of Remote sensing, Remote sensing in India, Electromagnetic radiation, Electromagnetic Radiation and Electromagnetic Spectrum, EMR quantities, Nomenclature and Units, Thermal Emission of Radiation, Radiation Principles, Interaction of EMR with the Earth Surface , Spectral signature, Reflectance characteristics of Earths cover type, Remote sensing systems, Human vision colours, Spectral signatures and their interpretation

**Unit 2: Remote Sensing platforms and sensors**

**(6 hrs)**

Platforms, Types of sensors, Sensor resolutions , Passive and Active Sensors, Optical sensors, Classification of RS, Selection of Sensor Parameter, Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal Resolution, Band combinations and optimum index factor, False and pseudo colour composites, Errors in the imaging process.

**Unit 3: Visual Image Interpretation**

**(7 hrs)**

Elements of image interpretation; interpretation key, Hardware and software aspects of digital image processing, Properties of digital remote sensing data, Concept of geo-referencing , Errors due to

geo-referencing, Physical and mathematical models, hybrid models, Rectification of images, interpolation methods in the rectification of images: nearest neighbour, bilinear and bi-cubic methods, Concept of world file and embedding of projection information in the images.

## **SECTION-B**

### **Unit 4: Remote Sensing Image Processing (7 hrs)**

Image Registration, Image enhancement techniques, The Classification Process, Image classification techniques: supervised & unsupervised techniques

### **Unit 5: Geographic Information Systems (7 hrs)**

Definition of GIS; Elements of a GIS; Coordinate System, Need for GIS, Data Models: Raster and Vector, GIS data acquisition, Data inputs for GIS, Integration of satellite images, aerial photographs and GIS, Concept of Web GIS

### **Unit 6: Data Exploration & Analysis (6 hrs)**

Data Display and Cartography, Data exploration, Vector data analysis, Raster data analysis, Terrain Mapping & analysis.

#### **Text Books:**

1. Lillesand, Kiefer, Chipman, Remote Sensing and Image Interpretation, Wiley Publications.
2. Robert A. Schowengerdt, Remote Sensing models & methods for image processing, 3<sup>rd</sup> edition, Academic press.
3. Kang-tsung Chang, "Introduction to Geographic Information Systems", Tata McGrawHill, Fourth Edition

#### **Reference Books:**

1. Fundamentals of Remote Sensing, George Joseph, Universities Press (India) Pvt. Ltd.
2. Remote Sensing – Principles & Applications, Dr. B C Panda, Viva Books Pvt. Ltd.
3. J. B. Campbell and R. H. Wyne, Introduction to Remote Sensing, Guilford Press, 2011

#### **PATTERN OF QUESTION PAPER:**

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#### **For 80 marks Paper:**

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2. Five questions in each section
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4. From the remaining questions in section A and B students are supposed to solve any two questions from each section, 15 marks each.

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**Final Year Engineering (CSE/IT)**  
**Semester – II**

**Course Code: CSE492**

**Teaching Scheme**

Theory: - 04 Hours/Week

**Title: Elective - II Green IT**

**Examination Scheme:**

Class Test: 20 Marks

Theory Examination (Marks): 80 Marks

Theory Examination (Duration): 03 Hours

**Prerequisite:**

Understanding of Environmental Science and Business Process

**Objectives:**

1. Learn to measure computer power usage, minimize power usage, procure sustainable hardware, design green data centers, and recycle computer equipment.
2. Acquire expertise for improving the energy efficiency of personal computers by reducing the power consumption requirements.
3. Evaluate the regulatory and governance issues surrounding IT.
4. Execute a virtualization plan.

**CONTENTS**

**SECTION-A**

**UNIT 1: Green IT an Overview:**

**(06 Hrs)**

Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Enterprise Green IT Strategy, Green IT Burden or opportunity, Life Cycle of a Device or hardware Reuse, Recycle and Dispose.

**UNIT 2: Green Software & Sustainable software Development**

**(08 Hrs)**

Energy- Saving Software Techniques- Computational Efficiency, Data Efficiency, Context Awareness, Idle Efficiency, Evaluating and Measuring Software Impact to Platform Power, Current practices, Sustainable Software, Software Sustainability Attributes, Software Sustainability Metrics, Sustainable Software methodology, Case Study.

**UNIT 3: Green Data Centres and Data Storage:**

**(06 Hrs)**

Data centres and Associated Energy Challenges ,Data Centre IT Infrastructure, Data Centre Facility Infrastructure, IT Infrastructure Management, Green Data Centre Metrics, Case study on Data Centre Management Strategies, Storage Media Power Characteristics-Hard Disks, Magnetic Tapes, Solid-State Drives, Energy Management Techniques for Hard Disks-State Monitoring,Caching,Dynamic RPM,System- Level Energy Management.



## **SECTION-B**

### **UNIT 4: Green Networks and Communication: (06 Hrs)**

Introduction, Objectives of Green Network Protocols-Energy-Optimizing Protocol Design, Bit Costs Associated with Network Communication Protocol, Green Network Protocols and Standards-Strategies to Reduce Carbon Emissions, Contributions from the EMAN Working Group, Contributions from Standardization Bodies.

### **UNIT 5: Green Cloud Computing and environmental Sustainability (06 Hrs)**

Cloud Computing, Cloud Computing Energy usage Model, Features of Clouds Enabling Green Computing, Green Cloud Architecture, case Study: IaaS Provider.

### **UNIT 6: Green Enterprises and Role of IT and Green IT Outlook (08 Hrs)**

Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise: IT Usage and hardware, Inter-organizational, Enterprise Activities and Green Issues, Enablers and Making the Case for IT and the green Enterprise, Awareness to implementation, Greening by IT, Green IT Megatrend, Seven-step approach to Creating Green IT Strategy, Research and Development Directions.

### **Text Books:**

1. San Murugesan, and G. R. Gangadharan “Harnessing Green IT: Principles and Practices”, *IEEE* Wiley publication.
2. Adrian Sobotta and Irene Sobotta ,”Greening IT - How Greener IT Can Form a Solid Base For a Low Carbon Society”, Creative Commons Publication, 2009. (greening\_it\_isbn - 9788791936029.pdf).

### **Pattern of Question Paper:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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. From the remaining questions in section A and B students are supposed to solve any two questions from each section, 15 marks each.

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**Semester – II**

**Course Code: CSE493**

**Title: Elective - II Agile Methodology (AM)**

**Teaching Scheme:**

Theory: 04 Hours/Week

**Examination Scheme**

Class Test:20 Marks

Theory Examination (Marks):80 Marks

Theory Examination (Duration):03 Hours

**Prerequisite:**

- Awareness of basics of software engineering concepts and waterfall methodology.
- Exposure to any object oriented programming language such as Java, C#.

**Objectives:**

- To understand the background and driving forces for taking an Agile approach to software development.
- To understand the business value of adopting agile approaches.
- To understand the Agile development practices.
- To drive development with unit tests using Test Driven Development.
- To Apply design principles and refactoring to achieve Agility.
- To deploy automated build tools, version control and continuous integration.

**CONTENTS**

**SECTION-A**

**Unit 1: Fundamentals of Agile**

**(6 hrs)**

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools.

**Unit 2: Agile Scrum Framework**

**(6 hrs)**

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and

retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

**Unit 3: Agile Testing (8 hrs)**

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), x Unit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

**SECTION-B**

**Unit 4: Agile Software Design and Development (6 hrs)**

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles,

**Unit 5: Agile Software Design Principles (6 hrs)**

Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.

**Unit 6: Industry Trends (8 hrs)**

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies.

**Text Books:**

1. Agile Software Development with Scrum by Ken Schawber, Mike Beedle Publisher: Pearson Published: 21 Mar 2008.
2. Agile Testing: A Practical Guide for Testers and Agile Teams by Lisa Crispin, Janet Gregory Publisher: Addison Wesley Published: 30 Dec 2008.

**Reference Books**

1. Agile Software Development, Principles, Patterns and Practices by Robert C. Martin Publisher: Prentice Hall Published: 25 Oct 2002.

**Pattern of Question Paper:**

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. 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. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.

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**Semester – II**

**Course Code : CSE471**

**Title :- LAB-V Computer System Security and Laws**

**Teaching Scheme**

Practical: 2 Hours/Week

**Examination Scheme**

Practical /Oral Examination:50 Marks  
Practical /Oral Examination (Duration) :- 03 Hours

**List of Practical Assignments:**

**Minimum 08 assignments should be conducted.**

1. Installation and demonstration of nmap tool.
2. Perform an experiment to demonstrate use of nmap tool for Port Scanning.
3. Installation and demonstration of Wireshark Network Analyzer tool.
4. Perform an experiment to demonstrate the use of wireshark network analyzer to sniff for router traffic.
5. Installation and demonstration of jcrypt tool.
6. Use jcrypt tool (or any other equivalent) to demonstrate asymmetric, symmetric crypto algorithm, hash and digital signatures
7. Case study : Kerberos.
8. Implementation of RSA algorithm using any appropriate Programming Language.
9. Demonstrate any tool for Intrusion Detection System (IDS)
10. Study of IT Act 2000.

**Practical Examination:**

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.

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**Semester – II**

**Course Code: CSE472**

**Title: LAB - VI Mobile Computing**

**Teaching Scheme:**

Practical: 2 Hours/Week

**Examination Scheme**

Practical /Oral Examination:50 Marks

Practical /Oral Examination (Duration): 03 Hours

**List of Practical Assignments:**

**Minimum 08 assignments should be conducted.**

1. Write a program to show how to use UI elements, layouts by using ADT.
2. Write a program to show Linking of activities.Broadcast receiver in Android.
3. Write a Program to develop simple application to show activity life cycle.
4. Write a Program work with Google services
5. Write a program for Broadcast receiver in Android.
6. Write a program by using <p>,line braking,fonts and formatting of text in WML
7. Write a program for Navigation between cards, deck, and formatted text.
8. Write a program Displaying of Image,table using WML
9. Write a program for anchor links, variables.
10. Write a program Methods of acquiring user inputs in WML
11. Write a program WML scripts basics by using conditional or loop statement
12. Write an assignment on latest Open Source Operating Systems for Mobile.

**Practical Examination:**

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.

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**Semester – II**

**Course Code: CSE473**

**Title: LAB VII Soft Computing**

**Teaching Scheme**

**Examination Scheme**

Practical: 2 Hours/Week

Practical /Oral Examination:50 Marks  
Practical /Oral Examination (Duration) :- 03 Hours

**List of Practical Assignments:**

**Minimum 08 implementation assignments and two study assignments should be conducted.**

1. Write a program to implement MP-model
2. Write a program for solving linearly separable and nonlinearly separable problems with single layer and multilayer perception
3. Write a program to solve pattern recognition problem with FFNN using back propagation algorithm
4. Write a program solve pattern storage problem with feedback NN
5. Write a program to Solve pattern clustering problem by unsupervised learning method using self organizing map (SOM)
6. Write a program to solve pattern recognition problem with learning vector quantization (LVQ)
7. Write a program to solve Face recognition problem using ANN as a classifier
8. Write a program to solve character recognition problem (or classification for medical database)
9. Write a program to implement Fuzzy set operation and properties .Write a program to implement Fuzzy Set operation and properties
10. Write a program to perform Max-Min composition of two matrices obtained from Cartesian Product.
11. Write a program to solve an optimization problem using Fuzzy If-Then Rules

**Practical Examination:**

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.

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**Semester – II**

**Course Code: CSE474**

**Title: - LAB VIII Remote Sensing & GIS**

**Teaching Scheme**

**Examination Scheme**

Practical: 2 Hours/Week

Term Work: 50 Marks

**List of Practical Assignments.**

**Minimum 08 assignments should be conducted.**

**(Software : ILWIS / GRASS / QGIS / ArcGIS )**

1. Reading and importing a raster dataset into RS/GIS s/w and creating a subset.
2. Image processing filters: smoothing and edge detection filtering
3. Image classification: Unsupervised classification
4. Image classification: Supervised classification
5. Image classification: Accuracy assessment
6. Image geo-referencing and understanding projections
7. Image fusion with images of two different resolutions
8. Digitization of point, line and polygon features
9. Composition of maps

**Term Work:**

The term work shall consist of atleast 8 experiments/ assignments based on the syllabus above.  
Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.



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**Semester – II**

**Course Code: CSE474**

**Title: LAB VIII Elective - II Green IT**

**Teaching Scheme:**

Practical: 2 Hours/Week

**Examination Scheme:**

Term work: 50 Marks

**List of Practical Assignments:**

**Minimum 08 assignments should be conducted.**

1. Case study on Climate change and low carbon society
2. Study types of Carbon Management Systems (CMS), their features and limitation.
3. Green IT and Disaster management
4. Green IT and Decision support system
5. Tools most useful in developing green software, developer perspective.
6. Case study on Data Center Management Strategies.
7. Cloud computing as Green IT initiative through visualization.
8. Case study on Smart Grid.

**Term Work:**

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above.  
Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.

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**Semester – II**

**Course Code: CSE474**

**Title: Lab - VIII Elective - II Agile Methodology**

**Teaching Scheme:**

Practical: 2 Hours/Week

**Examination Scheme**

Term Work: 50 Marks

**List of Practical Assignments:**

**Minimum 08 assignments should be conducted.**

1. Understand the background and driving forces for taking an Agile approach to software development.
2. Understand the business value of adopting Agile approaches.
3. Understand the Agile development practices.
- 4: Drive development with unit tests using Test Driven Development.
- 5: Apply design principles and refactoring to achieve Agility.
- 6 & 7: Deploy automated build tools, version control and continuous integration.
- 8: Perform testing activities within an agile project.

**Term Work:**

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above.

Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory.

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**Final Year Engineering (CSE)**  
**Semester – II**

**Course Code: CSE475**

**Title: Project Part II**

**Teaching Scheme**

Practical: 06 Hours/Week

**Examination Scheme**

Term Work : 50 Marks  
Practical /Oral Examination:100 Marks  
Practical /Oral Examination (Duration) :- 03 Hours

1. The guide should be internal examiner for oral examination.
2. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
3. The evaluations at final oral examination should be done jointly by the internal and external examiner.
4. The same project group of Part I should continue the work in Part – II as well. The project group should complete the project work taken in Part I. It should complete the rest of the work from stage III onwards till the conclusion. The performance Analysis chapter should consist of various testing methods used along with sample test cases. It should also include how better the system is performing as compared to other similar systems. The final examination will consist of the demonstration of work which will be judged by two examiners (one internal and one external) and the marks will be given accordingly. The suggestive format of the report is as follows:

( Only one report should be submitted per group as a part of term work submission)

**Title of the Project:**

Names & Roll Numbers of the students:

Name of the guide:

**Chapter 1:** Introduction

**Chapter 2:** Literature Survey

**Chapter 3:** System Development

(This chapter will include the entire design process with necessary DFDs, other diagrams, design methodologies and other design and implementation details.)

**Chapter 4:** Performance Analysis

**Chapter 5:** Conclusions

( Detailed format of the project report is to be made available by the Dept. )