

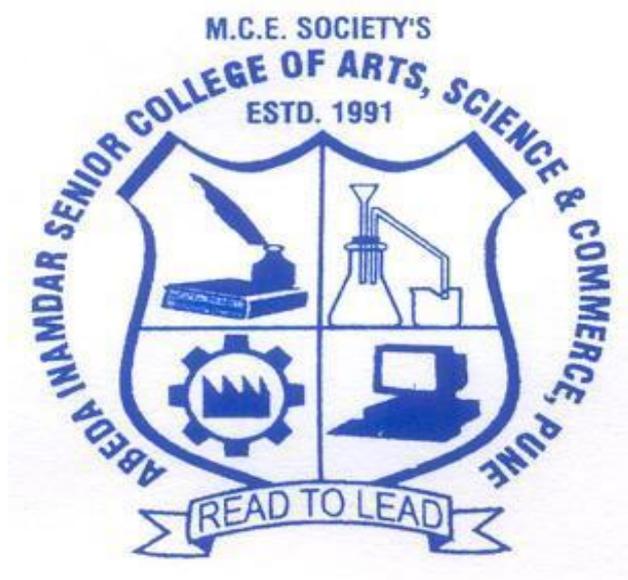
MCE Society's

Abeda Inamdar Senior College of Arts, Science and  
Commerce (Autonomous), Pune

## **FACULTY OF SCIENCE**

### **B. Voc. PROGRAM STRUCTURE**

Bachelor of Vocation in Data Science and Data Analytics



Choice-Based Credit System (CBCS) Under Autonomy

(Semester Pattern)

Program (2021 Pattern)

With effect from June 2021

## **Bachelor of Vocational Data Science and Data Analytics PROGRAM STRUCTURE**

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## 1) **PROGRAM OVERVIEW:**

Bachelor of Vocational Data Science and Data Analytics is a 3-year full-time undergraduate program designed to prepare graduates who can conduct data-driven investigations and visual and advanced analytics by acquiring and managing data of all types. Through this program, students will develop an in-depth understanding of data science and the techniques for analysis of quantitative and qualitative data to arrive at solutions. They will be able to identify patterns in order to predict trends from analyzing data of various sectors such as manufacturing, banking and finance, retail and healthcare. The program will enable students to rapidly adapt to the changing role of Information Sciences and craft data-driven solutions to tackle the challenges that arise in modern businesses. Students will also get the opportunity to undertake applied capstone projects and explore internships to supplement their academic learning with practical and real-life industry experience.

- **Program Educational Objectives:**

B.Voc. (Data Science and Data Analytics) program will prepare its students as:

**PEO 1:** To progress their career productively in software industry, academia, research, entrepreneurial pursuit, government, consulting firms and other Information Technology enabled services.

**PEO 2:** To achieve peer-recognition; as an individual or in a team; by adopting ethics and professionalism and communicate effectively to excel well in cross culture and interdisciplinary teams.

**PEO 3:** To continue a lifelong professional development in computing that contributes in self and societal growth.

- **Program Outcomes:**

On completion of B.Voc.(Data Science and Data Analytics) degree, the students will be able to:

**PO1:** Analyze the requirements of a computing problem using appropriate algorithms and data structures.

**PO2:** Implement the solution of a computing problem using appropriate programming languages.

**PO3:** Use mathematical underpinnings of the discipline of computer science.

**PO4:** Recognize the ethical, legal and social implications of computing in a global society.

**PO5:** Use oral and written communication skills to convey technical information effectively and accurately.

**PO6:** Use their interpersonal skills when working in a team environment.

**PO7:** Recognize the need for and ability to engage in continuing professional development.

**PO8:** Ability to use appropriate techniques, skills, and tools necessary for computing practice

## 2) INTRODUCTION :

The B.Voc. (Data Science and Data Analytics) degree program (2021 pattern) will be introduced in the following order:-

- |    |  |           |
|----|--|-----------|
| a. | First Year B.Voc. (Data Science and Data Analytics)  | 2021-2022 |
| b. | Second Year B.Voc. (Data Science and Data Analytics) | 2022-2023 |
| c. | Third Year B.Voc. (Data Science and Data Analytics)  | 2023-2024 |

- B.Voc. (Data Science and Data Analytics) Degree program will consist of three years divided into six semesters.
- The first year (Semester I and II), Second Year (Semester III and IV) and Third Year (Semester V and VI); Choice Based Credit System Examination will be held at the end of each semester.

## 3) ELIGIBILITY:

- a. Any candidate who has passed higher secondary school certificate (10 + 2) in science stream(PCM/PCB/PCMB) from Maharashtra State Board of Secondary and Higher Secondary Education or equivalent Board of Examination, is eligible for admission to the first year of this program (2021 Pattern)

OR

- b. Any candidate who has passed three year Diploma Course approved by the DTE, Maharashtra State or Equivalent authority.

OR

- c. Higher Secondary school certificate (10 + 2) Examination with English and vocational subject of +2 level(MCVC)-Medical Lab Technician(Subject code=P1/P2/P3)

#### 4) COURSES CARRYING PRACTICALS:

- a. **F.Y./S.Y. /T.Y.B.Voc. (Data Science and Data Analytics):** Each practical course will be of **1.5 credits** and each practical session will be of **03 hour 15 minutes** duration.
- b. There will be a practical and viva-voce examination for all the semesters of the F.Y./S.Y./T.Y.B.Voc. (Data Science and Data Analytics) for the practical course.

**Table 1: Course having Practical Examination**

Semester	Type of Course	Name of Practical Course	Course Code
I	Skill Component Practical	Lab Course-I : MS Excel & Web Designing	21BVDSA115
I	Skill Component Practical	Lab Course-II : C Programming	21BVDSA116
II	Skill Component Practical	Lab Course-I : Data Structure using C	21BVDSA125
II	Skill Component Practical	Lab Course-II: DBMS using MYSQL	21BVDSA126
III	Skill Component Practical	Lab Course-I : R Programming LAB	21BVDSA235
III	Skill Component Practical	Lab Course-II : Web Technology	21BVDSA236
IV	Skill Component Practical	Lab Course-I : Programming in Python	21BVDSA245
IV	Skill Component Practical	Lab Course-II : Java Programming	21BVDSA246
V	Skill Component Practical	Lab Course –I : Big Data Analytics using Hadoop	21BVDSA355
V	Skill Component Practical	Lab Course –II: Android Programming	21BVDSA356
VI	Skill Component Practical	Lab Course-I : Machine Learning	21BVDSA365
VI	Skill Component Practical	Lab Course-I I: Data Visualization using Power BI	21BVDSA366

#### 5) MEDIUM OF INSTRUCTION:

The Medium of Instruction and Examination (Written and Viva) shall be English.

## 6) SCHEME OF CREDITS (Academic/CGPA):

**Table 2: Total credits for three years B.Voc. (Data Science and Data Analytics) Program (2021 pattern)**

Sr. No	Semester No	No of Theory Courses	No of Lectures per week	Total Lecture Hours per Course	Credit per Course	No. of practical Courses	Credit per practical Courses	Total Credits (Lectures + Practical )
1	I	4 Core	03 Hrs.	45	3	2	1.5	12+3=15
2	II	4 Core	03 Hrs.	45	3	2	1.5	12+3=15
3	III	4 Core	03 Hrs.	45	3	2	1.5	12+3=15
4	IV	4 Core	03 Hrs.	45	3	2	1.5	12+3=15
5	V	4 Core	03 Hrs.	45	3	2	1.5	12+3=15
6	VI	4 Core	03 Hrs.	45	3	2	1.5	12+3=15
								<b>90</b>

**Note: 1 Theory Lecture = 60 Minutes.**

**Table 3: Compulsory Ability Enhancement (CGPA) Course (2021 Pattern)**

Sr. No.	Compulsory Ability Enhancement Courses	Class	Semester	Credit
2	Skill Enhancement Courses (SEC) (On Job Training )	F.Y. /S.Y. /T.Y.B.Voc. (Data Science and Data Analytics)	I/II/III/IV /V/VI	90
<b>Total</b>				<b>90</b>

## 7) COURSE WISE CLASSIFICATION OF CGPA/ACADEMIC CREDITS:

**Table 4: Course wise Total credits for three years B.Voc. (Data Science and Data Analytics)Program (2021 pattern)**

Sr. No	Nature of Courses	Semesters (Credits)						Total (Credits)
		I	II	III	IV	V	VI	
1	On Job Training	15	15	15	15	15	15	90
2	General Core Courses	12	12	12	12	12	12	72
3	Skill Component Practical	3	3	3	3	3	3	18
		30	30	30	30	30	30	180 (Grand Total)

## 8) SCHEME OF NO. OF COURSES:

**Table 5: Semester-Wise Number of CGPA Courses for Three Year B.Voc. (Data Science and Data Analytics)Program**

Sr. No	Nature of Courses	Semesters						Total
		I	II	III	IV	V	VI	
1	On Job Training	1	1	1	1	1	1	6
2	General Core Courses	4	4	4	4	4	4	24
3	Skill Component Practical	2	2	2	2	2	2	12
Sub Total		7	7	7	7	7	7	42 (Grand Total)

## 9) DURATION:

**Table 6: Stages and Exit points and Credits**

NSQF Level	Skill component credits	General Education Credits	Total credits for Award	Normal duration	Exit points / Awards
7	108	72	180	Six semesters	B. Voc. degree
6	72	48	120	Four semesters	Advanced diploma
5	36	24	60	Two semesters	Diploma
4	18	12	30	One semester	Certificate

## 10) ATTENDANCE:

No candidate shall be admitted to the semester end examinations unless he / she has satisfactorily completed 75% of attendance in each course in each semester.

### **11) COLLEGE TERMS:**

The dates for the commencement and conclusion of the first and the second terms shall be as determined by the college authorities. Only duly admitted students can keep the terms. The present relevant ordinances pertaining to grant of terms will be applicable.

### **12) METHODS OF EVALUATION AND PASSING CRITERIA:**

- a. The course carrying 100 marks shall be evaluated with continuous internal evaluation (CIE) and Semester End Examination mechanism. Continuous internal evaluation shall be of 40 marks and Semester End Examination shall be of 60 marks.
  - To pass the theory course of 3 credits having 100 marks, a student has to secure minimum 40 marks provided that he /she should secure minimum 16 marks in CIE and minimum 24marks in Semester End Examination.
  - To pass the practical or project course of 1.5 credits having 50 marks, a student has to secure minimum 20 marks provided that he/she should secure minimum 8 marks in CIE and minimum 12 marks in Semester End Examination.
  
- b. **Evaluation Criteria:** The evaluation of students will be based on three parameters:-
  - i. Continuous Internal Evaluation (CIE).
  - ii. Practical / Project Examination (List of courses having practical is given in sr.no 4).
  - iii. Semester End Examination.

i. **For Continuous Internal Evaluation (CIE):** Internal assessment will be as follows:

**Table 7: CIE of Theory Examination**

<b>Credits :03</b>			
<b>Duration : 1Hr/Exam</b>		<b>Marks:40</b>	
<b>10 Marks*</b>	<b>10 Marks</b>	<b>10 Marks</b>	<b>10 Marks*</b>
Offline / Online objective type examination	Two Class Tests (Average of two test)	Two Assignments (Each of 5 marks)	Mid Semester Descriptive Type Examination

\*20 Marks exam will be scaled down to 10 Marks

**For Practical/Project Examination:** Practical Question papers will be set for Fifty Marks (Three Hour Duration) for 1.5credits course. 15 credits for On Job Training Examination will be of Three Hour duration

ii. **For Practical/Project Examination:** Internal assessment will be as follows:

**Table 8: CIE of Practical and Project Examination**

<b>Practical</b>			<b>On Job Training</b>		
<b>Credits :1.5</b>			<b>Credits :15</b>		
<b>Marks:20</b>			<b>Marks:40</b>		
<b>5 marks</b>	<b>5 Marks</b>	<b>10 Marks</b>	<b>10 marks</b>	<b>10 Marks</b>	<b>20 Marks</b>
Attendance	Mock Practical	Lab Course Book / Journal	Synopsis and prerequisite	Analysis and Design	Two Demonstrations

i) For Semester End Examination:

Criteria for Paper Setting of Internal Assessment and Semester End Examination are as follows:

- Knowledge: 50 %
- Understanding: 25 %

- Applications, Analysis, and Problem Solving: 25%
- For Theory Examination: The Duration of the SEE will be as follows:
- Theory Question papers will be set for Fifty Marks (Two Hours Duration) for 04 credits course

**Table 9: S.E.E. Structure of Theory Paper Course**

Credits: 03				
Duration : 2.5 Hours			Marks : 60	
Q1	Q2	Q3	Q4	Q5
12 Marks	12 Marks	12 Marks	12Marks	12Marks
Short answers (any 6) Each carry 2 marks	Descriptive (any 3) Each carry 4 marks	Program/case study/Problems/ Find output or Errors(any 3) Each carry 4 marks	Descriptive (any 3) Each carry 4 marks	Descriptive/ Program/ Problem (any 3) Each carry 4 marks

**Table 10:S.E.E. Structure of Practical and Project Course**

Practical Credits :1.5		On Job Training Credits :15		
Duration : 03 Hours		Duration : 03 Hours		Marks :60
Q1	Q2	Viva	Project Report	Demonstration
15 Marks	15 Marks	10 Marks	10 Marks	40 Marks

### 13) REVISED MARKS STRUCTURE OF PROGRAM

**Table 11: First Year B.Voc. (Data Science and Data Analytics) Semester – I w.e.f. 2021- 22**

Course Code	Course / Title of Paper	Course	No. of lectures (Per Week)	No of Credits	Continuous Internal Evaluation		Semester End Examination		Total
					Theory	Practical	Theory	Practical	
21BVDSA111	Fundamental of Computers	General Core Course	3	3	40	--	60	--	100
21BVDSA112	Web Designing	Core Course	3	3	40	--	60	--	100
21BVDSA113	Programming in C	Core Course	3	3	40	--	60	--	100
21BVDSA114	Software Engineering	Core Course	3	3	40	--	60	--	100
21BVDSA115	Lab Course-I : MS Excel & Web Designing	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA116	Lab Course-II : C Programming	Skill Component	3HR	1.5	--	20	--	30	50
21BVDSA117	On Job Training*	Skill Component	12 HR	15	--	40	--	60	100
<b>Total Credit :30</b>					<b>Total CIE :240</b>		<b>Total SEE :360</b>		<b>600</b>

**Table 12: First Year B.Voc. (Data Science and Data Analytics) Semester – II w.e.f. 2021- 22**

Course Code	Course / Title of Paper	Course	No. of lectures (Per Week)	No of Credits	Continuous Internal Evaluation		Semester End Examination		Total
					Theory	Practical	Theory	Practical	
21BVDSA121	Data Structure using C	General Core Course	3	3	40	--	60	--	100
21BVDSA122	Database Management System	Core Course	3	3	40	--	60	--	100
21BVDSA123	Operating Systems	Core Course	3	3	40	--	60	--	100
21BVDSA124	Computer Networks	Core Course	3	3	40	--	60	--	100
21BVDSA125	Lab Course-I : Data Structure using C	Skill Component	3HR	1.5	--	20	--	30	50
21BVDSA126	Lab Course-II: DBMS using MYSQL	Skill Component	3HR	1.5	--	20	--	30	50
21BVDSA127	On Job Training *	Skill Component	12HR	15	--	40	--	60	100
<b>Total Credit :30</b>					<b>Total CIE :240</b>		<b>Total SEE :360</b>		<b>600</b>

**Table 13: Second Year B.Voc. (Data Science and Data Analytics) Semester – III w.e.f. 2022- 23**

Course Code	Course / Title of Paper	Course	No. of lectures (Per Week)	No of Credits	Continuous Internal Evaluation		Semester End Examination		Total
					Theory	Practical	Theory	Practical	
21BVDSA231	Introduction to R Programming	General Core Course	3	3	40	--	60	--	100
21BVDSA232	Web Technology using PHP Frameworks	Core Course	3	3	40	--	60	--	100
21BVDSA233	Applied Statistics - I	Core Course	3	3	40	--	60	--	100
21BVDSA234	Data Mining and Data Warehousing	Core Course	3	3	40	--	60	--	100
21BVDSA235	Lab Course-I : R Programming LAB	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA236	Lab Course-II : Web Technology	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA237	On Job Training*	Skill Component	12HR	15	--	40	--	60	100
<b>Total Credit :30</b>					<b>Total CIE :240</b>		<b>Total SEE :360</b>		<b>600</b>

**Table 14: Second Year B.Voc. (Data Science and Data Analytics) Semester – IV w.e.f. 2022- 23**

Course Code	Course / Title of Paper	Course	No. of lectures (Per Week)	No of Credits	Continuous Internal Evaluation		Semester End Examination		Total
					Theory	Practical	Theory	Practical	
21BVDSA241	Programming in Python	General Core Course	3	3	40	--	60	--	100
21BVDSA242	Object Oriented Programming Using Java	Core Course	3	3	40	--	60	--	100
21BVDSA243	Applied Statistics – II	Core Course	3	3	40	--	60	--	100
21BVDSA244	Cloud Computing	Core Course	3	3	40	--	60	--	100
21BVDSA245	Lab Course-I : Programming in Python	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA246	Lab Course-II : Java Programming	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA247	On Job Training*	Skill Component	12 HR	15	--	40	--	60	100
<b>Total Credit :30</b>					<b>Total CIE :240</b>		<b>Total SEE :360</b>		<b>600</b>

**Table 15: Third Year B.Voc. (Data Science and Data Analytics) Semester – V w.e.f. 2023- 24**

Course Code	Course / Title of Paper	Course	No. of lectures (Per Week)	No of Credits	Continuous Internal Evaluation		Semester End Examination		Total
					Theory	Practical	Theory	Practical	
21BVDSA351	Big Data Analytics	General Core Course	3	3	40	--	60	--	100
21BVDSA352	Android Programming	Core Course	3	3	40	--	60	--	100
21BVDSA353	Introduction to data Science	Core Course	3	3	40	--	60	--	100
21BVDSA354	Data Security	Core Course	3	3	40	--	60	--	100
21BVDSA355	Lab Course –I : Big Data Analytics using Hadoop	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA356	Lab Course –II: Android Programming	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA357	On Job Training*	Skill Component	12 HR	15	--	40	--	60	100
<b>Total Credit :30</b>					<b>Total CIE :240</b>		<b>Total SEE :360</b>		<b>600</b>

**Table 16: Third Year B.Voc. (Data Science and Data Analytics) Semester – VI w.e.f. 2023- 24**

Course Code	Course / Title of Paper	Course	No. of lectures (Per Week)	No of Credits	Continuous Internal Evaluation		Semester End Examination		Total
					Theory	Practical	Theory	Practical	
21BVDSA361	Machine Learning	General Core Course	3	3	40	--	60	--	100
21BVDSA362	Data Visualization using Power BI	Core Course	3	3	40	--	60	--	100
21BVDSA363	Artificial Intelligence	Core Course	3	3	40	--	60	--	100
21BVDSA364	Introduction to Soft Computing	Core Course	3	3	40	--	60	--	100
21BVDSA365	Lab Course-I : Machine Learning	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA366	Lab Course-I I: Data Visualization using Power BI	Skill Component	3 HR	1.5	--	20	--	30	50
21BVDSA367	On Job Training*	Skill Component	12 HR	15	--	40	--	60	100
<b>Total Credit :30</b>					<b>Total CIE :240</b>		<b>Total SEE :360</b>		<b>600</b>

#### 14) STANDARD OF PASSING:

- a. A student must obtain minimum 40% marks in Continuous Internal Evaluation (CIE) of theory and practical as well as semester end examination. It means that passing separately in the CIE and Semester End Examination is compulsory.
- b. Students who have failed in Continuous Internal Evaluation (CIE) of any semester can reappear for the same subjects in the next upcoming semester only. E.g. students failed in 1<sup>st</sup> semester can reappear in 2<sup>nd</sup> semester only and students failed in 2<sup>nd</sup> semester can appear in 3<sup>rd</sup> semester only.

#### 15) A.T.K.T. RULES:

- a. If a student fails in all the courses of semester-I, then that student will be allowed to proceed for semester II. Students who scores minimum **18 credits** can be admitted to S.Y.B.C.A. (Science).
- b. If a student fails in all the courses of semester III, then that student will be allowed to proceed for semester IV. Students who score **60 credits (100% credits)** in **F.Y.B.Voc. (Data Science and Data Analytics)** and minimum **18 credits** in **S.Y.B.Voc. (Data Science and Data Analytics)** can be admitted to **T.Y.B.Voc. (Data Science and Data Analytics)**
- c. If a candidate fails in all the courses (subject heads) of the passing of semester V shall be allowed to proceed to semester VI.
- d. A.T.K.T. rules are applicable for 2nd and 4th semester.

#### 16) VERIFICATION AND REVALUATION:

- a. The candidate may apply for verification and revaluation of result, which will be done by the **COLLEGE** as per ordinance framed on that behalf.
- b. There shall be revaluation of answer sheets of semester end examination of theory papers only, but not of internal assessment papers as per ordinance defined by college
- c. There shall be no revaluation of CIE and semester end practical examination.

## 17) STRUCTURE OF TRANSCRIPT:

- **Calculation of SGPA and CGPA:**

SGPA stands for Semester Grade Point Average. The performance of a student in a particular semester is given by SGPA. It can be calculated by the sum of total grade points divided by credit of total subject.

$$SGPA = \Sigma \frac{\text{Grade point earned X credits for each course}}{\text{TotalCredits}}$$

CGPA is the calculation of the cumulative grade point average value obtained by the student in all the subjects. The Grade Points obtained in all the subjects' are calculated along with the total number of credit hours the student has attempted.

$$CGPA = \Sigma \frac{\text{Grade point earned X credits for each course}}{\text{TotalCredits}}$$

- **Conversion of Marks into credit(s) and grade(s):**

The following illustrations could be taken as an example for computing SGPA and CGPA from percentage to credits in all disciplines, for the degree program in B.C.A (Science). The following formula may be used to convert (%) into Grade Letter.

**Table 17: Grades Points and Grade**

Sr.No.	Grade Letter	Grade Point	Marks
1	O(Outstanding)	10	90<= Marks <=100
2	A+(Excellent)	9	75<= Marks <=89
3	A(Very Good)	8	60<= Marks <=74
4	B+(Good)	7	55<= Marks <=59
5	B(Above Average)	6	50<= Marks <=54
6	C(Average)	5	45<= Marks <=49
7	D(Pass)	4	40<= Marks <=44
8	F(Fail)	0	Marks <40

**Table 18: Conversion of CGPA into corresponding percentage**

CGPA	Grade	Equation	Percentage
10	O	$20 \times 10 - 100$	100
9.75	O	$20 \times 9.75 - 100$	95
9.5	O	$20 \times 9.5 - 100$	90
9.0	A+	$12 \times 9 - 24$	84
8.25	A+	$12 \times 8.25 - 24$	75
8.0	A	$10 \times 8 - 7.5$	72.5
7.0	A	$10 \times 7 - 7.5$	62.5
6.75	A	$10 \times 6.75 - 7.5$	60
6.25	B+	$5 \times 6.25 + 26.25$	57.5
5.75	B+	$5 \times 5.75 + 26.25$	55
5.5	B	$10 \times 5.5 - 2.5$	52.5
5.25	B	$10 \times 5.25 - 2.5$	50
4.75	C	$10 \times 4.75 - 2.5$	45
4.00	C	$6.6 \times 4.0 + 13.6$	40

- a. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.
- b. For non-credit courses shall be evaluated on grading system and this will not be counted for the computation of SGPA/CGPA.

**18) COMPLETION OF DEGREE:**

The students who earn 180 Credits, shall be considered to have completed the requirements of **B.Voc. (Data Science and Data Analytics)** Program and CGPA shall be calculated for such successful students. The degree will be awarded by Savitribai Phule Pune University.

**19) IMPROVEMENT OF CLASS:**

- a. A Candidate will be allowed to re-appear for the examination for improvement of class or grade within a period of 2 years from the date of his/her passing bachelor's degree examination. Only 1 attempt for improvement will be allowed, according to the syllabus in existence at the time of improvement.
- b. A Candidate shall have to reappear for minimum 1/3<sup>rd</sup> and /or maximum all the theory courses (except practical and project) at a time on which the class is awarded.
- c. A Candidate who has appeared for improvement of class and fails to improve his/her -class, his/her performance at such reappearance shall be ignored.
- d. A Candidate appearing for the improvement of class grade shall not be entitled to be in the list of Rank holders/ Merit holders.
- e. Improved candidates will have to surrender the degree, statement of marks, passing certificate in original, after the declaration of their results of the concerned improved class. After surrendering the above documents in original, a new certificate will be issued in due course of time as in usual process.