# **OUTCOME BASED EDUCATION BOOKLET**

## **COMPUTER SCIENCE AND ENGINEERING**

### **B.Tech**

### For the Batches of Students during

Academic Years 2019-20, 2018-19 and 2017-18



.....Moving Towards Perfection in Engineering



### RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEEING & TECHNOLOGY

(AUTONOMOUS) Approved by AICTE: Affiliated to JNTUA and Accredited by NAAC with 'A+' Grade Nandyal – 518501, Andhra Pradesh

## **OUTCOME BASED EDUCATION**

## B. TECH- COMPUTER SCIENCE AND ENGINEERING

## Institute Vision and Mission

## Vision

To develop this rural based engineering college into an institute of technical education with global standards.

To become an institute of excellence which contributes to the needs of society To inculcate value based education with noble goal of "Education for peace and progress

## Mission

To build a world class undergraduate program with all required infrastructure that provides strong theoretical knowledge supplemented by the state of art skills. To establish postgraduate programs in basic and cutting edge technologies. To create conducive ambiance to induce and nurture research To turn young graduates to success oriented entrepreneurs To develop linkage with industries to have strong industry institute interaction To offer demand driven courses to meet the needs of the industry and society To inculcate human values and ethos into the education system for an all-round development of students.

## Department Vision and Mission

# Vision

- To empower students with cutting edge technologies in computer science and engineering.
- To train the students as entrepreneurs in computer science and engineering to address the needs of the society.
- To develop smart applications to disseminate information to rural people.

## Mission

- To become the best computer science and engineering department in the region offering undergraduate, post graduate and research programs in collaboration with industry.
  - To incubate, apply and spread innovative ideas by collaborating with relevant industries and R & D labs through focused research groups.
- To provide exposure to the students in the latest tools and technologies to develop smart applications for the society.

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## Part – I

#### PROGRAM EDUCATIONAL OBJECTIVES AND OUTCOMES

**Program Educational Objectives, Program Outcomes and Assessment Criteria** (Approved by Department Advisory Committee- CSE on 3/10/2012):

**Computer Science and Engineering Department Advisory Council:** The Computer Science and Engineering Department Advisory Committee (DAC) include a diverse group of experts from academic and industry, as well as alumni representation. The Advisory Board meets annually, or as needed, for a comprehensive review of the Computer Science and Engineering Department strategic planning and programs. The Advisory Council meets with administration, faculty and students and prepares a report, which is presented to principal. In each visit, the Department of Computer Science and Engineering responds to the report indicating improvements and amendments to the program.

### 1. PROGRAM EDUCATIONAL OBJECTIVES, OUTCOMES AND ASSESSMENT CRITERIA

#### Learning Outcomes, Assessment Criteria

The educational aims of a module are statements of the broad intentions of the teaching team. They indicate the objectives that the teaching team intends to cover and the learning opportunities that are necessary to be available to the student. A learning outcome is a statement that indicates the content that a learner (student) is expected to know, understand and/or be able to do at the end of a period of learning. It is advisable to express learning outcomes with the common prefix:

'On completion of (the period of learning e.g. module), the student is expected to be able to...'

Generally, learning outcomes do not specify curriculum, but more general areas of learning. It is not possible to prescribe precisely how specific a learning outcome statement should be. There is a balance to be struck between the degree of specificity in a learning outcome statement and that achieved by the assessment criteria. If there are too many learning outcomes for a module, then either they are becoming assessment criteria or they are specifying too much curricular detail. The curriculum should be described in the range statement. Too few learning outcomes are unlikely to provide sufficient information on the course. As a guide, there should be between 4 and 6 learning outcomes for a course.

The Program Educational Objectives (PEOs) of the Computer Science and Engineering department are broad statements or road maps describing career and professional objectives that intend the graduates to achieve through this program.

#### 2. B. TECH – COMPUTER SCIENCE AND ENGINEERING PROGRAM

#### EDUCATIONAL OBJECTIVES

A graduate of Rajeev Gandhi Memorial College of Engineering & Technology in Computer Science and Engineering discipline should have a successful career in Computer Science and Engineering or a related field, and within three to five years, should attain the following:

#### **PROGRAM EDUCATIONAL OBJECTIVES:**

#### **PEO1: Excellence Career**

Pursue a successful career in the field of Computer Science & Engineering or a related field utilizing his/her education and contribute to the profession as an excellent employee, or as an entrepreneur.

#### **PEO2: Enhance the Students Knowledge**

Be aware of the developments in the field of Computer Science & Engineering; continuously enhance their knowledge informally or by pursuing graduate studies.

#### **PEO3: Products Innovations**

Engage in research and inquiry leading to new innovations and products

#### **PEO4:** Communicative Work in Professional Environments

Be able to work effectively in multidisciplinary and multicultural environments.

#### **PEO5: Leadership and Contribution to Society**

To be responsible members and leaders of their communities, understand the human, social and environmental context of their profession and contribute positively to the needs of individuals and society at large

These objectives are quite broad by intention, as Computer Science and Engineering graduates may seek further education or work in diverse areas. To make these objectives meaningful, they may be demonstrated by performance, actions, or achievements.

#### i. To prepare the students who will be able to attain a solid foundation in Computer Science and engineering fundamentals with an attitude to pursue continuing education. – Excellence in Career

- □ Make the students to understand their aptitude to choose the correct path of study which leads to higher qualifications and heights in the chosen field.
- □ Should be prepared to undergo rigorous training in their fields of working.
- □ Be capable of utilizing the solid foundation obtained at institute to apply successfully in solving the real time engineering problems.

- □ Students need to have creative thinking processes that are acquired through good training to find solutions to engineering problems.
- ii. To prepare the students to function professionally in an increasingly international and rapidly changing world due to the advances in technologies and concepts and to contribute to the needs of the society- Enhance the students' knowledge; Products Innovations
  - □ Adoptability and accommodative mind set to suit modern world and changing economies.
  - □ By working hard in the chosen field and sharing the professional experience at different forums within and outside the country.
  - □ Desirable to be a member of various professional societies (IEEE, IETE, ISTE, IE, and etc.) to keep yourself abreast with the state-of-the-art technology.
  - □ Should continue additional education in a broad range of subjects other than engineering may be needed in order to meet professional challenges efficiently and effectively.
  - □ Continuous interaction with educational and research institutions or industrial research labs.
  - □ Have a sound foundation of knowledge within a chosen field and achieve good depth and experience of practice in it.
  - □ Able to relate knowledge within chosen field to larger problems in society and able to appreciate the interaction between science, technology, and society.
  - □ Strong grasp of quantitative reasoning and an ability to manage complexity and ambiguity.
  - □ To conduct research, and design, develop, test and oversee the development of software systems for global upliftment.
  - □ Applying scientific knowledge to solve technical problems and develop products and services that benefit the society.
  - □ An software engineer shall contribute to the society by research, design and development, testing and evaluation, application by manufacturing, maintenance by service, management and other functions like sales, customer service and etc.

# iii. To prepare the students to acquire and exercise excellent leadership qualities, at various levels appropriate to their experience, to address issues in a responsive, ethical, and innovative manner. – Leadership and Contributions to Society

- Gives ample opportunity to work in diverse fields to acquire leadership roles in professional circles outside the workplace.
- □ Should keep in mind that the opportunities may change with the times.
- □ Should be prepared for creative solo and collaborative brainstorming sessions.
- Be able to inspire the team with selfless motivation and attitude to achieve success.
- □ Ability to think laterally or at-least have a flexibility of thought and make choices based on the requirement for situation.
- iv. To prepare the students who will be able to excel, in their careers by being a part of success and growth of an organization, with which they are associated. Communicative work in professional environments

- □ To achieve this, the focus should not be limited to an engineering curriculum and even to the class room.
- Continuing professional education by attending short term in courses design to update engineering skills.
- **A** lifelong commitment to learning new and specialized information.
- □ Should accept first person responsibility and should take the initiative in carrying out the work.
- □ Should be determined for the duty and dedicated to work and have passion for that.
- **D** Be delight at work with a positive attitude.
- □ Should be a detailed worker so that one can be relied by the organization.

The department of Computer Science and Engineering periodically reviews these objectives and as part of this review process, encourages comments from all interested parties including current students, alumni, prospective students, faculty those who hire or admit our graduates to other programs members of related professional organizations, and colleagues from other educational institutions.

#### 3. B. TECH - COMPUTER SCIENCE AND ENGINEERING PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

A graduate of the Computer Science and Engineering Program Outcomes will demonstrate:

#### **PROGRAM OUTCOMES:**

#### **PO1. Engineering Knowledge**

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

#### **PO2.** Problem Analysis

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

#### **PO3.** Design/Development of Solutions

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

#### **PO4.** Conduct Investigations of Complex Problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

#### **PO5.** Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

#### **PO6.** The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

#### **PO7.** Environment and Sustainability

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

#### **PO8.** Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

#### **PO9. Individual and Team Work**

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

#### **PO10.** Communication

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

#### **PO11. Project Management and Finance**

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

#### **PO12. Life-long Learning**

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

#### **PROGRAM SPECIFIC OUTCOMES**

#### **PSO1.** Systems and Design Analysis

Students will have the ability to understand the principles and working of computer systems to assess the hardware and software aspects of computer systems.

#### **PSO2.** Professional Skills

Students will have the ability to understand the structure and development methodologies of software system, that possess professional skills and knowledge of software design process.

#### **PSO3.** Products Innovations and Successful career

Students will have the ability to use knowledge in various domains to identify research gaps and

hence to provide solution to new ideas and innovations

#### 4. MAPPING OF PROGRAM EDUCATIONAL OBJECTIVES TO PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

The following Figure shows the correlation between the PEOs and the POs and PSOs



## The following Table shows the correlation between the Program Educational Objectives and the Program Outcomes & Program Specific Outcomes

#### MAPPING OF OBJECTIVES AND OUTCOMES

The following Table shows the correlation between the PEOs and the POs

Progra	Program Educational Objective		Program Educational Objective		Program Outcomes
	Pursue a successful career in the field of Computer Science & Engineering or a	<b>PO1:</b>	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex		
	related field utilizing his/her education and contribute to the profession as an excellent employee,	<b>PO2:</b>	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of		
	or as an entrepreneur	<b>DO2</b> .	mathematics, natural sciences, and engineering sciences.		
		P03:	and design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations		
PEO I		PO4:	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions		
		PO5:	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations		
		<b>PO9:</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.		
		PO10:	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions		
		PO12:	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.		

Progra	am Educational Objective	Program Outcomes
	Be aware of the developments in the field of Computer Science & Engineering; continuously enhance their knowledge informally or by pursuing	<ul> <li>PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</li> <li>PO2: Identify, formulate, review research literature, and analyze complex engineering problems reaching</li> </ul>
	graduate studies.	substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
		and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations
		PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PEO II		PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
		<b>PO6:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
		<b>PO11</b> : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
		<b>PO12:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objective		Program Outcomes
	Engage in research and inquiry leading to new innovations and products	<b>PO1</b> : Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
		<ul> <li>PO2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences</li> </ul>
		<b>PO3</b> : Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
		<b>PO4</b> : Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PEO III		<b>PO5:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
		<b>PO6:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
		<b>PO7:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
		<b>PO8:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
		<b>PO9:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
		<b>PO11:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary
		PO12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PEO IV	Be able to work effectively in multidisciplinary and	<b>PO1:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Program Educational Objective		Program Outcomes
	multicultural environments.	<b>PO8:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
		<ul><li>PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings</li></ul>
		PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
		<b>PO11:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
		<b>PO12:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PEO V	To be responsible members and leaders of their communities, understand the human, social and empiropmental contact of	<b>PO5</b> : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
	their profession and contribute positively to the needs of individuals and	<b>PO6</b> : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
	society at large.	<b>PO7</b> : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
		<b>PO9</b> : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
		<b>PO11</b> :Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
		PO12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### 5. **RELATION BETWEEN** THE PROGRAM OUTCOMES AND PROGRAM **EDUCATIONAL OBJECTIVES**

A broad relation between the Program Educational Objectives and the Program Outcomes is given in

the following table:

PEOs PEOs	PEO I: Excellence in Career	PEO II: Enhance the Students Knowledg e	PEO III: Products Innovation S	PEO IV: Communicativ e Work in Professional Environments	PEO V: Leadership and Contributio n to Society
PO1: Engineering knowledge	Н	Н	S	S	-
PO2: Problem analysis	Н	S	S		-
PO3: Design/developm ent of solutions	S	S	S		-
PO4: Conduct investigations of complex problems	S	S	S		-
PO5: Modern tool usage	Н	Н	Н		S
PO6: The engineer and society	S	S	Н		Н
PO7: Environment and sustainability	S	-	Н		S
PO8: Ethics			S	Н	
PO9: Individual and team work	S		Н	Н	Н
PO10: Communication	S			Н	S
PO11: Project management and finance		S	Н	S	S
PO12: Life-long learning	Н	S	S	S	S

 
 Table 1 - Relationships between program objectives and program outcomes
 Key: H = Highly Related; S = Supportive

## RELATION BETWEEN THE PROGRAM SPECIFIC OUTCOMES AND THE PROGRAM EDUCATIONAL OBJECTIVES

A broad relation between the program Educational Objectives and the Program Specific Outcomes are given in the following table:

PSOs ↓	PEOs	(1) Excellence in Career	(2) Enhance the Students Knowledge	(3) Products Innovations	(4) Communicative Work in Professional Environments	(5) Leadership and Contribution to Society
PSO1	Systems and Design Analysis	S	Н	S	-	
PSO2	Professional Skills	Н	S	S	S	S
PSO3	Products Innovations and Successful Career	S	S	Н	Н	Н

Relationship between Program Specific Outcomes and Program Educational Objectives Key: H= Highly Related; S = Supportive

#### Note:

- The assessment process can be direct or indirect.
- The direct assessment will be through interim assessment by the faculty or by industry / technology experts.
- The indirect assessment on the other hand could be by students through course outcomes, lab evaluation, department associations, exit interviews, and other survey forms
- Frequency of assessment can be once in a year and taken actions suggested by DAC members.

## 6. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES OF (B.Tech) CSE GRADUATES

Graduates from accredited programs must achieve the following learning outcomes, defined by broad areas of learning.

The outcomes are distributed within and among the courses within our curriculum, and our students are assessed for the achievement of these outcomes, as well as specific course learning objectives, through testing, surveys, and other faculty assessment instruments. Information obtained in these assessments is used in a short-term feedback and improvement loop.

Each Computer Science and Engineering student will demonstrate the following attributes by the time they graduate:

#### **PO1. Engineering Knowledge**

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

- □ Identify the concepts and/or equations
- Execute the solution using a logic and structured approach

• Evaluate the solution of the problem

#### **PO2.** Problem Analysis

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

Performance Criteria Definitions

- □ Identify an engineering problem
- **□** Formulate appropriate theoretical basis for the analysis of a given problem
- □ Analyze an engineering problem
- Evaluate the appropriate solution to an engineering problem

#### **PO3. Design/Development of Solutions**

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

Performance Criteria Definitions

- □ Awareness of global effects of the product / practice / event
- **u** Understanding of economic factors
- Awareness of implications to society at large

#### **PO4.** Conduct Investigations of Complex Problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

Performance Criteria Definitions

- □ Identify problem/purpose
- □ Prepare hypothesis
- Outline procedure
- □ List materials and equipment
- Conduct experiment
- **D** Record observations, data and results
- □ Perform analysis
- Document conclusions

#### **PO5.** Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

- Use modern engineering tools for the system design, simulation and analysis
- □ Use software applications effectively to write technical reports and oral presentations
- □ Use modern equipment and instrumentation in the design process, analysis and troubleshooting

#### **PO6.** The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

Performance Criteria Definitions

- □ Informal meetings on current issues
- **D** Participation in public service extracurricular activities
- □ Required Humanities and Social Sciences (HSS) courses on contemporary issues

#### **PO7.** Environment and Sustainability

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

Performance Criteria Definitions

- Develop a methodology to accomplish the design
- □ Select a solution from the potential solutions
- **I** Implement the solution

#### **PO8.** Ethics

### Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

Performance Criteria Definitions

- Demonstrate knowledge of professional code of ethics
- □ Understanding of ethical and professional issues
- □ Acknowledge the work of other in a consistent manner
- □ Exhibit honest behavior

#### **PO9.** Individual and Team Work

### Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

Performance Criteria Definition

- **D** Research and gather information
- □ Share responsibilities and duties
- □ Fulfill team role's duties
- listen to other teammates

#### **PO10.** Communication

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

- □ Use appropriate format and grammatical structure
- □ Create a well organized document
- □ Present the results appropriately
- Demonstrate effective oral communication

#### **PO11. Project Management and Finance**

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

Performance Criteria Definitions

- □ Awareness of global effects of the product / practice / event
- □ Understanding of economic factors
- Awareness of implications to society at large

#### **PO12. Life-long Learning**

### Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Performance Criteria Definitions

- **□** Find relevant sources of information
- □ Participate in school or professional seminars
- □ Participate in students or professional associations

#### PROGRAM SPECIFIC OUTCOMES OF (B.Tech)CSE GRADUATES

#### **PSO1.** Systems and Design Analysis

### Students will have the ability to understand the principles and working of computer systems to assess the hardware and software aspects of computer systems..

Performance Criteria Definitions

- □ Significantly contributing and delivery of desired engineering component, system and design concepts
- □ Formulating and solving, moderately complex Computer Science and Engineering problems
- □ Skillful use of state-of-the-art tools for Computer Science and Engineering processes
- Making practical recommendations that address issues related to Computer Science and Engineering product and systems.

#### **PSO2.** Professional skills

## Students will have the ability to understand the structure and development methodologies of software system, that possess professional skills and knowledge of software design process

Performance Criteria Definitions

- **D** Problem solution or program solution with problem formulation and abstraction
- □ Information and data collection.
- **D** Program model translation with the software design methodologies
- **□** Experimental design and solution development.
- □ Implementation and documentation for the software project

#### **PSO3.** Products Innovations and Successful career

Students will have the ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.

- □ Investigate and define a problem and identify constraints relating to health, safety, environmental and sustainability and assessment of risks based on these constraints.
- □ Understand customer and user needs and the importance of considerations such as aesthetics Identify and manage costs and drivers thereof.
- □ Use creativity to establish innovative solution Ensure fitness of purpose, for all aspects of the problem including production, operation, maintenance and disposal.
- □ Manage the design process and evaluate outcomes.

**PO1: Engineering Knowledge** 

#### 7. PROCEDURES FOR OUTCOME DELIVERY AND ASSESSMENT WITH RESPECT TO PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES (REF : ACADEMIC YEAR -2019-20)

The categorization of outcomes of the above Computer science and Engineering courses is grouped as follows:

The Courses covered by Individual Program Outcomes and Program Specific Outcomes

Apply the know	vledge of mathematics, science, engine of complex engineering problems	neering fundan	nentals, and an engineering specialization
A0512153	Discrete Mathematics	A0582155	UNIX Tools and Programming Lab
A0012156	Probability and Statistics	A0583155	Compiler Design and Computer Networks Lab
A0514153	Database Management Systems	A0510155	C# & .NET Frame Work
A0430153	Digital Logic Design	A0525156	Android Programming
A0513153	Object Oriented Programming through C++	A1226157	Information Security
A0009153	Environmental Science	A0508156	Web Technologies
A0472153	Digital Logic Design Lab	A0526156	Object Oriented Analysis & Design
A0596153	Database Management Systems Lab	A0586156	SCI LAB
A0595154	Advanced Data Structures Through C++ Lab	A0584156	WT LAB
A0506156	Computer Architecture	A0594155	C# & .NET Framework Lab
A0516154	Core Java Programming	A0585156	Android programming Lab
A0517154	Formal Languages and Automata Theory	A0528127	Computer Graphics
A0518154	Design and Analysis of Algorithms	A1217156	Software Testing Methodologies and Tools
A0519154	Operating Systems	A0533157	Data Warehousing & Mining
A0016155	Engineering Economics and Accountancy	A1228157	Cloud Infrastructure and Services
A0598154	CJP Lab	A0546158	Multimedia Application Development
A0597154	OS LAB	A0587157	Data Mining Lab
A0599154	Design and Analysis of Algorithms Lab	A1283156	Software Testing Tools Lab
A0520155	Advanced Java Programming	A0587127	Mini Project
A0509157	Computer Networks	A0017157	Management Science
A0521155	Compiler Design	A1232157	Human Computer Interaction
A0522155	Software Engineering	A0589158	PHP Programming
A0523155	UNIX Tools and Programming	A0571158	Seminar
A0524155	Principles of Programming	A0572158	Comprehensive Viva Voce

	Languages		
A0581155	Advanced Java Programming Lab	A0590128	Project Work
PO2: Problem	Analysis		
Identify, form	ulate, review research literature, and	analyze compl	lex engineering problems reaching
substantiated	conclusions using first principles of n	nathematics, na	atural sciences, and engineering sciences
A0512153	Discrete Mathematics	A0582155	UNIX Tools and Programming Lab
A0012156	Probability and Statistics	A0583155	Compiler Design and Computer
A0514153	Database Management Systems	A0510155	C# & .NET Frame Work
A0430153	Digital Logic Design	A0525156	Android Programming
A0513153	Object Oriented Programming through C++	A1226157	Information Security
A0009153	Environmental Science	A0508156	Web Technologies
A0472153	Digital Logic Design Lab	A0526156	Object Oriented Analysis & Design
A0595154	Advanced Data Structures Through C++ Lab	A0586156	SCI LAB
A0506156	Computer Architecture	A0584156	WT LAB
A0516154	Core Java Programming	A0594155	C# & .NET Framework Lab
A0517154	Formal Languages and Automata Theory	A0585156	Android programming Lab
A0518154	Design and Analysis of Algorithms	A0528127	Computer Graphics
A0519154	Operating Systems	A1217156	Software Testing Methodologies and Tools
A0016155	Engineering Economics and Accountancy	A0533157	Data Warehousing & Mining
A0598154	CJP Lab	A1228157	Cloud Infrastructure and Services
A0597154	OS LAB	A0546158	Multimedia Application Development
A0599154	Design and Analysis of Algorithms Lab	A0587157	Data Mining Lab
A0520155	Advanced Java Programming	A1283156	Software Testing Tools Lab
A0509157	Computer Networks	A0587127	Mini Project
A0521155	Compiler Design	A0017157	Management Science
A0522155	Software Engineering	A1232157	Human Computer Interaction
A0523155	UNIX Tools and Programming	A0589158	PHP Programming
A0524155	Principles of Programming Languages	A0571158	Seminar
A0581155	Advanced Java Programming Lab	A0572158	Comprehensive Viva Voce
A0582155	UNIX Tools and Programming Lab	A0590128	Project Work
PO3: Design/De	evelopment of Solutions		l.
Design solution	s for complex engineering problems a	nd design syste	em components or processes that meet the
specified needs	with appropriate consideration for	the public heal	Ith and safety, and the cultural, societal,
and environme	ntal considerations		
A0512153	Discrete Mathematics	A0510155	C# & .NET Frame Work
A0012156	Probability and Statistics	A0525156	Android Programming
A0514153	Database Management Systems	A1226157	Information Security
A0430153	Digital Logic Design	A0508156	Web Technologies
A0513153	Object Oriented Programming	A0526156	Object Oriented Analysis & Design
A0009153	Environmental Science	A0586156	SCILAB
A0472153	Digital Logic Design Lab	A0584156	WTLAB
A0596153	Database Management Systems Lab	A0510155	C# & .NET Frame Work

A0506156         Computer Architecture         A0528127         Computer Graphics           A0516154         Core Java Programming         A1217156         Software Testing Methodologies and Tools           A0517154         Formal Languages and Automata Theory         A0533157         Data Warehousing & Mining           A0518154         Design and Analysis of Algorithms         A0546158         Multimedia Application Development           A0519154         Operating Systems         A0587157         Data Mining Lab           A0599154         CIP Lab         A0587127         Mini Project           A0599154         CIP Lab         A0587127         Mini Project           A0599154         Obergin and Analysis of Algorithms         A0589158         PHP Programming           A052155         Software Engineering         A0589158         PHP Programming           A052155         UNIX Tools and Programming         A0581155         Advanced Java Programming           A052155         UNIX Tools and Programming         A0581155         Advanced Java Programming           A0514153         Discrete Mathematics         A0519154         Operating Systems           A0514153         Discrete Mathematics         A0519154         Operating Systems           A0514153         Discrete Mathematics         A0591154	A0595154	Advanced Data Structures Through C++ Lab	A0585156	Android programming Lab
A0516154         Core Java Programming         A1217156         Software Testing Methodologies and Tools           A0517154         Formal Languages and Automata Theory         A0533157         Data Warehousing & Mining           A0518154         Design and Analysis of Algorithms         A0546158         Multimedia Application Development           A0519154         Operating Systems         A0587157         Data Mining Lab           A05016155         Engineering Economics and Accountancy         A1283156         Software Testing Tools Lab           A0599154         OS LAB         A0587127         Mini Project           A0590155         Advanced Java Programming         A0580128         Project Work           A052155         Advanced Java Programming         A0581155         Advanced Java Programming Languages           A052155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A052155         UNIX Tools and Programming         A0581154         Advanced Java Programming Lab           A051153         Database Management Systems         A0616154         Gepreiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0513153         Digital Logic Design         A0591154         OP Lab           A04301635         Digital Logic Desing         A059	A0506156	Computer Architecture	A0528127	Computer Graphics
A0517154         Formal Languages and Automata Theory         A0533157         Data Warehousing & Mining           A0518154         Design and Analysis of Algorithms         A0586158         Multimedia Application Development           A0519154         Operating Systems         A0587157         Data Mining Lab           A0016155         Engineering Economics and Accountancy         A1283156         Software Testing Tools Lab           A0589154         CPL Lab         A00587127         Mini Project           A0589154         Design and Analysis of Algorithms         A0589158         PHP Programming           A0520155         Advanced Java Programming         A0524155         Principles OF Programming Languages           A0522155         UNIX Tools and Programming         A0524155         Principles OF Programming Languages           A052155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           Vise research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A051153         Discrete Mathematics         A0519154         Operating Systems           A0430153         Digital Logic Design         A0598154         CPE Lab           A0430153         Digital Logic Desing Lab         A0520155         Adva	A0516154	Core Java Programming	A1217156	Software Testing Methodologies and Tools
A0518154         Design and Analysis of Algorithms         A0546158         Multimedia Application Development           A0519154         Operating Systems         A0587157         Data Mining Lab           A0016155         Engineering Economics and Accountancy         A1283156         Software Testing Tools Lab           A0598154         CPL Lab         A0057127         Management Science           A0599154         Design and Analysis of Algorithms Lab         A00524155         Phile Programming           A0522155         Advanced Java Programming         A0524155         Principles of Programming Languages           A0523155         UNIX Tools and Programming         A0545155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming         A0545155         Advanced Java Programming Lab           A0581255         UNIX Tools and Programming         A0545155         Advanced Java Programming Lab           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0430153         Digital Logic Design         A0599154         OS LAB           A0430153         Digital Logic Design Lab         A0599154         Design and Analysis of Algorithms Lab           A059	A0517154	Formal Languages and Automata Theory	A0533157	Data Warehousing & Mining
A0519154         Operating Systems         A0587157         Data Mining Lab           A0016155         Engineering Economics and Accountancy         A1283156         Software Testing Tools Lab           A0598154         CIP Lab         A0587157         Management Science           A0599154         OS LAB         A0017157         Management Science           A0599154         OS LAB         A0017157         Management Science           A0520155         Advanced Java Programming         A0589158         PHP Programming Languages           A052155         Software Engineering         A0524155         Principles of Programming Languages           A058155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming         A0581154         Operating Systems           A0512153         Discrete Mathematics         A0519154         Operating Systems           A051153         Discrete Mathematics         A059154         CIP Lab           A051153         Digital Logic Design         A0599154         CIP Lab           A0513153         Object Oriented Programming         A0599154         OS LAB           A04512153         Digital Logic Design Lab         A0599154         OS LAB           A059	A0518154	Design and Analysis of Algorithms	A0546158	Multimedia Application Development
A0016155         Engineering Economics and Accountancy         A1283156         Software Testing Tools Lab           A0598154         CJP Lab         A0587127         Mini Project           A0599154         Design and Analysis of Algorithms         A0589158         PHP Programming           A0520155         Advanced Java Programming         A0590128         Project Work           A0522155         Software Engineering         A0524155         Principles of Programming Lap           A0582155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           View research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0512153         Discrete Mathematics         A0516154         Operating Systems           A0512153         Discrete Mathematics         A059154         OS LAB           A0430153         Digital Logic Design         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0599154         Advanced Java Programming           A0595154         Advanced Data Structures Through         A052155         Advanced Java Programming           A	A0519154	Operating Systems	A0587157	Data Mining Lab
A0598154         CIP Lab         A0587127         Mini Project           A0597154         OS LAB         A0017157         Management Science           A0599154         Design and Analysis of Algorithms         A0589158         PHP Programming           A0522155         Software Engineering         A0524155         Principles of Programming Languages           A0523155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A0582155         LUNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A0582155         LUNIX Tools and Programming         A0514153         Advanced Java Programming Lab           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0514153         Database Management Systems         A0016155         Engineering Economics and Accountancy           A0430153         Digital Logic Design         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0599154         CJB Lab           A059154         Advanced Data Structures Through C++         A0523155         UNIX Tools and Programming A0526156           A0516156         Computer Architecture         A0523155         UNIX Tools and Programming Lab           A0516154         Core Java Prog	A0016155	Engineering Economics and Accountancy	A1283156	Software Testing Tools Lab
A0597154         OS LAB         A0017157         Management Science           A0599154         Design and Analysis of Algorithms         A0589158         PHP Programming           A0520155         Advanced Java Programming         A0550128         Project Work           A0522155         Software Engineering         A0524155         Principles of Programming Languages           A0523155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming         A0581154         Operating Systems           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0512153         Database Management Systems         A0016155         Engineering Economics and Accountancy           A0430153         Digital Logic Design         A0597154         OS LAB           A0472153         Object Oriented Programming         A0520155         Advanced Java Programming           A0595154         Core Java Programming         A0520155         Advanced Java Programming           A0595154         Core Java Programming         A0520155         VIX Tools and Programming           A051155         Core Java Programmi	A0598154	CJP Lab	A0587127	Mini Project
A0599154         Design and Analysis of Algorithms Lab         A0589158         PHP Programming           A0520155         Advanced Java Programming         A0590128         Project Work           A0522155         Software Engineering         A0524155         Principles of Programming Languages           A0581155         UNIX Tools and Programming A0581155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming Lab         Advanced Java Programming Lab           PO4: Conduct Investigations of Complex Problems         Use research-based Knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0514153         Discrete Mathematics         A0519154         Operating Systems           A0513153         Discrete Mathematics         A006155         Engineering Economics and Accountacy           A0430153         Digital Logic Design Lab         A0597154         OS LAB           A0472153         Digital Logic Design Lab         A0599154         Advanced Java Programming           A0505154         Core Java Programming         A0524155         Principles of Programming           A05154         Core Java Programming         A0524155         Principles of Programming Lab           A0517154         Formal Languages and Automata Theory         A05	A0597154	OS LAB	A0017157	Management Science
A0520155         Advanced Java Programming         A0590128         Project Work           A0522155         Software Engineering         A0524155         Principles of Programming Lab           A0582155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           PO4: Conduct Investigations of Complex Problems         Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0513153         Digital Logic Design         A0598154         CIP Lab           A0430153         Digital Logic Design Lab         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0520155         Advanced Java Programming           A0550156         Computer Architecture         A052155         VINX Tools and Programming           A0551154         Core Java Programming         A0524155         Principles of Programming Lab           A055154         Core Java Programming         A0584156         SCI LAB<	A0599154	Design and Analysis of Algorithms Lab	A0589158	PHP Programming
A0522155         Software Engineering         A0524155         Principles of Programming Languages           A0582155         UNIX Tools and Programming         A0581155         Advanced Java Programming Lab           PO4: Conduct Investigations of Complex Problems         Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0514153         Database Management Systems         A0016155         Accountancy           A040153         Digital Logic Design         A0598154         CIP Lab           A0472153         Object Oriented Programming         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0599154         Design and Analysis of Algorithms Lab           A0595154         Care Lab         Advanced Data Structures Through C++         A0520155         Advanced Java Programming           A0514154         Core Java Programming         A0524155         Principles of Programming Lab           A0595154         Care Lab         Advanced Data Structures Through C++         A0524155         VIIX Tools and Programming           A0514154         Core Java Programming         A0524155         VIIX Tools and Programming Lab	A0520155	Advanced Java Programming	A0590128	Project Work
A0523155         UNIX Tools and Programming Lab         A0581155         Advanced Java Programming Lab           A0582155         UNIX Tools and Programming Lab         Interpretation of data, and synthesis of the information to provide valid conclusions           PO4: Conduct Investigations of Complex Problems         Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0513153         Digital Logic Design         A0598154         CJP Lab           A0430153         Digital Logic Design Lab         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0520155         Advanced Java Programming           A0506156         Computer Architecture         A0523155         UNIX Tools and Programming Languages           A051154         Formal Languages and Automata         A0581155         Advanced Java Programming Lab           A0512156         Android Programming         A0584155         UNIX Tools and Programming Lab           A0525156         Android Programming         A0584156         WTI LAB           A0526156         Object Oriented Analysis &	A0522155	Software Engineering	A0524155	Principles of Programming Languages
A0582155         UNIX Tools and Programming Lab           PO4: Conduct Investigations of Complex Problems Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0514153         Database Management Systems         A0016155         Engineering Economics and Accountancy           A0430153         Digital Logic Design         A0598154         CJP Lab           A0512153         Digital Logic Design         A0599154         OS LAB           A0472153         Digital Logic Design Lab         A0599154         Design and Analysis of Algorithms Lab           A0595154         Advanced Data Structures Through C++ Lab         A0520155         Advanced Java Programming           A0516154         Core Java Programming         A0523155         UNIX Tools and Programming Laguages           A0517154         Formal Languages and Automata         A0581155         Advanced Java Programming Lab           A0520155         Android Programming         A0584156         WT LAB           A0520156         Android Programming         A0584156         WT LAB           A0510154         Core Java Programming         A0584156         WT LAB           A0520156	A0523155	UNIX Tools and Programming	A0581155	Advanced Java Programming Lab
PO4: Conduct Investigations of Complex Problems           Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0513         Digital Logic Design         A0598154         CIP Lab           A0430153         Digital Logic Design         A0598154         CIP Lab           A0472153         Digital Logic Design Lab         A0599154         Design and Analysis of Algorithms Lab           A0472153         Digital Logic Design Lab         A0520155         Advanced Java Programming           A05154         C4++ Lab         A0520155         Advanced Java Programming           A0506156         Computer Architecture         A0523155         UNIX Tools and Programming Languages           A051154         Formal Languages and Automata         A0581155         Advanced Java Programming Lab           A0525156         Android Programming         A0584156         WT LAB           A0528127         Computer Graphics         A0584156         WT LAB           A0528127         Computer Graphics         A0587127         Main Project           A0528155         Digital Logic Design         A0546158         Software T	A0582155	UNIX Tools and Programming Lab		
Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions           A0512153         Discrete Mathematics         A0519154         Operating Systems           A0514153         Database Management Systems         A0016155         Engineering Economics and Accountancy           A0430153         Digital Logic Design         A0598154         CJP Lab           A0513153         Object Oriented Programming through C++         A0599154         OS LAB           A0595154         Advanced Data Structures Through C++ Lab         A0520155         Advanced Java Programming           A051154         Core Java Programming C++ Lab         A0523155         UNIX Tools and Programming Languages           A051154         Core Java Programming Theory         A0584155         UNIX Tools and Programming Lab           A0510155         C# & .NET Frame Work         A0584155         UNIX Tools and Programming Lab           A0525156         Android Programming         A0584156         WIX Tools and Programming Lab           A0526156         Object Oriented Analysis & Design         A0584156         WIX Tools and Programming Lab           A0525156         Android Programming         A0584156         WIX Tools and Programming Lab           A0528127         Computer Graphics	<b>PO4: Conduct</b>	Investigations of Complex Problems		
interpretation of data, and synthesis of the information to provide valid conclusionsA0512153Discrete MathematicsA0519154Operating SystemsA0514153Database Management SystemsA0016155Engineering Economics and AccountancyA0430153Digital Logic DesignA0598154CJP LabA0513153Object Oriented Programming through C++A0599154OS LABA0472153Digital Logic Design LabA0599154Design and Analysis of Algorithms LabA0595154Advanced Data Structures Through C++ LabA0520155Advanced Java ProgrammingA0506156Core Java ProgrammingA0523155UNIX Tools and Programming LaguagesA051154Formal Languages and Automata TheoryA0581155Advanced Java Programming LabA052156Android ProgrammingA058156SCI LABA0526156Object Oriented Analysis & DesignA0586156SCI LABA0526156Object Oriented Analysis & DesignA0586158Multimedia Application DevelopmentA0528127Computer GraphicsA0587157Data Mining LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0599158PHP ProgrammingA0058156Software Testing Tools LabA059128Project WorkA0017157Management ScienceA0593157Data Warehousing & MiningA0587127Mini ProjectA0599158PHP ProgrammingA0017157Management ScienceA0593157Data Warehousing & MiningA00587127Mini ProjectA059	Use research-l	based knowledge and research met	thods includin	g design of experiments, analysis and
A0512153Discrete MathematicsA0519154Operating SystemsA0514153Database Management SystemsA0016155Engineering Economics and AccountancyA0430153Digital Logic DesignA0598154CIP LabA0513153Object Oriented Programming through C++A0597154OS LABA0472153Digital Logic Design LabA0599154Design and Analysis of Algorithms LabA0595154Advanced Data Structures Through C++ LabA0520155Advanced Java ProgrammingA0506156Computer ArchitectureA0523155UNIX Tools and ProgrammingA051154Core Java ProgrammingA0524155Principles of Programming LabA051155Care Java ProgrammingA05881155Advanced Java Programming LabA0510155C# & .NET Frame WorkA0581155SCI LABA052156Android ProgrammingA0546158Multimedia Application DevelopmentA0528126Object Oriented Analysis & DesignA0546158Multimedia Application DevelopmentA0528127Computer GraphicsA0587157Data Mining LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA059129Project WorkProject workPO5:PO5:Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB10Eng	interpretation	of data, and synthesis of the informat	ion to provide <sup>,</sup>	valid conclusions
A0514153Database Management SystemsA0016155Engineering Economics and AccountancyA0430153Digital Logic DesignA0598154CJP LabA0513153Object Oriented Programming through C++A0599154OS LABA0472153Digital Logic Design LabA0599154Design and Analysis of Algorithms LabA0595154Advanced Data Structures Through C++ LabA0520155Advanced Java ProgrammingA0506156Computer ArchitectureA0523155UNIX Tools and ProgrammingA0510154Core Java ProgrammingA0524155Principles of Programming LanguagesA051155C# & NET Frame WorkA0581155Advanced Java Programming LabA0508156Web TechnologiesA0584156SCI LABA0526156Object Oriented Analysis & DesignA0546158Multimedia Application DevelopmentA0526156Object Oriented Analysis & DesignA0587157Data Mining LabA0526156Object Oriented Analysis & A0587157Data Mining LabA0528127Computer GraphicsA0587127Mini ProjectA0589158PHIP ProgrammingA0017157Management ScienceA0599158PHP ProgrammingA0017157Management ScienceA0599158PHP ProgrammingA0017157Management ScienceA0599158PHP ProgrammingA0017157Management ScienceA0599158PHP ProgrammingA0017157Management ScienceA0599158PHP ProgrammingA0017157Management ScienceA059159Data Warehousing & Mining <t< td=""><td>A0512153</td><td>Discrete Mathematics</td><td>A0519154</td><td>Operating Systems</td></t<>	A0512153	Discrete Mathematics	A0519154	Operating Systems
A0430153Digital Logic DesignA0598154CJP LabA0513153Object Oriented Programming through C++A0597154OS LABA0472153Digital Logic Design LabA0599154Design and Analysis of Algorithms LabA0595154Advanced Data Structures Through C++ LabA0520155Advanced Java ProgrammingA0506156Computer ArchitectureA0523155UNIX Tools and ProgrammingA0516154Core Java ProgrammingA0524155Principles of Programming LanguagesA0517154Formal Languages and Automata TheoryA0586156SCI LABA0525156Android ProgrammingA0586156SCI LABA0526156Object Oriented Analysis & DesignA0584156WT LABA0528127Computer GraphicsA0587157Data Mining LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP programmingA0017157Management ScienceA0590128Project WorkMini ProjectA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0512153Discrete MathematicsAHSB10Engineering physics LaboratoryA0512154Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0012156Probability and StatisticsAMEB01Engineering physics LaboratoryA0012156Probability and StatisticsAMEB01Engineering physics Laboratory	A0514153	Database Management Systems	A0016155	Engineering Economics and Accountancy
A0513153Object Oriented Programming through C++A0597154OS LABA0472153Digital Logic Design LabA0599154Design and Analysis of Algorithms LabA0595154Advanced Data Structures Through C++ LabA0520155Advanced Java ProgrammingA0506156Computer ArchitectureA0523155UNIX Tools and ProgrammingA0517154Core Java ProgrammingA0524155Principles of Programming LanguagesA0517154Formal Languages and Automata TheoryA0581155Advanced Java Programming LabA0525156Android ProgrammingA0582155UNIX Tools and Programming LabA0526156Object Oriented Analysis & DesignA0586156SCI LABA0528127Computer GraphicsA0587157Data Mining LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkDiscrete MathematicsAHSB13PO5: Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor Physics LaboratoryA0420153Digital Logic DesignAHSB10Engineering physics Laboratory A0009153	A0430153	Digital Logic Design	A0598154	CJP Lab
A0472153Digital Logic Design LabA0599154Design and Analysis of Algorithms LabA0595154Advanced Data Structures Through C++ LabA0520155Advanced Java ProgrammingA0506156Computer ArchitectureA0523155UNIX Tools and ProgrammingA0516154Core Java ProgrammingA0524155Principles of Programming LanguagesA0517154Formal Languages and Automata TheoryA0581155Advanced Java Programming LabA0510155C# & .NET Frame WorkA0582155UNIX Tools and Programming LabA0525156Android ProgrammingA0586156SCI LABA0526156Object Oriented Analysis & DesignA0546156WT LABA0528127Computer GraphicsA0587157Data Mining LabA1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0599128Project WorkProject WorkProject WorkPO5:Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0090153Environmental ScienceA0506156Computer Architecture <td>A0513153</td> <td>Object Oriented Programming through C++</td> <td>A0597154</td> <td>OS LAB</td>	A0513153	Object Oriented Programming through C++	A0597154	OS LAB
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A0516154Core Java ProgrammingA0524155Principles of Programming LanguagesA0517154Formal Languages and Automata TheoryA0581155Advanced Java Programming LabA0510155C# & .NET Frame WorkA0582155UNIX Tools and Programming LabA0525156Android ProgrammingA0586156SCI LABA0508156Web TechnologiesA0584156WT LABA0526156Object Oriented Analysis & DesignA0546158Multimedia Application DevelopmentA0528127Computer GraphicsA0587157Data Mining LabA1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0590128Project WorkPoject WorkPoject WorkPO5: Modern Tool Usage Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0506156	Computer Architecture	A0523155	UNIX Tools and Programming
A0517154Formal Languages and Automata TheoryA0581155Advanced Java Programming LabA0510155C# & .NET Frame WorkA0582155UNIX Tools and Programming LabA0525156Android ProgrammingA0586156SCI LABA0508156Web TechnologiesA0584156WT LABA0526156Object Oriented Analysis & DesignA0546158Multimedia Application DevelopmentA0528127Computer GraphicsA0587157Data Mining LabA1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkPostPostPoster techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0516154	Core Java Programming	A0524155	Principles of Programming Languages
A0510155C# & .NET Frame WorkA0582155UNIX Tools and Programming LabA0525156Android ProgrammingA0586156SCI LABA0508156Web TechnologiesA0584156WT LABA0526156Object Oriented Analysis & DesignA0546158Multimedia Application DevelopmentA0528127Computer GraphicsA0587157Data Mining LabA1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkPostPO5:Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0517154	Formal Languages and Automata Theory	A0581155	Advanced Java Programming Lab
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A0508156Web TechnologiesA0584156WT LABA0526156Object Oriented Analysis & DesignA0546158Multimedia Application DevelopmentA0528127Computer GraphicsA0587157Data Mining LabA1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkPO5: Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0525156	Android Programming	A0586156	SCI LAB
A0526156Object Oriented Analysis & DesignA0546158Multimedia Application DevelopmentA0528127Computer GraphicsA0587157Data Mining LabA1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkPO5: Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0508156	Web Technologies	A0584156	WT LAB
A0528127Computer GraphicsA0587157Data Mining LabA1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkPO5: Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0526156	Object Oriented Analysis & Design	A0546158	Multimedia Application Development
A1217156Software Testing Methodologies and ToolsA1283156Software Testing Tools LabA0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkImage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0528127	Computer Graphics	A0587157	Data Mining Lab
A0533157Data Warehousing & MiningA0587127Mini ProjectA0589158PHP ProgrammingA0017157Management ScienceA0590128Project Work <b>PO5: Modern Tool Usage</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A1217156	Software Testing Methodologies and Tools	A1283156	Software Testing Tools Lab
A0589158PHP ProgrammingA0017157Management ScienceA0590128Project WorkPO5: Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0533157	Data Warehousing & Mining	A0587127	Mini Project
A0590128Project WorkPO5: Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0589158	PHP Programming	A0017157	Management Science
PO5: Modern Tool UsageCreate, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0590128	Project Work		
Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitationsA0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	PO5: Modern	Fool Usage	•	·
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A0512153Discrete MathematicsAHSB13Semiconductor PhysicsA0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	prediction and	modeling to complex engineering act	ivities with an	understanding of the limitations
A0012156Probability and StatisticsAMEB01Workshop Manufacturing Practises LaboratoryA0430153Digital Logic DesignAHSB10Engineering physics LaboratoryA0009153Environmental ScienceA0506156Computer Architecture	A0512153	Discrete Mathematics	AHSB13	Semiconductor Physics
A0430153         Digital Logic Design         AHSB10         Engineering physics Laboratory           A0009153         Environmental Science         A0506156         Computer Architecture	A0012156	Probability and Statistics	AMEB01	Workshop Manufacturing Practises Laboratory
A0009153 Environmental Science A0506156 Computer Architecture	A0430153	Digital Logic Design	AHSB10	Engineering physics Laboratory
	A0009153	Environmental Science	A0506156	Computer Architecture

A0472153	Digital Logic Design Lab	A0516154	Core Java Programming
10506152	Database Management Systems	A 0517154	Formal Languages and Automata
A0390133	Lab	A031/134	Theory
A0521155	Compiler Design	A0518154	Design and Analysis of Algorithms
A0523155	UNIX Tools and Programming	A0519154	Operating Systems
A0524155	Principles of Programming	A0016155	Engineering Economics and
110524155	Languages	/10010155	Accountancy
A0581155	Advanced Java Programming Lab	A0598154	CJP Lab
A0582155	UNIX Tools and Programming Lab	A0597154	OS LAB
A0583155	Compiler Design and Computer Networks Lab	A0599154	Design and Analysis of Algorithms Lab
A0525156	Android Programming	A0520155	Advanced Java Programming
A1226157	Information Security	A0509157	Computer Networks
A0508156	Web Technologies	A0585156	Android programming Lab
A0526156	Object Oriented Analysis & Design	A0528127	Computer Graphics
A0586156	SCI LAB	A1217156	Software Testing Methodologies and Tools
A0584156	WT LAB	A0533157	Data Warehousing & Mining
A0594155	C# & .NET Framework Lab	A1228157	Cloud Infrastructure and Services
A0587157	Data Mining Lab	A0589158	PHP Programming
A1283156	Software Testing Tools Lab	A0571158	Seminar
A0587127	Mini Project	A0572158	Comprehensive Viva Voce
A0017157	Management Science	A0590128	Project Work
A1232157	Human Computer Interaction		
PO6. The Engi	ineer and Society		
100. The Engl	meet and society		
Apply reasonin	ng informed by the contextual knowl	ledge to assess s	societal, health, safety, legal and cultural
Apply reasonin issues and the	ng informed by the contextual knowl consequent responsibilities relevant t	ledge to assess s o the profession	societal, health, safety, legal and cultural aal engineering practice
Apply reasonin issues and the A0512153	ng informed by the contextual knowl consequent responsibilities relevant t Discrete Mathematics	edge to assess s o the profession A0581155	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab
Apply reasonin issues and the A0512153 A0430153	ng informed by the contextual knowl consequent responsibilities relevant t Discrete Mathematics Digital Logic Design	edge to assess s o the profession A0581155 A0582155	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab
Apply reasonin issues and the A0512153 A0430153 A0513153	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming	edge to assess s o the profession A0581155 A0582155 A0583155	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer
Apply reasonin           issues and the           A0512153           A0430153           A0513153	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++	edge to assess a o the profession A0581155 A0582155 A0583155	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab
Apply reasonin           issues and the           A0512153           A0430153           A0513153           A0009153	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science	edge to assess s o the profession A0581155 A0582155 A0583155 A0510155	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work
Apply reasonin           issues and the           A0512153           A0430153           A0513153           A0009153           A0472153	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab	edge to assess a o the profession A0581155 A0582155 A0583155 A0510155 A0525156	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work Android Programming
Apply reasonin           issues and the           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab	edge to assess a o the profession A0581155 A0582155 A0583155 A0510155 A0525156 A1226157	societal, health, safety, legal and cultural nal engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work Android Programming Information Security
Apply reasonin           issues and the           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy	edge to assess a           o the profession           A0581155           A0582155           A0583155           A0583155           A0510155           A0525156           A1226157           A0508156	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work Android Programming Information Security Web Technologies
Apply reasonin           issues and the of           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab	edge to assess s           o the profession           A0581155           A0582155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156	societal, health, safety, legal and cultural al engineering practice         Advanced Java Programming Lab         UNIX Tools and Programming Lab         Compiler Design and Computer         Networks Lab         C# & .NET Frame Work         Android Programming         Information Security         Web Technologies         Object Oriented Analysis & Design
Apply reasonin           issues and the of           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154           A0509157	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks	edge to assess s           o the profession           A0581155           A0582155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0526156           A0526156	Societal, health, safety, legal and cultural nal engineering practiceAdvanced Java Programming LabUNIX Tools and Programming LabCompiler Design and Computer Networks LabC# & .NET Frame WorkAndroid ProgrammingInformation SecurityWeb TechnologiesObject Oriented Analysis & DesignSCI LAB
Apply reasonin           issues and the e           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154           A0509157           A0521155	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design	edge to assess a o the profession A0581155 A0582155 A0583155 A0510155 A0525156 A1226157 A0508156 A0526156 A0586156 A0586156 A0584156	societal, health, safety, legal and cultural al engineering practice         Advanced Java Programming Lab         UNIX Tools and Programming Lab         Compiler Design and Computer         Networks Lab         C# & .NET Frame Work         Android Programming         Information Security         Web Technologies         Object Oriented Analysis & Design         SCI LAB         WT LAB
Apply reasonin           issues and the e           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154           A0509157           A0521155	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming	edge to assess s           o the profession           A0581155           A0582155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0586156           A0586156           A0584156           A0594155	societal, health, safety, legal and cultural al engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work Android Programming Information Security Web Technologies Object Oriented Analysis & Design SCI LAB WT LAB C# & .NET Framework Lab
Apply reasonin           issues and the           A0512153           A0430153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154           A0509157           A0523155           A0533157	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining	edge to assess s           o the profession           A0581155           A0582155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0586156           A0586156           A0584155           A0594155           A0585156	societal, health, safety, legal and cultural nal engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work Android Programming Information Security Web Technologies Object Oriented Analysis & Design SCI LAB WT LAB C# & .NET Framework Lab Android programming Lab
Apply reasonin           issues and the           A0512153           A0430153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154           A0509157           A0523155           A0533157           A1228157	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining Cloud Infrastructure and Services	edge to assess a o the profession A0581155 A0582155 A0583155 A0510155 A0525156 A1226157 A0508156 A0526156 A0586156 A0584156 A0584155 A0585156 A0587127	societal, health, safety, legal and cultural nal engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work Android Programming Information Security Web Technologies Object Oriented Analysis & Design SCI LAB WT LAB C# & .NET Framework Lab Android programming Lab
Apply reasonin           issues and the of           A0512153           A0430153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154           A0509157           A0523155           A0533157           A1228157           A0546158	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining Cloud Infrastructure and Services Multimedia Application Development	edge to assess s           o the profession           A0581155           A0582155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0586156           A0584155           A0585156           A0586156           A0594155           A0587127           A0017157	Societal, health, safety, legal and cultural nal engineering practiceAdvanced Java Programming LabUNIX Tools and Programming LabCompiler Design and Computer Networks LabC# & .NET Frame WorkAndroid ProgrammingInformation SecurityWeb TechnologiesObject Oriented Analysis & DesignSCI LABWT LABC# & .NET Framework LabAndroid programming Lab
Apply reasonin           issues and the of           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0599154           A0509157           A0523155           A0533157           A1228157           A0546158           A0589158	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining Cloud Infrastructure and Services Multimedia Application Development PHP Programming	edge to assess a           o the profession           A0581155           A0582155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0586156           A0586156           A0584156           A0594155           A0585156           A0587127           A0017157           A0572158	Societal, health, safety, legal and cultural aal engineering practiceAdvanced Java Programming LabUNIX Tools and Programming LabCompiler Design and Computer Networks LabC# & .NET Frame Work Android ProgrammingInformation SecurityWeb TechnologiesObject Oriented Analysis & DesignSCI LABWT LABC# & .NET Framework LabAndroid programming Lab
Apply reasonin           issues and the e           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0599154           A0509157           A0523155           A0533157           A1228157           A0546158           A0589158	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining Cloud Infrastructure and Services Multimedia Application Development PHP Programming Seminar	edge to assess a           o the profession           A0581155           A0582155           A0583155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0586156           A0586156           A0585156           A0585156           A0585156           A0585156           A0587127           A0017157           A0572158           A0590128	Societal, health, safety, legal and cultural aal engineering practiceAdvanced Java Programming LabUNIX Tools and Programming LabCompiler Design and Computer Networks LabC# & .NET Frame WorkAndroid ProgrammingInformation SecurityWeb TechnologiesObject Oriented Analysis & DesignSCI LABWT LABC# & .NET Framework LabAndroid programming LabMini ProjectManagement ScienceComprehensive Viva VoceProject Work
Apply reasonin           issues and the of           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0595154           A0599154           A0509157           A0523155           A0533157           A1228157           A0546158           A0571158           PO7: Environt	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining Cloud Infrastructure and Services Multimedia Application Development PHP Programming Seminar nent and Sustainability	edge to assess a           o the profession           A0581155           A0582155           A0583155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0586156           A0584156           A0594155           A0585156           A0587127           A0017157           A0572158           A0590128	Societal, health, safety, legal and cultural nal engineering practiceAdvanced Java Programming LabUNIX Tools and Programming LabCompiler Design and Computer Networks LabC# & .NET Frame WorkAndroid ProgrammingInformation SecurityWeb TechnologiesObject Oriented Analysis & DesignSCI LABWT LABC# & .NET Framework LabAndroid programming LabMini ProjectManagement ScienceComprehensive Viva VoceProject Work
Apply reasonin           issues and the of           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0595154           A0599154           A0509157           A0523155           A0533157           A1228157           A0546158           A0571158           PO7: Environt           Understand the	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining Cloud Infrastructure and Services Multimedia Application Development PHP Programming Seminar nent and Sustainability e impact of the professional engineeri	edge to assess s           o the profession           A0581155           A0582155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0526156           A0586156           A0586156           A0585156           A0585156           A0587127           A0017157           A0572158           A0590128           ing solutions in	societal, health, safety, legal and cultural al engineering practice         Advanced Java Programming Lab         UNIX Tools and Programming Lab         Compiler Design and Computer         Networks Lab         C# & .NET Frame Work         Android Programming         Information Security         Web Technologies         Object Oriented Analysis & Design         SCI LAB         WT LAB         C# & .NET Framework Lab         Android programming Lab         Mini Project         Management Science         Comprehensive Viva Voce         Project Work
Apply reasonin           issues and the of           A0512153           A0430153           A0513153           A0009153           A0472153           A0595154           A0016155           A0599154           A0509157           A0523155           A0533157           A1228157           A0546158           A0571158           PO7: Environt           Understand the           demonstrate th	ng informed by the contextual knowl consequent responsibilities relevant to Discrete Mathematics Digital Logic Design Object Oriented Programming through C++ Environmental Science Digital Logic Design Lab Advanced Data Structures Through C++ Lab Engineering Economics and Accountancy Design and Analysis of Algorithms Lab Computer Networks Compiler Design UNIX Tools and Programming Data Warehousing & Mining Cloud Infrastructure and Services Multimedia Application Development PHP Programming Seminar nent and Sustainability e impact of the professional engineering knowledge of, and need for sustain	edge to assess s           o the profession           A0581155           A0582155           A0583155           A0583155           A0510155           A0525156           A1226157           A0508156           A0526156           A0526156           A0586156           A0584155           A0585156           A0587127           A0017157           A0572158           A0590128           ing solutions in able development	societal, health, safety, legal and cultural nal engineering practice Advanced Java Programming Lab UNIX Tools and Programming Lab Compiler Design and Computer Networks Lab C# & .NET Frame Work Android Programming Information Security Web Technologies Object Oriented Analysis & Design SCI LAB WT LAB C# & .NET Framework Lab Android programming Lab Mini Project Management Science Comprehensive Viva Voce Project Work societal and environmental contexts, and ent

A0009153	Environmental Science	A0526156	Object Oriented Analysis & Design
A0519154	Operating Systems	A0584156	WT LAB
A0016155	Engineering Economics and Accountancy	A0594155	C# & .NET Framework Lab
A0509157	Computer Networks	A0528127	Computer Graphics
A0521155	Compiler Design	A1228157	Cloud Infrastructure and Services
A0523155	UNIX Tools and Programming	A0587127	Mini Project
A0524155	Principles of Programming Languages	A0017157	Management Science
A0581155	Advanced Java Programming Lab	A1232157	Human Computer Interaction
A0582155	UNIX Tools and Programming Lab	A0589158	PHP Programming
A0583155	Compiler Design and Computer Networks Lab	A0571158	Seminar
A0572158	Comprehensive Viva Voce	A0590128	Project Work
PO8: Ethics Apply ethica practice	l principles and commit to professional	ethics and res	ponsibilities and norms of the engineering
A0312133	Discrete Mathematics	A0310134	
A0514153	Database Management Systems	A0016155	Accountancy
A0513153	Object Oriented Programming through C++	A0597154	OS LAB
A0009153	Environmental Science	A0520155	Advanced Java Programming
A0596153	Database Management Systems Lab	A0509157	Computer Networks
A0595154	Advanced Data Structures Through C++ Lab	A0521155	Compiler Design
A0523155	UNIX Tools and Programming	A0522155	Software Engineering
A0582155	UNIX Tools and Programming Lab	A0510155	C# & .NET Frame Work
A0583155	Compiler Design and Computer Networks Lab	A0525156	Android Programming
A0594155	C# & .NET Framework Lab	A1226157	Information Security
A0585156	Android programming Lab	A0508156	Web Technologies
A0528127	Computer Graphics	A1228157	Cloud Infrastructure and Services
A1283156	Software Testing Tools Lab	A0546158	Multimedia Application Development
A0587127	Mini Project	A0571158	Seminar
A0017157	Management Science	A0572158	Comprehensive Viva Voce
A0590128	Project Work		
PO9: Individ Function effe settings	lual and Team Work ectively as an individual, and as a men	iber or leader	in diverse teams, and in multidisciplinary
A0512153	Discrete Mathematics	A0522155	Software Engineering
A0513153	Object Oriented Programming through C++	A0523155	UNIX Tools and Programming
A0009153	Environmental Science	A0524155	Principles of Programming Languages
A0472153	Digital Logic Design Lab	A0581155	Advanced Java Programming Lab
A0595154	Advanced Data Structures Through C++ Lab	A0582155	UNIX Tools and Programming Lab
A0506156	Computer Architecture	A0510155	C# & .NET Frame Work
A0516154	Core Java Programming	A0525156	Android Programming
A0517154	Formal Languages and Automata Theory	A0508156	Web Technologies
A0518154	Design and Analysis of Algorithms	A0526156	Object Oriented Analysis & Design
A0519154	Operating Systems	A0584156	WT LAB

A0016155	Engineering Economics and	A0585156	Android programming Lab
A 0598154	CIP Lab	A0528127	Computer Graphics
A0390134		A0320127	Software Testing Methodologies and
A0597154	OS LAB	A1217156	Tools
A0599154	Design and Analysis of Algorithms Lab	A0587157	Data Mining Lab
A0520155	Advanced Java Programming	A1283156	Software Testing Tools Lab
A1232157	Human Computer Interaction	A0587127	Mini Project
A0589158	PHP Programming	A0017157	Management Science
A0590128	Project Work		
PO10: Com	nunication		
Communicat	e effectively on complex engineering ac	tivities with th	ne engineering community and with society
at large, suc	h as, being able to comprehend and v	write effective	reports and design documentation, make
effective pres	sentations, and give and receive clear in	nstructions	1
A0512153	Discrete Mathematics	A0518154	Design and Analysis of Algorithms
A0012156	Probability and Statistics	A0519154	Operating Systems
A0514153	Database Management Systems	A0016155	Engineering Economics and Accountancy
A0513153	Object Oriented Programming through C++	A0599154	Design and Analysis of Algorithms Lab
A0596153	Database Management Systems Lab	A0520155	Advanced Java Programming
A0522155	Software Engineering	A0581155	Advanced Java Programming Lab
A0523155	UNIX Tools and Programming	A0582155	UNIX Tools and Programming Lab
A0508156	Web Technologies	A0584156	WT I AB
A0526156	Object Oriented Analysis & Design	A0528127	Computer Graphics
A1283156	Software Testing Tools Lab	Δ1232157	Human Computer Interaction
A0587127	Mini Project	A0580158	PHP Programming
A0017157	Managamant Science	A0500128	Project Work
<b>PO11: Projo</b>	t Management and Finance	A0390128	Floject Wolk
Demonstrate	knowledge and understanding of the	engineering or	nd management principles and apply these
to one's own	n work, as a member and leader in	a team, to n	nanage projects and in multidisciplinary
environment	s		
A0514153	Database Management Systems	A0009153	Environmental Science
A0596153	Database Management Systems Lab	A0516154	Core Java Programming
10016155	Engineering Economics and	A0517154	Formal Languages and Automata Theory
A0010133	Accountancy	A031/134	Format Languages and Automata Theory
A0598154	CJP Lab	A0520155	Advanced Java Programming
A0521155	Compiler Design	A0523155	UNIX Tools and Programming
A0581155	Advanced Java Programming Lab	A0582155	UNIX Tools and Programming Lab
A0510155	C# & .NET Frame Work	A0526156	Object Oriented Analysis & Design
A0584156	WT LAB	A0528127	Computer Graphics
A0594155	C# & .NET Framework Lab	A1217156	Software Testing Methodologies and Tools
A1283156	Software Testing Tools Lab	A0533157	Data Warehousing & Mining
A0587127	Mini Project	A0589158	PHP Programming
A0017157	Management Science	A0571158	Seminar
A0572158	Comprehensive Viva Voce	A0590128	Project Work
PO12: Life-le	ong Learning		
Recognize th	e need for, and have the preparation an	nd ability to er	ngage in independent and life-long learning
	Discrete Methematics	A0516154	Coro Java Programming
A0012155	Discrete Mathematics Drobability and Statistics	A0510134	Formal Languages and Automate Theory
A0/20152	Digital Logic Design	A0510154	Operating Systems
A0512152	Object Oriented Programming	A0016155	Engineering Economics and Accountency
L0212122	object Oriented Flogramming	L 10010133	Engineering Leononnes and Accountancy

	through C++		
A0009153	Environmental Science	A0598154	CJP Lab
A0472153	Digital Logic Design Lab	A0599154	Design and Analysis of Algorithms Lab
A0596153	Database Management Systems Lab	A0520155	Advanced Java Programming
A0595154	Advanced Data Structures Through C++ Lab	A0509157	Computer Networks
A0524155	Principles of Programming Languages	A0521155	Compiler Design
A0581155	Advanced Java Programming Lab	A0583155	Compiler Design and Computer Networks Lab
A0508156	Web Technologies	A0510155	C# & .NET Frame Work
A0526156	Object Oriented Analysis & Design	A0525156	Android Programming
A0584156	WT LAB	A0533157	Data Warehousing & Mining
A0594155	C# & .NET Framework Lab	A1228157	Cloud Infrastructure and Services
A0585156	Android programming Lab	A0546158	Multimedia Application Development
A0528127	Computer Graphics	A1283156	Software Testing Tools Lab
A1217156	Software Testing Methodologies and Tools	A0587127	Mini Project
A0571158	Seminar	A0017157	Management Science
A0572158	Comprehensive Viva Voce	A1232157	Human Computer Interaction
A0590128	Project Work	A0589158	PHP Programming

#### **PSO1: Professional Skills**

The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.

4.0510150		4.0450150	
A0512153	Discrete Mathematics	A0472153	Digital Logic Design Lab
A0514153	Database Management Systems	A0596153	Database Management Systems Lab
A0430153	Digital Logic Design	A0595154	Advanced Data Structures Through C++ Lab
A0513153	Object Oriented Programming through C++	A0506156	Computer Architecture
A0522155	Software Engineering	A0516154	Core Java Programming
A0523155	UNIX Tools and Programming	A0517154	Formal Languages and Automata Theory
A0524155	Principles of Programming Languages	A0518154	Design and Analysis of Algorithms
A0581155	Advanced Java Programming Lab	A0519154	Operating Systems
A0582155	UNIX Tools and Programming Lab	A0016155	Engineering Economics and Accountancy
A0583155	Compiler Design and Computer Networks Lab	A0598154	CJP Lab
A0510155	C# & .NET Frame Work	A0597154	OS LAB
A0525156	Android Programming	A0599154	Design and Analysis of Algorithms Lab
A1226157	Information Security	A0520155	Advanced Java Programming
A0508156	Web Technologies	A0509157	Computer Networks
A0526156	Object Oriented Analysis & Design	A0521155	Compiler Design
A0584156	WT LAB	A1228157	Cloud Infrastructure and Services
A0594155	C# & .NET Framework Lab	A0546158	Multimedia Application Development
A0585156	Android programming Lab	A1283156	Software Testing Tools Lab
A0528127	Computer Graphics	A0587127	Mini Project
A1217156	Software Testing Methodologies and Tools	A0017157	Management Science
A0533157	Data Warehousing & Mining	A1232157	Human Computer Interaction

10571159	Sominor	10590159	DUD Programming
A0572158	Comprehensive Vive Vece	A0500128	Project Work
R0372136	comprehensive viva voce	A0390128	Floject Work
The ability to a	m-solving skins	a aftwara proiog	t development using open anded programming
The ability to a	to deliver a quality product for business	soltware projec	t development using open-ended programming
environments	to deriver a quarity product for business	success.	
A0512153	Discrete Mathematics	A0472153	Digital Logic Design Lab
A0012155	Probability and Statistics	A0596153	Database Management Systems Lab
A0514153	Database Management Systems	A0595154	Advanced Data Structures Through C++ Lab
A0430153	Digital Logic Design	A0506156	Computer Architecture
110100100	Object Oriented Programming	110200120	
A0513153	through C++	A0516154	Core Java Programming
A0522155	Software Engineering	A0517154	Formal Languages and Automata Theory
A0523155	UNIX Tools and Programming	A0518154	Design and Analysis of Algorithms
10504155	Principles of Programming	4.0510154	
A0524155	Languages	A0519154	Operating Systems
A0581155	Advanced Java Programming Lab	A0016155	Engineering Economics and Accountancy
A0582155	UNIX Tools and Programming Lab	A0598154	CJP Lab
10592155	Compiler Design and Computer	40507154	OSIAD
A0585155	Networks Lab	A0597154	OS LAB
A0510155	C# & .NET Frame Work	A0599154	Design and Analysis of Algorithms Lab
A0525156	Android Programming	A0520155	Advanced Java Programming
A1226157	Information Security	A0509157	Computer Networks
A0508156	Web Technologies	A0521155	Compiler Design
A0526156	Object Oriented Analysis & Design	A0584156	WT LAB
A1228157	Cloud Infrastructure and Services	A0594155	C# & .NET Framework Lab
A0546158	Multimedia Application Development	A0585156	Android programming Lab
A0587157	Data Mining Lab	A0528127	Computer Graphics
A1283156	Software Testing Tools Lab	A1217156	Software Testing Methodologies and Tools
A0587127	Mini Project	A0533157	Data Warehousing & Mining
A0017157	Management Science	A0571158	Seminar
A1232157	Human Computer Interaction	A0572158	Comprehensive Viva Voce
A0589158	PHP Programming	A0590128	Project Work
<b>PSO3: Success</b>	sful career and Entrepreneurship		
The ability to	employ modern computer languages, en	vironments, and	platforms in creating Innovative career paths,
to be an entre	preneur, and a zest for higher studies.	1	
A0512153	Discrete Mathematics	A0513153	Object Oriented Programming through C++
A0012156	Probability and Statistics	A0009153	Environmental Science
A0514153	Database Management Systems	A0472153	Digital Logic Design Lab
A0506156	Computer Architecture	A0596153	Database Management Systems Lab
A0516154	Core Java Programming	A0595154	Advanced Data Structures Through C++ Lab
A0517154	Formal Languages and Automata Theory	A0598154	CJP Lab
A0518154	Design and Analysis of Algorithms	A0597154	OS LAB
A0519154	Operating Systems	A0599154	Design and Analysis of Algorithms Lab
A0523155	UNIX Tools and Programming	A0520155	Advanced Java Programming
A0524155	Principles of Programming Languages	A0509157	Computer Networks
A0581155	Advanced Java Programming Lab	A0521155	Compiler Design
A0582155	UNIX Tools and Programming Lab	A0525156	Android Programming
A0583155	Compiler Design and Computer Networks Lab	A1226157	Information Security
A0510155	C# & .NET Frame Work	A0508156	Web Technologies
A0584156	WT LAB	A0526156	Object Oriented Analysis & Design

A0594155	C# & .NET Framework Lab	A1228157	Cloud Infrastructure and Services
A0585156	Android programming Lab	A0546158	Multimedia Application Development
A0528127	Computer Graphics	A0587157	Data Mining Lab
A1217156	Software Testing Methodologies and Tools	A1283156	Software Testing Tools Lab
A0533157	Data Warehousing & Mining	A0587127	Mini Project
A1232157	Human Computer Interaction	A0572158	Comprehensive Viva Voce
A0589158	PHP Programming	A0590128	Project Work
A0571158	Seminar		

#### 8. METHODS OF MEASURING LEARNING OUTCOMES AND VALUE ADDITION

There are many different ways to assess student learning. In this section, we present the different types of assessment approaches available and the different frameworks to interpret the results.

- i. Mid Semester Course Evaluation
- ii. End-of Semester Course Evaluation
- iii. Continuous Evaluation of Classroom Performance
- iv. Course End Surveys
- v. Course Instructor's Evaluations
- vi. Program Exit Survey
- vii. Alumni Survey
- viii. Employer Survey
- ix. Laboratory and Project Works
- x. Balanced Composition in Curriculum
- xi. Department Advisory Committee and Faculty Meetings
- xii. Professional Societies

The above assessment indicators are detailed below.

#### i. Mid Semester Course Evaluation

Mid semester course reviews are conducted for all courses by the department. All students are encouraged to actively participate in this evaluation process. These evaluations are critically reviewed by HOD and senior faculty and the essence is communicated to the faculty concerned to analyze, improve and practice so as to improve the performance of the student.

#### ii. End-of Semester Course Evaluation

The end-of semester course reviews are conducted, feedback taken from students and remedial measures will be taken up such that the student gets benefited before going for the university end exams. The positive and negative comments made by the students about the course are recorded and submitted to the departmental academic council (DAC) and to the Principal for taking necessary actions to better the course for subsequent semesters.

#### iii. Continuous Evaluation of Classroom Performance

Students are encouraged and motivated to participate actively in the classroom proceedings by way of interactive teaching by the instructor. Surprise class tests comprising of short answer questions, quiz based discussions, multiple-choice, true-false, and matching tests are conducted to strengthen the teaching-learning process. Apart from teacher control and covering content, the teacher also acts as a felicitator and students discover things for themselves, enabling them to be more independent and becoming life-long learners exploring student-centric educational philosophy.

#### iv. Course End Surveys

Students are encouraged to fill-out a brief survey on the fulfillment of course outcomes. The data is reviewed by the concerned course faculty and the results are kept open for the entire faculty. Based on this, alterations or changes to the course contents are undertaken by thorough discussions in DAC meetings.

#### v. Course Instructor's Evaluations

The course coordinator will collect the course portfolios from the respective instructors of each course offered in a given semester at the beginning of the semester as well as at the end of the semester. They remain on file for verification and study by the entire faculty. This helps the course coordinator and faculty to understand how effectively we can teach the given course. Betterment can be achieved from time to time and continuous improvement can be shown in handling courses in the subsequent semesters.

#### vi. Program Exit Survey

The program exit survey form is to be filled by all the students leaving the institution. The questionnaire is designed in such a way to gather information from the students regarding the program educational objectives, solicit about program experiences, carrier choices, as well as any suggestions and comments for the improvement of the program. The opinions expressed in exit interview forms are reviewed by the DAC for implementation purposes.

#### vii. Alumni Survey

The survey asks former students of the department about the status of their employment and further education, perceptions of institutional emphasis, estimated gains in knowledge and skills, involvement as undergraduate students, and continuing involvement with Institute of Aeronautical Engineering. This survey is administered every three years. The data obtained will be analyzed and used in continuous improvement.

#### viii. Employer Survey

The main purpose of this employer questionnaire is to know employer's views about the skills they require of employees compared to the skills actually possessed by them. The purpose is also to identify gaps in technical and vocational skills, need for required training practices to fill these gaps and criteria for hiring new employees. These employer surveys are reviewed by the College Academic Council (CAC) to affect the present curriculum to suit the requirements of the employer.

#### ix. Laboratory and Project Works

The laboratory work is continuously monitored and assessed to suit the present demands of the industry. Students are advised and guided to do project works giving solutions to research/industrial problems to the extent possible by the capabilities and limitations of the student. The results of the assessment of the individual projects and laboratory work can easily be conflated in order to provide the students with periodic reviews of their overall progress and to produce terminal marks and grading.

#### x. Balanced Composition in Curriculum

The undergraduate program in Computer Science and engineering is designed to prepare students for successful careers in engineering and related fields by providing a balanced education, that prepares students to apply analytical, computational, experimental, and methodological tools to solve engineering problems; a strong foundation in mathematics and physical sciences; a broad and balanced general education in the humanities, arts, social sciences, and interdisciplinary studies; sufficient training and development of skills for effective communication and teamwork; a proper understanding of an engineer's professional and ethical responsibilities in relation to engineering fields and society; and recognition of the need for lifelong learning. The student's intellectual and ethical development is assessed continuously in relation to the balanced composition in curriculum.

#### xi. Department Advisory Committee and Faculty Meetings

The DAC meets bi-annually for every academic year to review the strategic planning and modification of PEOs. Faculty meetings are conducted at least once in fort night for ensuring the implementation of DAC's suggestions and guidelines. All these proceeding are recorded and kept for the availability of all faculties.

#### xii. Professional Societies

The importance of professional societies like IEEE, IETE, ISTE etc., are explained to the students and they are encouraged to become members of the above to carry out their continuous search for knowledge. Student and faculty chapters of the above societies are constituted for a better technical and entrepreneurial environment. These professional societies promote excellence in instruction, research, public service and practice.

#### Program Outcomes and Program Specific Outcomes Attained Values for the Academic Year 2019-20 in B. Tech -Computer Science and Engineering

COURSE	CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Discrete Mathematics	A0512153	2.72	2.72	2.71	2.72	2.71	2.72	-	2.72	2.72	2.71	-	2.72	2.7	2.71	2.72
Probability and	A0012156															
Statistics		2.69	2.65	2.63	-	2.56	-	-	-	-	2.69	-	2.56	-	2.56	2.68
Database	A0514153							0.67	• • •							
Management Systems	10120152	2.66	2.61	2.65	2.68	-	-	2.67	2.68	-	2.61	2.61	-	2.63	2.67	2.67
Digital Logic Design	A0430153	2.59	2.66	2.63	2.6	2.6	2.6	-	-	-	-	-	2.66	2.61	2.6	-
Object Oriented	A0513153															
C++		2.72	2.72	2.72	2.72	-	2.72	_	2.72	2.72	2.72	-	2.72	2.72	2.72	2.72
Environmental	A0009153															
Science	100007100	2.81	2.77	2.78	-	2.74	2.79	2.79	2.8	2.75	-	2.75	2.79	-	-	2.78
Digital Logic Design	A0472153															
Lab		2.69	2.69	2.69	2.69	2.69	2.69	-	-	2.69	-	-	2.69	2.69	2.69	2.69
Database	A0596153															
Management Systems		2.00		2.00		2.00			2.00		2.00	2.00	2.00	2.00	2.00	2.00
	10505154	2.89	-	2.89	-	2.89	-	-	2.89	-	2.89	2.89	2.89	2.89	2.89	2.89
Advanced Data	A0595154															
C++ Lab		2.86	2.86	2.86	2.86	-	2.86	-	2.86	2.86	-	-	2.86	2.86	2.86	2.86
Computer	A0506156															
Architecture		2.73	2.78	2.76	2.71	2.77	-	-	-	2.88	-	-	-	2.76	2.77	2.76
Core Java	A0516154															
Programming		2.65	2.64	2.64	2.64	2.64	-	-	2.65	2.65	-	2.65	2.64	2.65	2.64	2.63
Formal Languages	A0517154															
and Automata Theory		2.34	2.4	2.32	2.45	2.23	-	-	-	2.42	-	2.41	2.32	2.34	2.38	2.41
Design and Analysis	A0518154	0.70	0.70	0.70		0.70				0.70	0.70			0.70	0.70	0.70
of Algorithms		2.72	2.72	2.72	-	2.72	-	-	-	2.72	2.72	-	-	2.72	2.72	2.72
Operating Systems	A0519154	2.68	2.68	2.68	2.67	2.68	-	2.67	-	2.68	2.68	-	2.67	2.68	2.68	2.68
Engineering	A0016155															
Accountancy		2 67	2.68	2.68	2 69	2 69	2.68	2 69	27	2 69	2 69	2 69	2 69	27	2.68	_
CIPLab	A0598154	2.07	2.00	2.00	2.02	2.02		-		2.02	-	2.02	2.02	2.74	2.00	2 74
OS LAB	A0597154	2.37	2.37	2.37	2.37	2.37	-	-	2.37	2.37	-	-	-	2.37	2.37	2.37
Design and Analysis	A0599154															
of Algorithms Lab		2.43	2.43	2.43	2.43	2.43	2.43	-	-	2.43	2.43	-	2.43	2.43	2.43	2.43
Advanced Java	A0520155															
Programming		2.51	2.51	2.51	2.51	2.51	-	-	2.51	2.51	2.51	2.51	2.51	2.51	2.50	2.51
Computer Networks	A0509157	2.44	2.39	-	-	2.38	2.39	2.42	2.38	-	-	-	2.38	2.47	2.48	2.37
Compiler Design	A0521155	2.37	2.34	-	-	2.38	2.36	2.39	2.4	-	-	2.35	2.4	2.37	2.36	2.33
Software Engineering	A0522155	2.23	2.26	2.14	-	-	-	-	2.24	2.15	2.28	-	-	2.16	2.2	-

UNIV Tools and	10522155				1		1							1		
Programming	A0525155	2.47	2.5	2.4	2.47	2.37	2.31	2.47	2.68	2.64	2.38	2.67	-	2.5	2.44	2.43
Principles of	A0524155	2,	2.0	2	2,	2107	2.01	,	2.00	2.0 .	2.00	2.07		2.0	2	2.10
Programming																
Languages		2.4	2.4	2.4	2.4	2.4	-	2.39	-	2.4	-	-	2.39	2.4	2.4	2.4
Advanced Java	A0581155															
Programming Lab		2.44	2.44	2.44	2.44	2.44	2.44	2.44	-	2.44	2.44	2.44	2.44	2.44	2.44	2.44
UNIX Tools and Programming Lab	A0582155	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	-	2.84	2.84	2.84
Compiler Design and	A0583155															
Computer Networks																
Lab		2.3	2.3			2.3	2.3	2.3	2.3				2.3	2.3	2.3	2.3
C# & .NET Frame	A0510155															
Work		1.95	1.97	1.94	1.86	1.93	1.95	-	-	1.9	-	1.84	1.95	2.06	1.92	1.91
Android	A0525156	0.04	2.05	2.04	0.05	2.04	0.04		2.04	2.04			2.04	2.04	0.04	0.04
Programming		2.84	2.85	2.84	2.85	2.84	2.84	-	2.84	2.84	-	-	2.84	2.84	2.84	2.84
Information Security	A1226157	2.34	2.36	2.26	-	2.27	2.38	-	2.27	-	-			2.33	2.31	2.16
Web Technologies	A0508156	2.62	2.63	2.62	2.62	2.63	2.61	2.6	2.65	2.63	2.6	-	2.62	2.63	2.63	2.62
Object Oriented	A0526156	2.26	0.26	0.07	2.24	2.52	0.00	26	0.00	26	2 20	2.20	0.25	2.4	0.01	0.00
Analysis & Design		2.36	2.36	2.37	2.24	2.52	2.33	2.6	2.33	2.6	2.29	2.29	2.35	2.4	2.31	2.33
SCILAB	A0586156	75.88	77.65	76.47	/6.4/	77.06	77.06									
WT LAB	A0584156	2.84	2.84	2.84	2.84	2.84	2.84	2.84	-	2.84	2.84	2.84	2.84	2.84	2.84	2.84
C# & .NET	A0594155	2.20	2.20			2.20	2.20	2.20	2.20			2.20	2.20	2.20	2.20	2.20
	10505156	2.29	2.29	-	-	2.29	2.29	2.29	2.29	-	-	2.29	2.29	2.29	2.29	2.29
Lab	A0585156	2.92	2.92	2.92	-	2.92	2.92	-	2.92	2.92	-	-	2.92	2.92	2.92	2.92
Computer Graphics	A0528127	2.54	2.54	2.57	2.55	2.57	-	2.57	2.55	2.6	2.6	2.59	2.58	2.57	2.56	2.55
Software Testing	A1217156															
Methodologies and																
Tools		2.45	2.5	2.51	2.44	2.45	-	-	-	2.48	-	2.49	2.42	2.48	2.45	2.49
Data Warehousing &	A0533157															
Mining		2.33	2.31	2.32	2.32	2.33	2.34	-	-	-	-	2.32	2.32	2.34	2.32	2.33
Cloud Infrastructure	A1228157	2.64	2 (7			2.02	2.02	2 (1	2 (1				2.02	2.00	2.65	2.01
And Services	10546159	2.04	2.07	-	-	2.03	2.62	2.01	2.01	-	-	-	2.02	2.00	2.05	2.01
Application	A0546158															
Development		2.27	2.29	2.29	2.28	-	2.29	-	2.26	-	-	-	2.26	2.28	2.28	2.28
Data Mining Lab	A0587157	2.79	2.79	2.79	2.79	2.79	-	-	-	2.79	-	-	-	-	2.79	2.79
Software Testing	A1283156															
Tools Lab		2.75	2.75	2.75	2.75	2.75	-	-	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
Mini Project	A0587127	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Managamant Salanga	A0017157															
Management Science		2.38	2.41	2.41	2.38	2.37	2.42	2.55	2.4	2.4	2.4	2.37	2.4	2.38	2.38	-
Human Computer	A1232157	a -	a -							a -			a -		a -	
Interaction	10505155	2.7	2.7	-	-	2.7	-	2.7	-	2.7	2.7	-	2.7	2.7	2.7	2.7
PHP Programming	A0589158	2.41	2.41	2.4	2.38	2.43	2.45	2.45	-	2.41	2.42	2.41	2.42	2.43	2.41	2.42
Seminar	A0571158	2.98	2.98	-	-	2.98	2.98	2.98	2.98	-	-	2.98	2.98	2.98	2.98	2.98
Comprehensive Viva Voce	A0572158	3	3	-	-	3	3	3	3	-	-	3	3	3	3	3
Project Work	A0590128	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

## Program Outcomes and Program Specific Outcomes Attained Values for the Academic Year 2018-19 inB. Tech -Computer Science and Engineering

COURSE	CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Discrete Mathematics	A0512153	2.61	2.61	2.61	2.61	2.61	2.6	-	2.61	2.6	2.61	-	2.61	2.6	2.61	2.61
Probability and	A0012156	256	2.63	2.64		2 5 5					2.56		2 5 5		2 55	266
Statistics		2.30	2.05	2.04	-	2.33	-	-	-	-	2.30	-	2.33	-	2.33	2.00

Detebase	40514152															
Management Systems	A0314133	2 51	2 47	2 51	26	_	_	2 48	26	_	2 47	2 47	_	2 44	2.61	2 4 9
Digital Logic Design	A0/30153	2.51	2.47	2.51	2.0	2.51	2 52	2.40	2.0		2.47	2.47	2 5 5	2.44	2.64	2.47
	A0430133	2.01	2.34	2.31	2.32	2.31	2.32	-	-	-	-	-	2.55	2.5	2.04	-
Programming through	A0515155															
C++		2.6	2.61	2.6	2.61	-	2.6	-	2.61	2.6	2.6	_	2.61	2.61	2.61	2.61
Environmental	A0009153	2.0	2.01	2.0	2.01		2.0		2.01	2.0	2.0		2.01	2.01	2.01	2.01
Science	100007100	2.72	2.72	2.76	-	2.76	2.74	2.72	2.73	2.69	-	2.74	2.73	-	-	2.76
Digital Logic Design	A0472153															
Lab	110172133	2.62	2.62	2.62	2.62	2.62	2.62	-	-	2.62	-	-	2.62	2.62	2.62	2.62
Database	A0596153															
Management Systems	10090100															
Lab		2.71	-	2.71	-	2.71	-	-	2.71	-	2.71	2.71	2.71	2.71	2.71	2.71
Advanced Data	A0595154															
Structures Through																
C++ Lab		2.43	2.43	2.43	2.43	-	2.43	-	2.43	2.43	-	-	2.43	2.43	2.43	2.43
Computer	A0506156															
Architecture		2.31	2.47	2.45	2.26	2.16	-	-	-	2.78	-	-	-	2.29	2.38	2.37
Core Java	A0516154															
Programming		2.1	2.1	2.1	2.1	2.1	-	-	2.11	2.09	-	2.1	2.1	2.1	2.1	2.1
Formal Languages	A0517154															
and Automata Theory		2.21	2.22	2.2	2.21	2.14	-	-	-	2.2	-	2.26	2.2	2.2	2.2	2.26
Design and Analysis	A0518154															
of Algorithms		2.31	2.31	2.3	-	2.31	-	-	-	2.31	2.31	-	-	2.31	2.31	2.31
Operating Systems	A0519154	2.43	2.43	2.42	2.43	2.43	-	2.43	-	2.42	2.42	-	2.42	2.42	2.43	2.43
Engineering	A0016155															
Economics and																
Accountancy		2.73	2.75	2.73	2.74	2.72	2.74	2.76	2.77	2.74	2.75	2.75	2.76	2.72	2.77	-
CJP Lab	A0598154	2.45	2.45	2.45	2.45	2.45	-	-	-	2.45	-	2.45	2.45	2.45	2.45	2.45
OS LAB	A0597154	2.46	2.46	2.46	2.46	2.46	-	-	2.46	2.46	-	-	-	2.46	2.46	2.46
Design and Analysis	A0599154															
of Algorithms Lab		2.47	2.47	2.47	2.47	2.47	2.47	-	-	2.47	2.47	-	2.47	2.47	2.47	2.47
Advanced Java	A0520155															
Programming		2.51	2.51	2.51	2.51	2.51	-	-	2.51	2.51	2.51	2.51	2.51	2.51	2.5	2.51
Computer Networks	A0509157	2.55	2.55	-	-	2.53	2.55	2.55	2.56	-	-	-	2.55	2.55	2.55	2.55
Compiler Design	A0521155	2.39	2.44	-	-	2.39	2.35	2.37	2.43	-	-	2.41	2.43	2.42	2.38	2.45
Software Engineering	A0522155	2.37	2.4	2.37	-	-	-	-	2.34	2.4	2.4	-	-	2.36	2.38	-
UNIX Tools and	A0523155															
Programming		2.66	2.64	2.65	2.67	2.66	2.66	2.67	2.67	2.64	2.65	2.66	-	2.66	2.66	2.66
Principles of	A0524155															
Programming																
Languages		2.44	2.44	2.44	2.44	2.44	-	2.45	-	2.44	-	-	2.44	2.44	2.44	2.44
Advanced Java	A0581155															
Programming Lab		2.47	2.47	2.47	2.47	2.47	2.47	2.47	-	2.47	2.47	2.47	2.47	2.47	2.47	2.47
UNIX Tools and	A0582155															
Programming Lab		2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	-	2.8	2.8	2.8
Compiler Design and	A0583155															
Computer Networks																
Lab		2.67	2.67	-	-	2.67	2.67	2.67	2.67	-	-	-	2.67	2.67	2.67	2.67
C# & .NET Frame	A0510155	0.54	25	0.51	0.51	0.50	0.50			2.16		2.44	0.57	0.00	0.50	0.50
Work		2.56	2.5	2.51	2.51	2.53	2.52	-	-	2.46	-	2.44	2.57	2.68	2.52	2.53
Android	A0525156	27	2 72	2.71	2.00	27	2 72		2.65	2.00			27	27	27	27
riogramming	A 100 C1 57	2.1	2.12	2.71	2.09	2.1	2.12	-	2.03	2.09	-	-	2.7	2.1	2.1	2.1
Information Security	A1226157	2.65	2.65	2.65	-	2.65	2.65	-	2.65	2.65	-	-	2.65	2.65	2.65	2.65
Web Technologies	A0508156	2.24	2.23	2.24	2.23	2.24	2.23	2.24	2.24	2.24	2.22	-	2.24	2.23	2.24	2.23
Object Oriented	A0526156	0.50	0.50	0.1-	0.50	a :=		0	0.70	0.70	0.55	0.70	0.51	0.51	0.5	0.77
Analysis & Design		2.53	2.58	2.46	2.63	2.47	2.4	2.52	2.52	2.52	2.75	2.52	2.51	2.54	2.6	2.55
SCI LAB	A0586156															
WT LAB	A0584156	2.46	2.46	2.46	2.46	2.46	2.46	2.46	-	2.46	2.46	2.46	2.46	2.46	2.46	2.46
C# & .NET	A0594155															
Framework Lab		2.63	2.63	-	-	2.63	2.63	2.63	2.63	-	-	2.63	2.63	2.63	2.63	2.63

Android programming	A0585156															
Lab		2.7	2.72	2.71	2.69	2.7	2.72	-	2.65	2.69	-	-	2.7	2.7	2.7	2.7
Computer Graphics	A0528127	2.42	2.52	2.39	2.53	2.41	-	2.39	2.51	2.41	2.41	2.41	2.42	2.43	2.48	2.48
Advanced Databases	A0542158	1.94	1.97	1.9	1.97	1.97	-	1.98	-	1.98	2.07	1.97	1.94	1.96	1.97	2
Software Testing Methodologies and Tools	A1217156	2.32	2.44	2.45	2.36	2.34	-	-	_	2.42	_	2.44	2.34	2.41	2.43	2.38
Data Warehousing & Mining	A0533157	2.16	2.15	2.15	2.15	2.15	2.16	-	-	-	-	2.15	2.15	2.16	2.15	2.16
Cloud Infrastructure and Services	A1228157	2.77	2.78	-	-	2.78	2.77	2.76	2.76	-	-	-	2.77	2.77	2.77	2.76
Multimedia Application Development	A0546158	2.11	2.1	2.1	2.09	-	2.09	_	2.09	-	-	2.06	2.1	2.1	2.1	2.1
Data Mining Lab	A0587157	2.66	2.66	2.66	2.66	2.66	-	-	-	2.66	-	-	-	-	2.66	2.66
SCI Lab	A0586156	2.43	2.44	2.44	2.45	2.44	-	-	2.42	2.42	2.44	2.43	2.44	2.43	2.44	2.44
Software Testing Tools Lab	A1283156	2.75	2.75	2.75	2.75	2.75	-	-	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
Mini Project	A0587127	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Management Science	A0017157	2.53	2.52	2.52	2.51	2.52	2.53	2.52	2.53	2.53	2.53	2.53	2.52	2.54	2.53	-
Human Computer Interaction	A1232157	2.51	2.51	-	-	2.51	-	2.51	-	2.51	2.51	-	2.51	2.51	2.51	2.51
PHP Programming	A0589158	2.55	2.55	2.55	2.55	2.54	2.54	2.54	1	2.55	2.55	2.55	2.55	2.55	2.55	2.55
Seminar	A0571158	3	-	3	-	3	3	3	-	3	3	3	-	-	3	3
Comprehensive Viva Voce	A0572158	3	3	-	-	-	-	-	-	-	3	3	3	-	3	3
Project Work	A0590128	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Average		2.49	2.48	2.46	2.44	2.48	2.50	2.48	2.50	2.48	2.50	2.46	2.47	2.46	2.49	2.49

## Program Outcomes and Program Specific Outcomes Attained Values for the Academic Year 2017-18 in B. Tech -Computer Science and Engineering

COURSE	CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Discrete Mathematics	A0512153	2.49	2.49	2.49	2.49	2.49	2.48	-	2.49	2.48	2.49	-	2.49	2.49	2.49	2.49
Probability and Statistics	A0012156	2.57	2.62	2.57	-	2.54	-	-	-	-	2.57	-	2.54	-	2.54	2.64
Database Management Systems	A0514153	2.24	2.22	2.18	2.31	-	-	2.14	2.31	-	2.22	2.22	-	2.19	2.27	2.22
Digital Logic Design	A0430153	2.81	2.71	2.65	2.63	2.62	2.63	-	-	-	-	-	2.72	2.62	2.88	-
Object Oriented Programming through C++	A0513153	2.67	2.67	2.67	2.69	-	2.68	-	2.67	2.67	2.66	-	2.67	2.67	2.67	2.67
Environmental Science	A0009153	2.64	2.64	2.63	-	2.5	2.57	2.64	2.64	2.61	-	2.5	2.63	-	-	2.63
Digital Logic Design Lab	A0472153	2.59	2.59	2.59	2.59	2.59	2.59	-	-	2.59	-	-	2.59	2.59	2.59	2.59
Database Management Systems Lab	A0596153	2.75	-	2.75	-	2.75	-	-	2.75	-	2.75	2.75	2.75	2.75	2.75	2.75
Advanced Data Structures Through C++ Lab	A0595154	2.6	2.6	2.6	2.6	-	2.6	-	2.6	2.6	-	-	2.6	2.6	2.6	2.6
Computer Architecture	A0506156	2.66	2.67	2.67	2.65	2.62	-	-	-	2.7	-	-	-	2.64	2.66	2.66
Core Java Programming	A0516154	2.73	2.73	2.73	2.74	2.73	-	-	2.73	2.73	-	2.73	2.73	2.73	2.73	2.74
Formal Languages and Automata Theory	A0517154	2.59	2.6	2.58	2.61	2.57	-	-	-	2.6	-	2.58	2.58	2.59	2.59	2.58

Design and Analysis of Algorithms	A0518154	2.57	2.57	2.57	-	2.57	-	-	-	2.58	2.57	-	-	2.58	2.58	2.58
Operating Systems	A0519154	2.68	2.68	2.68	2.68	2.68	-	2.69	-	2.68	2.68	-	2.69	2.68	2.69	2.69
Engineering	A0016155															
Economics and																
Accountancy		2.78	2.78	2.8	2.79	2.8	2.77	2.78	2.76	2.79	2.78	2.78	2.78	2.82	2.78	-
CJP Lab	A0598154	2.46	2.46	2.46	2.46	2.46	-	-	-	2.46	-	2.46	2.46	2.46	2.46	2.46
OS LAB	A0597154	2.88	2.88	2.88	2.88	2.88	-	-	2.88	2.88	-	-	-	2.88	2.88	2.88
Design and Analysis of Algorithms Lab	A0599154	2.48	2.48	2.48	2.48	2.48	2.48	-	-	2.48	2.48	-	2.48	2.48	2.48	2.48
Advanced Java Programming	A0520155	2.71	2.73	2.72	2.73	2.72	-	-	2.72	2.72	2.73	2.72	2.72	2.72	2.71	2.72
Computer Networks	A0509157	2.7	2.69	-	-	2.69	2.69	2.69	2.69	-	-	-	2.7	2.7	2.69	2.69
Compiler Design	A0521155	2.46	2.46	-	-	2.6	2.72	2.48	2.48	-	-	2.47	2.48	2.48	2.56	2.47
Software Engineering	A0522155	2.49	2.5	2.47	-	-	-	-	2.49	2.49	2.5	-	-	2.49	2.48	-
UNIX Tools and Programming	A0523155	2.51	2.46	2.5	2.47	2.53	2.48	2.47	2.47	2.44	2.47	2.46	_	2.47	2.47	2.47
Principles of	A0524155				,											
Programming Languages		2.59	2.59	2.59	2.59	2.59	-	2.58	-	2.59	-	-	2.59	2.59	2.59	2.59
Advanced Java Programming Lab	A0581155	2 65	2 65	2 65	2 65	2 65	2 65	2 65	-	2 65	2 65	2 65	2 65	2 65	2 65	2 65
SCI Lab		2.05	2.05	2.65	2.05	2.65	-	-	2 66	2.65	2.65	2.65	2.65	2.65	2.65	2.65
UNIX Tools and	A0582155	2.00	2.07	2.07	2.00	2.00			2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Programming Lab	110002100	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	-	2.81	2.81	2.81
Compiler Design and Computer Networks Lab	A0583155	2.85	2.85	_	_	2.85	2.85	2.85	2.85	_	_	_	2.85	2.85	2.85	2.85
C# & .NET Frame	A0510155	2.05	2.05	2.64	2.50	2.00	2.00	2.05	2.00	2.50		2.50	2.05	2.00	2.00	2.00
Work	10525156	2.64	2.64	2.64	2.59	2.63	2.58	-	-	2.59	-	2.59	2.65	2.69	2.62	2.62
Android Programming	A0525156	2 67	2 65	2 66	2 67	2 64	2 63	_	2 66	2 61	_	-	2 67	2 65	2 66	2.68
Information Security	A1226157	2.46	2.49	2.41	-	2.53	2.45	-	2.53	-	-	-	-	2.45	2.46	2.42
Web Technologies	A0508156	2.4	2.4	2.4	2.4	2.4	2.4	2.41	2.38	2.4	2.42	-	2.4	2.41	2.4	2.4
Object Oriented	A0526156															
Analysis & Design		2.6	2.62	2.61	2.59	2.63	2.56	2.62	2.62	2.62	2.6	2.61	2.59	2.62	2.6	2.58
SCI LAB	A0586156															
WT LAB	A0584156	2.86	2.86	2.86	2.86	2.86	2.86	2.86	-	2.86	2.86	2.86	2.86	2.86	2.86	2.86
C# & .NET	A0594155															
Framework Lab	10505154	2.8	2.8	-	-	2.8	2.8	2.8	2.8	-	-	2.8	2.8	2.8	2.8	2.8
Android programming Lab	A0585156	2.86	2.86	2.86	-	2.86	2.86	-	2.86	2.86	-	-	2.86	2.86	2.86	2.86
Computer Graphics	A0528127	2.34	2.4	2.33	2.39	2.37	-	2.33	2.38	2.4	2.4	2.39	2.37	2.37	2.38	2.38
Web Technologies &Programming	A0527127	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.66	2.65	2.64	-	2.65	2.65	2.65	2.65
Data Warehousing & Mining	A0529127	2.5	2.53	2.54	2.55	2.56	2.51	-	-	-	-	2.57	2.59	2.51	2.53	2.52
Human Computer Interaction	A1232157	2.79	2.79	-	-	2.79	-	2.79	-	2.79	2.79	-	2.8	2.79	2.79	2.79
Concepts of Machine	A0541128															
Learning		2.7	2.67	2.67	2.67	2.7	2.72	2.72	2.72	0	0	0	2.72	2.65	2.65	2.65
Distributed Databases	A0533127	2.52	2.52	2.52	2.52	2.52	-	2.52	-	2.53	2.54	2.52	2.51	2.51	2.52	2.51
Digital Image Processing	A0423127	2.34	2.36	-	-	2.36	2.36	2.36	2.36	-	-	2.32	2.36	2.37	2.37	2.3
Digital Image	A0585127															
Processing Lab		2.77	2.77	-	-	2.77	2.77	2.77	2.77	-	-	2.77	2.77	2.77	2.77	2.77
Web Technologies &Programming Lab	A0586127	2.86	2.86	2.86	2.86	2.86	2.86	2.86	-	2.86	2.86	2.86	2.86	2.86	2.86	2.86
Seminar	A0588128	3	-	3	-	3	3	3	-	3	3	3	-	-	3	3

Comprehensive Viva	A0589128															
Voce		3	3	-	-	-	-	-	-	-	3	3	3	-	3	3
Mini Project	A0587127	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Management Science	A0014125	2.65	2.66	2.65	2.65	2.66	2.65	2.66	2.65	2.65	2.66	2.66	2.66	2.63	2.67	-
PROJECT WORK	A0590128	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Average		2.61	2.60	2.58	2.57	2.61	2.60	2.58	2.57	2.60	2.58	2.58	2.61	2.59	2.61	2.60

## Part - II

#### METHODOLOGY FOR PREPARATION AND ASSESSMENT OF COURSE LEVEL STUDENT LEARNING OUTCOMES

Although the term "Expected Learning Outcome" may be new, the process of identifying the key concepts or skills that students are expected to learn during specific courses is not. Many people are more familiar with the terms "course objective" or "course competency". Expected learning outcomes are really very similar to both of these concepts, so if you already have course objectives or competencies, you are close to having expected learning outcomes for class.

This will provide information on exactly what expected learning outcomes are and what methods can be used to assess them. This is designed to assist faculty with the process of developing expected learning outcomes and methods for assessing those outcomes in their courses. This provides basic information related to (1) course purpose; (2) expected learning outcomes; (3) methods for assessing expected learning outcomes; (4) criteria for grade determination; and (5) course outline.

#### **Expected Learning Outcomes:**

After reading and completing this, individuals will be able to:

- Prepare a description of the course as well as a written statement regarding the course's purpose;
- Construct/develop expected learning outcomes for the course;
- Create an assessment plan that outlines the specific methods that will be used to assess the expected student learning outcomes for a course;
- Describe how grades will be determined in a process that is separate and distinct from assessing the expected learning outcomes;
- Identify the common components of a course outline
- Revise their course syllabi to incorporate a course purpose, expected learning outcomes, methods to assess those outcomes, the criteria for grade determination, and a course outline.
- This process uses some terminology related to expected learning outcomes and assessment. A brief glossary of terms has been provided below for reference purposes.

#### Assessment of expected learning outcomes:

The process of investigating (1) what students are learning and (2) how well they are learning it in relation to the stated expected learning outcomes for the course.

#### Assessment plan:

The proposed methods and timeline for assessment-related activities in a given course (e.g., when are you going to check what/how well the students are learning and how are you going to do that?).

#### **Classroom Assessment Technique (CAT):**

Angelo and Cross (1993) developed a variety of techniques/activities than can be used to assess students' learning. These CATs are often done anonymously and are not graded. These activities check on the class'

learning while students are still engaged in the learning process. An example of a CAT is a non-graded quiz given a few weeks before the first exam.

#### **Course description:**

A formal description of the material to be covered in the course.

#### **Course purpose:**

The course purpose describes the intent of the course and how it contributes to the programme. The course purpose goes beyond the course description.

#### **Expected learning outcome:**

A formal statement of what students are expected to learn in a course (synonyms for "expected learning outcome" include learning outcome, learning outcome statement, and student learning outcome).

#### **Evaluation:**

Making a judgment about the quality of student's learning/work and assigning marks based on that judgment. Evaluation activities (such as exams, papers, etc.) are often seen as formal ways to assess the expected learning outcomes for a course.

#### Methods for assessing student learning outcomes:

This term refers to any technique or activity that is used to identify what students are learning or how well they are learning. Formal methods for evaluating student learning outcomes include Continuous Assessment Tests, Mid Semester Test, Tutorials, End Semester Examination etc. The assessment methods are used to identify how the well students have acquired the learning outcomes for the course.

#### 1. COURSE PURPOSE

One of the first steps in identifying the expected learning outcomes for a course is identifying the purpose of teaching in the course. By clarifying the purpose of the course, faculty can help discover the main topics or themes related to students' learning. These themes help to outline the expected learning outcomes for the course.

The course purpose involves the following:

- 1. What role does this course play within the programme?
- 2. How is the course unique or different from other courses?
- 3. Why should/do students take this course? What essential knowledge or skills should they gain from this experience?
- 4. What knowledge or skills from this course will students need to have mastered to perform well in future classes or jobs?
- 5. Why is this course important for students to take?

The "Course Description" provides general information regarding the topics and content addressed in the course, the "Course Purpose" goes beyond that to describe how this course fits in to the students' educational experience in the programme.

#### 2. EXPECTED LEARNING OUTCOMES

#### **Expected Learning Outcome (definition)**

An expected learning outcome is a formal statement of what students are expected to learn in a course. Expected learning outcome statements refer to specific knowledge, practical skills, areas of professional development, attitudes, higher-order thinking skills, etc. that faculty members expect students to

develop, learn, or master during a course (Suskie, 2004). Expected learning outcomes are also often referred to as "learning outcomes", "student learning outcomes", or "learning outcome statements".

#### Simply stated, expected learning outcome statements describe:

- What faculty members want students to know at the end of the course and
- What faculty members want students to be able to do at the end of the course

#### Learning outcomes have three major characteristics

- They specify an action by the students/learners that is **observable**
- They specify an action by the students/learners that is **measurable**
- They specify an action that is done by the **students/learners** (rather than the faculty members)

Effectively developed expected learning outcome statements should possess all three of these characteristics. When this is done, the expected learning outcomes for a course are designed so that they can be assessed (Suskie, 2004).

#### 3. TO DEFINE EFFECTIVE LEARNING OUTCOME STATEMENTS

When stating expected learning outcomes, it is important to use verbs that describe exactly what the learner(s) will be able to do upon completion of the course.

#### Examples of good action words to include in expected learning outcome statements:

Compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, explain, predict, assess, compare, rate, critique, outline, or evaluate

There are some verbs that are unclear in the context of an expected learning outcome statement (e.g., know, be aware of, appreciate, learn, understand, comprehend, and become familiar with). These words are often vague, have multiple interpretations, or are simply difficult to observe or measure (American Association of Law Libraries, 2005). As such, it is best to avoid using these terms when creating expected learning outcome statements.

For example, please look at the following learning outcomes statements:

- The students will understand basic Data Mining techniques.
- The students will appreciate knowledge discovery from Data Mining techniques.

Both of these learning outcomes are stated in a manner that will make them difficult to assess. Consider the following:

- How do you observe someone "understanding" a theory or "appreciating" Data Mining techniques?
- How easy will it be to measure "understanding" or "appreciation"?

#### These expected learning outcomes are more effectively stated the following way:

- The students will be able to identify and describe what techniques are used to extract knowledge from Database Repositories.
- The students will be able to identify the characteristics of Classification techniques from other Data Mining techniques.

#### Incorporating Critical Thinking Skills into Expected Learning Outcomes Statements

Many faculty members choose to incorporate words that reflect critical or higher-order thinking into their learning outcome statements. Bloom (1956) developed a taxonomy outlining the different types of thinking skills people use in the learning process. Bloom argued that people use different levels of

thinking skills to process different types of information and situations. Some of these are basic cognitive skills (such as memorization) while others are complex skills (such as creating new ways to apply information). These skills are often referred to as critical thinking skills or higher-order thinking skills.

Bloom proposed the following taxonomy of thinking skills. All levels of Bloom's taxonomy of thinking skills can be incorporated into expected learning outcome statements. Recently, Anderson and Krathwohl (2001) adapted Bloom's model to include language that is oriented towards the language used in expected learning outcome statements. A summary of Anderson and Krathwohl's revised version of Bloom's taxonomy of critical thinking is provided below.

#### Definitions of the different levels of thinking skills in Bloom's taxonomy

- 1. **Remember** recalling relevant terminology, specific facts, or different procedures related to information and/or course topics. At this level, a student can remember something, but may not really understand it.
- **2.** Understand the ability to grasp the meaning of information (facts, definitions, concepts, etc.) that has been presented.
- **3.** Apply being able to use previously learned information in different situations or in problem solving.
- **4. Analyze** the ability to break information down into its component parts. Analysis also refers to the process of examining information in order to make conclusions regarding cause and effect, interpreting motives, making inferences, or finding evidence to support statements/arguments.
- 5. Evaluate being able to judge the value of information and/or sources of information based on personal values or opinions.
- 6. Create the ability to creatively or uniquely apply prior knowledge and/or skills to produce new and original thoughts, ideas, processes, etc. At this level, students are involved in creating their own thoughts and ideas.

#### List of Action Words Related to Critical Thinking Skills

Here is a list of action words that can be used when creating the expected student learning outcomes related to critical thinking skills in a course. These terms are organized according to the different levels of higher-order thinking skills contained in Anderson and Krathwohl's(2001) revised version of Bloom's taxonomy.

REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
Choose	Classify	Apply	Analyze	Agree	Adapt
Define	Compare	Build	Assume	Appraise	Build
Find	Contrast	Choose	Categorize	Assess	Change
How	Demonstrate	Construct	Classify	Award	Choose
Label	Explain	Develop	Compare	Choose	Combine
List	Extend	Experiment with	Conclusion	Compare	Compile
Match	Illustrate	Identify	Contrast	Conclude	Compose
Name	Infer	Interview	Discover	Criteria	Construct
Omit	Interpret	Make use of	Dissect	Criticize	Create
Recall	Outline	Model	Distinguish	Decide	Delete
Relate	Relate	Organize	Divide	Deduct	Design
Select	Rephrase	Plan	Examine	Defend	Develop

Show	Show	Select	Function	Determine	Discuss
Spell	Summarize	Solve	Inference	Disprove	Elaborate
Tell	Translate	Utilize	Inspect	Estimate	Estimate
What			List	Evaluate	Formulate
When			Motive	Explain	Happen
Where			Relationships	Importance	Imagine
Which			Simplify	Influence	Improve
Who			Survey	Interpret	Invent
Why			Take part in	Judge	Make up
			Test for	Justify	Maximize
			Theme	Mark	Minimize
				Measure	Modify
				Opinion	Original
				Perceive	Originate
				Prioritize	Plan
				Prove	Predict
				Rate	Propose
				Recommend	Solution
				Rule on	Solve
				Select	Suppose
				Support	Test
				Value	Theory

## 4. TIPS FOR DEVELOPING COURSE LEVEL EXPECTED LEARNING OUTCOMES STATEMENTS

- Limit the course-level expected learning outcomes to 5 10 statements for the entire course (more detailed outcomes can be developed for individual units, assignments, chapters, etc.).
- Focus on overarching or general knowledge and/or skills (rather than small or trivial details).
- Focus on knowledge and skills that are central to the course topic and/or discipline.
- Create statements that are student-centered rather than faculty-centered (e.g., "upon completion of this course students will be able to list the name of all Communication techniques" versus "one objective of this course is to teach the names of all Communication techniques").
- Focus on the learning that results from the course rather than describing activities or lessons in the course.
- Incorporate or reflect the institutional and departmental missions.

Incorporate various ways for students to show success (outlining, describing, modeling, depicting, etc.) rather than using a single statement such as "at the end of the course, students will know \_\_\_\_\_" as the stem for each expected outcome statement.

#### 5. SAMPLE EXPECTED LEARNING OUTCOMES STATEMENTS

The following depict some sample expected learning outcome statements from selected courses.

#### Computer Networks:

After completing this course the student must demonstrate the knowledge and ability to:

1. Understand basic computer network technology.

- 2. Understand and explain Data Communications System and its components.
- 3. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- 4. Identify the different types of network topologies and protocols.
- 5. Identify the shortest path in a given network.
- 6. Model mathematically various error control schemes.
- 7. Analyze different LLC multiplexing mechanisms, node-to-node flow and error control.
- 8. Analyze different MAC mechanisms (Aloha, Slotted Aloha, TDMA, FDMA) and understand their pros and cons.
- 9. Identify the different types of network devices and their functions within a network.
- 10. Enable to interconnect various heterogeneous networks.
- 11. Understand and building the skills of sub netting and routing mechanisms.
- 12. Design and implement a peer to peer file sharing application utilizing application layer protocols such as HTTP, DNS, and SMTP and transportation layer protocol.
- 13. Predict ethical, legal, security and social issues related to computer networks.

#### Linux Programming:

After completing this course the student must demonstrate the knowledge and ability to:

- 1. Identify and use Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security.
- 2. Develop shell scripts to perform more complex tasks.
- 3. Illustrate file processing operations such as standard I/O and formatted I/O.
- 4. Generalize Signal generation and handling signals.
- 5. Develop programs using different Inter Process Communication (IPC) Mechanisms.
- 6. Use multithreading concepts to reduce the wastage of CPU time.
- 7. Design various client server applications using TCP or UDP protocols.

#### Operating Systems:

After completing this course the student must demonstrate the knowledge and ability to:

- 1. Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
- 2. Understand the difference between process & thread, issues of scheduling of user-level processes/ threads and their issues.
- 3. Produce customized algorithmic solutions for given synchronization problems.
- 4. Use modern operating system calls and synchronization libraries in software/ hardware interfaces.
- 5. Identify the rationale behind various memory management techniques along with issues and challenges of main memory, virtual memory and file system.
- 6. Infer the performance of page replacement algorithms in various scenarios.
- 7. Recognize the issues related to file system interface and implementation, disk management.
- 8. Compare and Contrast the time complexities of various disk scheduling algorithms.
- 9. Understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.

#### 6. AN OVERVIEW OF ASSESSMENT

#### What is assessment?

According to Palomba and Banta (1999) assessment involves the systematic collection, review, and use of evidence or information related to student learning. Assessment helps faculty understand how well their students understand course topics/lessons. Assessment exercises are often anonymous. This anonymity allows students to respond freely, rather than trying to get the "right" answer or look good. Assessment exercises attempt to gauge students' understanding in order to see what areas need to be re-addressed in order to increase the students' learning.

In other words, assessment is the process of investigating (1) what students are learning and (2) how well they are learning it in relation to the stated expected learning outcomes for the course. This process also involves providing feedback to the students about their learning and providing new learning opportunities/strategies to increase student learning.

For example, Dr. JVR initiates a class discussion on material from Chapter One and determines that most students are confused about Topic X. This class discussion served as a method for assessing student learning and helped determine the fact that student learning related to Topic X is somewhat lacking. Dr. JVR now has the opportunity to (1) inform the students that there is some confusion and (2) make adjustments to address this confusion (e.g., ask student to re-read Chapter One, re-lecture over Topic X, etc.). This assessment process helps increase students' learning.

#### What is the difference between "evaluation" and "assessment"?

Evaluation focuses on making a judgment about student work to be used in assigning marks that express the level of student performance. Evaluation is usually used in the process of determining marks. Evaluation typically occurs after student learning is assumed to have taken place (e.g., a final exam). Evaluation is part of the assessment process. Course assignments that are evaluated/graded (e.g., exams, papers, tutorials, etc.) are often seen as formal assessment techniques.

While evaluation is an important component of most classrooms, it does have some limitations. For example, if the class average on an exam is a 45%, is seems pretty clear that something went wrong along the way. When one has only evaluated the final learning product, it can be challenging to go back and discover what happened. It can also be difficult to address the situation or provide opportunities for students to learn from their mistakes. Yes, a curve on an exam can help address a low class average, but does it help the students learn? Engaging in informal assessment activities throughout the course can help avoid this situation.

#### What is involved in the assessment process?

- 1. Establishing expected learning outcomes for the course;
- 2. Systematically gathering, analyzing, and interpreting evidence (through formal assessment activities such as exams or papers and informal assessment activities such as in-class discussions exercises) to determine how well the students' learning matches:
  - Faculty expectations for what students will learn and
  - The stated expected learning outcomes for the course
- 3. Faculty members should use this evidence/assessment of student learning to:
  - Provide questionery to students about their learning (or lack thereof) and

• Adjust their teaching methods and/or students' learning behaviors to ensure greater student learning (Maki, 2004).

The Best Practice in a Classroom Assessment and is an example of a method that can be used to assess learning outcomes. At the end of a class period or major topic, faculty ask students to anonymously write down what point(s) were the most unclear to them. After class, faculty members review these responses and then re-teach or re-address any confusing topics, thus increasing student learning (Angelo & Cross, 1993).

#### 7. DESCRIPTION OF A COURSE PURPOSE

When planning a course and determining the Learning Outcomes for that course, it is important to examine the course's purpose within the context of the college, and/or the department/program. This process will assist faculty in determining the intent of the course as well as how the course fits into the curriculum. This will help identify the essential knowledge, skills, etc. that should be incorporated into the course and the stated expected learning outcomes for the course. The course purpose section should clarify the level of the course within the programme (e.g., is the course required as a core or an elective and whether it requires any pre-requisites etc.). It should also describe the course's role in the departmental/programmatic curriculum by addressing the intent (importance, main contribution etc.) of the course.

#### STEP ONE: Determine if the course is part of the IEEE / ACM / AICTE Model Curriculum

The earliest curriculum was published in 1968 for computer science (CS) by the Association for Computing Machinery (ACM), and in 1977 the Computer Society of the Institute for Electrical and Electronic Engineers (IEEE-CS) provided its first curriculum recommendations. In the late 1980's the ACM and the IEEE-CS together formed a task force to create curricula for computer science and computer engineering. The core curriculum covers classes in computer science curriculum, and subsequently separate curricula reports were issued for information systems, software engineering and computer engineering

#### STEP TWO: Determine how the course fits into the departmental curriculum

Here are some questions to ask to help determine how a course fits in the departmental curriculum: What role does the course play in the departmental/programmatic curriculum?

- Is this course required?
- Is this course an elective?
- Is this course required for some students and an elective for others?
- Does this class have a pre-requisite?
- Is this class a pre-requisite for another class in the department?
- Is this course part of IEEE / AICTE Model Curriculum?

#### How advanced is this course?

- Is this course an undergraduate or graduate course?
- Where does this course fall in students' degree plan as an introductory course or an advanced course?
- Can I expect the students taking this course to know anything about the course topic?
- Are other faculty members counting on students who have taken this course to have mastered certain knowledge or skills?

#### When students leave this course, what do they need to know or be able to do?

- Is there specific knowledge that the students will need to know in the future?
- Are there certain practical or professional skills that students will need to apply in the future?

• Five years from now, what do you hope students will remember from this course?

#### What is it about this course that makes it unique or special?

- Why does the program or department offer this course?
- Why can't this course be "covered" as a sub-section of another course?
- What unique contributions to students' learning experience does this course make?
- What is the value of taking this course? How exactly does it enrich the program or department?

### 8. PROCEDURE FOR DEVELOPMENT OF EXPECTED LEARNING OUTCOMES FOR A COURSE

The following pages should be of assistance in developing several broad, effectively stated expected learning outcomes for a course. When beginning to construct expected learning outcome statements, it is always good to think about the learners.

Please take a moment to think about the student learners in the course. Please consider the following questions:

- What are the most essential things the students need to know or be able to do at the end of this course?
- What knowledge and skills will they bring with them?
- What knowledge and skills should they learn from the course?

When you begin thinking about the expected learning outcomes for a course, it is a good idea to think broadly. Course-level expected learning outcomes do not need to focus on small details; rather, they address entire classes of theories, skill sets, topics, etc.

The "Course Description" contains the following contents:

- Course Overview
- Prerequisite(s)
- Marks Distribution
- Evaluation Scheme
- Course Objectives
- Course Outcomes
- How Course Outcomes are assessed
- Syllabus
- List of Text Books / References / Websites / Journals / Others
- Course Plan
- Mapping course objectives leading to the achievement of the program outcomes
- Mapping course outcomes leading to the achievement of the program outcomes

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### ajeev Gandhi Memorial College of Engineering & Technology

(Autonomous)

Nandyal, Andhra Pradesh -518501

#### **COMPUTER SCIENCE AND ENGINEERING**

#### **COURSE DESCRIPTOR**

#### **COURSE DESCRIPTOR**

Course Title	DATA WAREHOUSING & MINING							
Course Code	A0533157							
Programme	B.Tech	B.Tech						
Year & Semester	IV B.Tech & I Sem, A	IV B.Tech & I Sem, Academic Year : 2020-21						
Course Type	Core							
Regulation	RGM-R-2015							
	Th	eory	Pract	ical				
Course Structure	Lectures	Tutorials	Practicals	Credits				
	3	1	-	-				
Course Faculty	<ol> <li>Dr. K Rajendra Prasad, Professor, Dept. of CSE (A &amp; C Sections)</li> <li>Mr. M. Suleman Basha, Asst. Professor, Dept. of CSE (B- Section)</li> </ol>							

#### I. COURSE OVERVIEW:

The course addresses the concepts, skills, methodologies, and models of data warehousing. The proper techniques for designing data warehouses for various business domains, and covers concepts for potential uses of the data warehouse and other data repositories in mining opportunities are addressed. Data mining, the extraction of hidden predictive information from large databases, is a powerful new technology with great potential to help companies focus on the most important information in their data warehouses. Data mining tools predict future trends and behaviors, allowing businesses to make proactive, knowledge- driven decisions.

#### II. COURSE PRE-REQUISITES:

Level	<b>Course Code</b>	Semester	Prerequisites	Credits
B.Tech	A0514153	II B.Tech II Sem	Database Management System	3

#### **III. MARKS DISTRIBUTION**

Subject	End Examination	Mid Examination	Total Marks

Data Warehousing & Mining 70	0 Marks	30 Marks	100
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#### IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

~	LCD / PPT	~	Seminars	~	Videos	
×	Open Ended Experime	ents				

#### V. EVALUATION METHODOLOGY:

**Internal Examination**: The course will be evaluated for a total of 100 marks, with 30 marks for Internal(Mid Exam) Assessment and 70 marks for End Examination. Out of 30 marks allotted for Internal during the semester, marks are awarded by taking average of two mid examinations and 5 marks scored in the assignment.

End Examination: The end examination is conducted for 70 marks of 3 hours duration.

The emphasis on the questions is broadly based on the f	ollowing criteria:
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50 %	To test the objectiveness of the concept.
30 %	To test the analytical skill of the concept.
20 %	To test the application skill of the concept.

#### Internal Assessment (IA):

IA is conducted for a total of 30 marks (Table 1), with 25 marks for Internal Examination , 05 marks for Assignment.

Component	The	eory	Total Maria
Type of Assessment	MID Exam	I otai Wiarks	
MID Exams (I & II)	25	05	30

Table 1: Assessment pattern for CIA

#### VI. PROGRAM OUTCOMES

	Program Outcomes (POs)
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
	3 = High; 2 = Medium; 1 = Low

#### VII. COURSE OBJECTIVES:

#### The course should enable the students to:

Ι	With the basic data warehousing and data mining concepts
Π	To learn mining rules in large databases
III	To get idea on clustering analysis
IV	Applications that can enable them to set up and manage an industrial data warehousing and data mining system.
V	To learn about OLTP and OLAP systems

#### VIII. COURSE OUTCOMES (COs):

CO1	Ability to do Conceptual, Logical, and Physical design of Data Warehouses.
CO2	Familiarity with Requirements Engineering for Data Warehouses
CO3	OLAP applications and OLAP deployment
CO4	Have a good knowledge of the fundamental concepts that provide the foundation of data mining
CO5	Learn broad classes of data mining technologies
CO6	Understand how these concepts are engineered to use some of the basic data mining tools.

#### IX. COURSE OUTCOMES to POs Mapping:

Course Outcomes	At the end of the course, the student will have the ability to	PO's Mapped	Strength of Mapping
CO 1	Ability to do Conceptual, Logical, and Physical design of Data Warehouses.	PO 1, PO2	2,2
CO 2	Familiarity with Requirements Engineering for Data Warehouses	PO 1, PO 3	2,1
CO 3	OLAP applications and OLAP deployment	PO 2, PO 3 , PO 4	2,2,1
CO 4	Have a good knowledge of the fundamental concepts that provide the foundation of data mining	PO 1	2
CO 5	Learn broad classes of data mining technologies	PO 1, PO 5	2, 1
CO6	Understand how these concepts are engineered to use some of the basic data mining tools.	PO2	1

#### 3 = High; 2 = Medium; 1 = Low MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM X. **OUTCOMES**

Course Outcome (CO)	Program Outcome (PO)											
	<b>PO 1</b>	PO 2	<b>PO 3</b>	PO 4	<b>PO 5</b>	PO 6	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	PO 10	PO 11	PO 12
CO 1	2	2										
CO 2	2		1									
CO 3		2	2	1								
CO 4	2											
CO 5	2				1							
CO 6		1										

#### XI. ASSESSMENT METHODOLOGIES -DIRECT

Internal Exam	PO1, PO2, PO3, PO4, PO 5	End Exams	PO1, PO2, PO3, PO4, PO 5	Assignment	PO1, PO2, PO3, PO4, PO 5
Viva	-	Mini Project	-	Laboratory Practices	-

#### XII. ASSESSMENT METHODOLOGIES -INDIRECT

~	Early Semester Feedback	~	Course End Survey
×	Assessment of Mini Projects by Experts		

#### XIII SYLLABUS

UNIT - I	INTRODUCTION	Classes: 10					
What Motivated Data Mining? Why is it Important?; What is Data Mining?; Data Mining-On What							
Kind of Data	a?; Data Mining Functionalities: What kinds of Data Can be Mined?; Are	e all of Patterns					
Interesting?;	Classification of Data Mining Systems; Data Mining task primitives;						
Data Wareh	ouse and OLAP Technology: What is a Data Warehouse?; A Multidin	nensional Data					
Model: Fror	n Tables and Spreadsheet to Data Cubes, Stars, Snowflakes and Fac	ct constellation					
schemas for	Multidimensional Databases, Measures: Their Categorization and Compu	tation, Concept					
Hierarchies,	OLAP operations in the Multidimensional Data Model; Data Warehous	se Architecture:					
Steps for the	Design and Construction of Data Warehouses, A three-tier Architecture						
UNIT-II	DATA PRE-PROCESSING	Classes: 08					
Why pre-pro	cess the data; Descriptive Data Summarization: Measuring the Central T	endency,					
Measuring th	ne Dispersion of Data, Graphic Displays of Basic Descriptive Data Sumn	naries; Data					
Cleaning: M	issing values, Noisy Data Cleaning as a process; Data Integration and Tra	ansformation:					
Data Integra	tion, Data Transformation, Data Reduction: Data Cube aggregation, attri	bute subset					
selection; Di	mensionality Reduction, Luminosity Reduction;						
UNIT-III	MINING FREQUENT PATTERNS, ASSOCIATIONS, AND	Classes: 10					
	CORRELATIONS						
Basic Concepts: Efficient and Scalable Frequent Itemset Mining methods: The Apriori Algorithm.							
Generating Association Rules from Frequent Itemsets, Improving Efficiency of Apriori, Mining							
Frequent Itemsets without Candidate Generation; Mining various kinds of Association Rules: Mining							
multilevel & multi-dimensional association rules; From Association Mining to Correlation Analysis:							
Strong Rules are not necessarily Interesting, From Association analysis to Correlation analysis;							

#### UNIT-IV CLASSIFICATION -I

Classes: 12

Overview of Classification and Prediction: What is Classification, What is prediction?; Issues Regarding Classification and Prediction: Preparing data for Classification and Prediction, Comparing Classification and Prediction Methods; Bayesian Classification: Bayes' theorem, Naïve Bayesian Classification; Classification by Decision Tree Induction: Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction; Rule-Based Classification: Using IF-THEN rules for Classification, Rule Extraction from Decision Tree, Rule Induction using a Sequential Covering Algorithm; Classification by Back propagation: A Multilayer Feed-Forward Neural Network, Defining Network Topology, Back propagation;

#### UNIT-V CLASSIFICATION -II

Classes: 08

Support Vector Machines: The Case when the Data are Linearly Separable, The Case when the Data are Linearly Inseparable; Lazy Learners: k- Nearest-Neighbour Classifiers, Case-Based Reasoning; Prediction: Linear Regression, Nonlinear Regression; Accuracy and Error Measures: Classifier Accuracy Measures, Predictor Error Measures; Evaluating the Accuracy of a Classifier or Predictor: Holdout Method and Random sub sampling, Cross validation, Bootstrap;

#### UNIT-IV CLUSTER ANALYSIS

Overview of Cluster Analysis; Types of data in Cluster Analysis: Interval- Scaled Variables, Binary Variables, Categorical, Ordinal, and Ratio-Scaled variables, Variables of Mixed Types; A Categorization of Major Clustering Methods; Partitioning Methods: Classical Partitioning Methods: k-Means and k-Medoids, Partitioning Methods in Large Databases: From k-Medoids to CLARANS; Hierarchical Methods: Agglomerative and Divisive Hierarchical Clustering, BIRCH, ROCK; Density-

Based Methods: DBSCAN; Grid- Based Methods: STING; Model-Based Clustering Methods: Expectation-Maximization;

#### **Text Books:**

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber Harcourt India, second Edition.

**Reference Books:** 

- 1. Data Mining Introductory and advanced topics-Margaret H Dunham, Pearson Education
- 2. Data Mining Techniques Arun K Pujari, University Press
- 3. Data Warehousing in the Real World Sam Anahory & Dennis Murray. Pearson Edn Asia.
- 4. Data Warehousing Fundamentals Paulraj Ponnaiah Wiley Student Edition
- 5. The Data Warehouse Life cycle Tool kit Ralph Kimball Wiley Student Edition.

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