CXT 401	USER INTERFACE SOFTWARE & TECHNOLOGY	Category	L	T	P	Credit	Year of Introduction
		PCC	2	1	0	3	2021

Preamble: This is a core course in computer science and design. The main objective of this course is to learn how to use user interface software and technologies in designing human-computer interaction, user experience, and ultimately, how we navigate and interact with the digital world. Recognizing the ever-evolving landscape of technology, characterized by rapid innovation and constant refinement, we endeavor to delve into the principles, methodologies, and advancements that drive the design, development, and implementation of user interfaces.

Prerequisite: Basic programming skills, Web Programming

NB- Students are not expected to write Bootstrap code for the exam.

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

CO1	Summarize interaction design principles and user behaviour patterns to organize content effectively. **[Cognitive knowledge level: Understand]**
CO2	Explain navigational models, layout patterns, and interactive elements to design intuitive navigation systems and responsive user interfaces. **[Cognitive knowledge level: Understand]**
CO3	Apply design patterns, layout structures, and components in Bootstrap5 to create optimized user interactive systems. **[Cognitive knowledge level: Apply]**
CO4	Develop practical skills in designing and prototyping user interfaces using Bootstrap5,considering factors such as page layout, interactive elements and visual aesthetics.**[Cognitive knowledge level: Apply]**
CO5	Analyze the effectiveness of user interface designs and iterate to enhance user experience and satisfaction. **[Cognitive knowledge level: Analyze]**

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO12
CO1	✓	✓										✓
CO2	✓	✓										✓
CO3	✓	✓	✓	✓	✓							✓
CO4	✓	✓	✓	✓	✓							✓
CO5	✓	✓	✓	✓	✓							✓

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Life long learning

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination Marks**
	Test 1 (Marks)	**Test 2 (Marks)**	
Remember	**30**	**30**	**30**
Understand	**30**	**30**	**30**
Apply	**40**	**40**	**40**
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : **10 marks**
Continuous Assessment - Test : **25 marks**
Continuous Assessment – Assignment :**15 marks**

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. The first internal evaluation test is to be conducted based on the first two modules of the Syllabus. The second internal evaluation test is to be conducted based on the third and fourth modules of the Syllabus. There will be two parts: Part A and Part B. Students should answer all questions from Part A. Part B contains 7 questions each with 7 marks. Out of the 7 questions, a student should answer any 5. An assignment/quiz/open book test is to be given based on the fifth module of the Syllabus. The time duration for each internal evaluation test is 1 hour and 30 minutes.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have a maximum of 2 sub-divisions and carries 14 marks.

Syllabus

Module - 1 (Understanding User Behavior and Research)

Introduction to user research and its importance in interface design, Exploring user motivations and behavior patterns -Analyzing common user behaviors - safe exploration, instant gratification, satisficing, habituation, and streamlined repetition. Introduction to Bootstrap 5-layout structures- grid system, containers, and spacing utilities.

Module- 2 (Organizing Content and Information Architecture)

Introduction to information architecture and application structure - Exploring patterns for feature organization, search, and browsing. Organizing content in Bootstrap 5- images, cards, lists, and tables.

Module - 3 (Navigation and Wayfinding)

Introduction to navigation design and signposts - Navigational models, Design conventions for websites, Patterns - clear entry points, menus, and breadcrumbs. Bootstrap 5's navigation components- navbar, dropdowns, and pagination.

Module - 4 (Organizing Page Layout)

Introduction to page layout principles and visual frameworks - Basics of page layout, Layout patterns -centerstage, grid of equals, module tabs, accordion, collapsible panels, diagonal balance, and liquid layout. Creation of responsive and flexible page layouts-Usage of containers, rows, and columns to structure content on different devices using Bootstrap 5.

Module - 5 (Interactivity, Forms, and Control)

Introduction to interactive elements: Actions and Commands - Exploring patterns- buttons, hover tools, action panels, progress indicators. Bootstrap 5's form components -form controls, input groups, and custom form elements.

NB- Students are not expected to write Bootstrap code for the exam.

Text Book

1. Designing Interfaces: Patterns for Effective Interaction Design - Jenifer Tidwell, Second edition, O'Reilly Media, Inc.
2. https://getbootstrap.com/docs/5.0/getting-started/

Reference Books

1. The Design of Everyday Things. Donald A. Norman. Basic Books; 1st Basic edition (September 2002), ISBN: 0-465- 06710-7 (paperback)
2. Human-Computer Interaction by Alan Dix, Janet E. Finlay, Gregory D. Abowd, and Russell Beale
3. About Face: The Essentials of Interaction Design- Alan Cooper, Robert Reimann, David Cronin, and Christopher Noessel

4. The Elements of User Experience: User-Centered Design for the Web and Beyond- Jesse James Garrett
5. Sketching User Experiences: Getting the Design Right and the Right Design (Interactive Technologies). Bill Buxton. Morgan Kaufmann, 1st edition (March 30, 2007), ISBN- 10: 0123740371

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define user research in the context of interaction design.
2. Explain instant gratification.
3. Explain the spacing utilities in Bootstrap5.

Course Outcome 2 (CO2):

1. How do different navigational models influence user comprehension and task completion rates?
2. Write notes on clear entry points.
3. Explain input groups in Bootstrap5.

Course Outcome 3 (CO3):

1. Illustrate the use of grid system to design a responsive layout using Bootstrap5.
2. Explain how the component Table is used to organize content in Bootstrap5.
3. Compare the various layout structures used in designing a user interface.

Course Outcome 4 (CO4):

1. Illustrate how form control can be used to design interactive user interfaces.
2. Sketch a page layout applying diagonal balance.
3. Discuss best practices for implementing accordion panels in interface design.

Course Outcome 5 (CO5):

1. Analyze the effectiveness of sign-in tools in interface navigation design, considering their impact on user authentication processes and overall user experience.
2. Analyze the principles of visual hierarchy in page layout design and their influence on user attention and comprehension. How can designers create effective visual hierarchies to guide users through content?

Model Question paper

QP CODE: **PAGES:3**

Reg No:_____ **Name:_____**

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CXT401

Course Name: User Interface Software & Technology

Max.Marks:100 **Duration: 3 Hours**

PART A

Answer all Questions. Each question carries 3 Marks

1. Define user research in the context of interaction design. Provide two examples of user research methods commonly used in interface design.

2. Explain the concept of "satisficing" in user behavior. How can designers address satisficing tendencies in interface design?

3. Discuss the significance of information architecture in interface design. Provide two principles of effective information architecture.

4. How can lists be used to organize contents in Bootstrap5?

5. Explain the importance of clear entry points in interface design. Provide two examples of interfaces that effectively utilize clear entry points.

6. Explain navbar with its subcomponents.

7. Discuss about grid of equals in page layout design.

8. Explain the concept of module tabs in page layout. How do module tabs help organize content on a webpage?
9. Explain the concept of "responsive design" in interface development. How does responsive design enhance user experience across different devices?
10. Explain form control in Bootstrap5.

Part B

(Answer any one question from each module. Each question carries 14 Marks)

11. a) Discuss the significance of user research in interaction design, considering its impact on product development and user satisfaction. Provide examples to illustrate the importance of user research in real-world interface design projects. (7 marks)

    b) Explain the concept of "instant gratification" in user behavior and its implications for interface design. How can designers balance the need for instant gratification with other design considerations such as usability and accessibility? (7 marks)

OR

12. a)Discuss the concept of "streamlined repetition" in interface design and its relationship to user efficiency and productivity. How can designers leverage streamlined repetition to improve user workflows and task completion rates? (7 marks)

b) Assess the role of habituation in user behavior and its effects on interface engagement over time. Provide strategies for designing interfaces that mitigate habituation and maintain user engagement (7 marks)

13. a) Explain the effectiveness of different information architecture models in organizing complex content structures. Provide examples of interfaces that demonstrate the successful implementation of each model. (7 marks)

    b) Explain how the component Table is used to organize content in Bootstap5. (7 marks)

OR

14. a) Discuss the role of alternative views in content organization and navigation design. How do alternative views enhance user comprehension and exploration of diverse content types? (7 marks)

    b) Explain the effectiveness of the canvas plus palette pattern in organizing and presenting content within digital interfaces. (7 marks)

15. a)How do different navigational models influence user comprehension and task completion rates? (7 marks)

    b) Discuss the advantages and limitations of modal panels and provide recommendations for their appropriate use in interface design. (7 marks)

OR

16. a) Discuss the concept of "escape hatch" in navigation design and its role in facilitating user exploration and recovery from navigational errors. (7 marks)

    b) Explain the effectiveness of sign-in tools in interface navigation design, considering their impact on user authentication processes and overall user experience. (7 marks)

17. a) Explain the principles of visual hierarchy in page layout design and their influence on user

attention and comprehension. (7 marks)

b) Discuss the best practices for implementing accordion panels in interface design. (7 marks)

OR

18. a) How can designers leverage liquid layouts to optimize user experience across different devices and screen sizes? (7 marks)

b) Explain the effectiveness of diagonal balance in page layout design, considering its impact on visual aesthetics and user engagement. (7 marks)

19. a) How can designers implement progressive disclosure techniques to enhance user understanding and engagement? (7 marks)

b) Discuss the best practices for designing intuitive and accessible hover interactions. (7 marks)

OR

20. a) How can designers implement multi-level undo functionality effectively while maintaining interface consistency and performance? (7 marks)

b) Discuss the best practices for designing and implementing macros in interfaces to support user workflows and task automation. (7 marks)

Teaching Plan

Sl. No	Topic	No. of Hours (36 hrs.)
Module - 1 (Understanding User Behavior and Research) 7 Hours		
1.1	Introduction to user research and its importance in interface design	1 Hour
1.2	Exploring user motivations and behavior patterns	1 Hour
1.3	Safe exploration, instant gratification	1 Hour
1.4	Satisficing, habituation, and streamlined repetition.	1 Hour
1.5	Introduction to Bootstrap 5-layout structures-	1 Hour
1.6	Grid system, containers	1 Hour
1.7	Spacing utilities.	1 Hour
Module - 2 (Organizing Content and Information Architecture) 7 Hours		
2.1	Introduction to information architecture and application structure	1 Hour
2.2	Exploring patterns for feature organization.	1 Hour
2.3	Exploring patterns for search, and browsing.	1 Hour
2.4	Organizing content in Bootstrap 5- images	1 Hour
2.5	Cards	1 Hour
2.6	Lists	1 Hour
2.7	Tables	1 Hour
Module - 3 (Navigation and Wayfinding) 7 Hours		
3.1	Introduction to navigation design and signposts	1 Hour
3.2	Navigational models	1 Hour
3.3	Design conventions for websites	1 Hour
3.4	Patterns - clear entry points	1 Hour
3.5	Menus, and breadcrumbs.	1 Hour
3.6	Bootstrap 5's navigation components- navbar	1 Hour

3.7	Dropdowns, pagination	1 Hour
Module - 4 (Organizing Page Layout) 8 Hours		
4.1	Introduction to page layout principles and visual frameworks	1 Hour
4.2	Basics of page layout	1 Hour
4.3	Layout patterns -centerstage	1 Hour
4.4	Grid of equals, module tabs	1 Hour
4.5	Accordion, collapsible panels	1 Hour
4.6	Diagonal balance, liquid layout.	1 Hour
4.7	Creation of responsive and flexible page layouts	1 Hour
4.8	Usage of containers, rows, and columns to structure content on different devices using Bootstrap 5	1 Hour
Module - 5 (Interactivity, Forms, and Control) 7 Hours		
5.1	Introduction to interactive elements	1 Hour
5.2	Actions and Commands	1 Hour
5.3	Exploring patterns- buttons	1 Hour
5.4	Hover tools, action panels	1 Hour
5.5	Progress indicators	1 Hour
5.6	Bootstrap 5's form components -form controls, input groups	1 Hour
5.7	Custom form elements	1 Hour

CXT 433	Video Editing	Category	L	T	P	Credit	Year of Introduction
		PEC	2	1	0	3	2021

Preamble: This is an elective course in computer science and design. The course gives a comprehensive understanding of video editing, techniques, tools and principles. It covers the concept of basic and advanced editing techniques, audio manipulation, linear and nonlinear editing and also the concepts of AVID XPRESS DV 4.

Prerequisite: Basic Knowledge of Multimedia

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

CO1	Explain the broad perspective of linear and nonlinear editing concepts. **(Cognitive Knowledge Level: Understand)**
CO2	Articulate the concept of Storytelling styles. **(Cognitive Knowledge Level: Understand)**
CO3	Apply basic editing techniques, including transitions, titles, color correction and audio manipulation **(Cognitive Knowledge Level: Apply)**
CO4	Discuss the advanced editing techniques, **(Cognitive Knowledge Level: Understand)**
CO5	Explain the concepts of AVID XPRESS DV 4.**(Cognitive Knowledge Level: Understand)**

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO12
CO1	✓	✓										✓
CO2	✓	✓										✓
CO3	✓	✓	✓	✓								✓
CO4	✓	✓										✓
CO5	✓	✓	✓	✓	✓							✓

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and teamwork
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Lifelong learning

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination Marks**
	Test 1 (Marks)	**Test 2 (Marks)**	
Remember	**20**	**20**	**20**
Understand	**30**	**30**	**30**
Apply	**50**	**50**	**50**
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks	**CIE Marks**	**ESE Marks**	**ESE Duration**
150	**50**	**100**	**3 hours**

Continuous Internal Evaluation Pattern:

Attendance : **10 marks**

Continuous Assessment - Test : **25 marks**
Continuous Assessment - Assignment :**15 marks**

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. The first internal evaluation test is to be conducted based on the first two modules of the Syllabus. The second internal evaluation test is to be conducted based on the third and fourth modules of the Syllabus. There will be two parts: Part A and Part B. Students should answer all questions from Part A. Part B contains 7 questions each with 7 marks. Out of the 7 questions, a student should answer any 5. An assignment/quiz/open book test is to be given based on the fifth module of the Syllabus. The time duration for each internal evaluation test is 1 hour and 30 minutes.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-divisions and carries 14 marks.

Syllabus

Module – 1 (Introduction to editing)

Evolution of filmmaking - Introducing Digital Video - Getting Your Digital Video Gear -linear editing - non-linear digital video - Economy of Expression - risks associated with altering reality through editing.

Module - 2 (Story telling)

Storytelling styles in a digital world through jump cuts, L-cuts, match cuts, cutaways, dissolves, split edits - Consumer and pro NLE systems - digitizing images - managing resolutions - mechanics of digital editing - pointer files - media management

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Module - 3 (Using audio and video)

Capturing digital and analog video - importing audio - Working with Clips - Turning Your Clips into a Movie - Fixing Color and Light Issues - Using Transitions and Titles - Working with Audio.

Module 4 (Advanced Video Editing)

Using Video Effects in iMovie - Working with Still Photos and Graphics- Previewing video - Exporting Movies for the Online World - Exporting Digital Video to Tape - Recording CDs and DVDs – Tools for

digital video production.

Module 5 (Working with AVID XPRESS DV 4 6)

Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing to Record and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options.

Text Books

1. Keith Underdahl, “Digital Video for Dummies”, Third Edition, Dummy Series, 2001.
2. Avid Xpress DV 4 User Guide, 2007.
3. Ken Dancyger, "The Technique of Film and Video Editing: History, Theory, and Practice", 5th Edition.

Reference Books

1. Robert M. Goodman and Partick McGarth, “Editing Digital Video: The Complete Creative and Technical Guide”, Digital Video and Audio, McGraw – Hill 2003.
2. Walter Murch, “In the Blink of An Eye: 2nd Edition.

Sample Course Level Assessment Questions:

Course Outcome 1 (CO1):

1. Write Notes on evolution of film making.
2. Explain video editing process with various stages.
3. Demonstrate linear video editing techniques with its advantages and disadvantages.
4. Differentiate linear and nonlinear editing. Mention the application of both techniques in detail.
5. What are the prerequisites for video creation and editing? Explain in detail.
6. Examine the commercial requirements of video editing. How to attain those requirements?
7. What is meant by economy of expression? Identify the ways to achieve video editing.
8. Explain the risks associated with altering reality through editing.

Course Outcome 2 (CO2):

1. Explain the purpose of story board in digital video editing with suitable diagrams.
2. Discuss about various story telling techniques.
3. Demonstrate various cuts used in video editing with applications.
4. Which software is best for NLE? Justify with pros and cons.
5. Write about digitization process of images with necessary steps.
6. Describe different types of resolutions. Mention advantages and disadvantages of higher video resolution.
7. Explain the terms i) pixel, ii) video resolution iii)P and I in resolution iv) Aspect ratio.

8. Summarize the uses media management in video editing.
9. Analyze in detail about five phases of video editing.

Course Outcome 3 (CO3):

1. Explain audio compression techniques in detail.
2. How to store files on CD and VCD? Compare its performance.
3. Discuss the ways to record audio files. Demonstrate any one method in detail.
4. Compare various video compression techniques.
5. Write about various video file formats supported by android phone. List the steps to convert video files to different formats.
6. Examine the method to import and export video files from laptop to mobile phone.
7. Identify various video storage devices. Analyze its performance in various aspects.
8. Enumerate the difficulties faced by editors with audio and video files.
9. With an example explain how basic editing techniques, transitions, titles, color correction are applied in editing.

Course Outcome 4 (CO4):

1. Compare various video editing software's.
2. Write notes on evolution of Final cut pro editing tool.
3. Explain about animation effects created by Final cut pro editing tool.
4. Discuss about built in effects associated with Final cut pro editing to improve video quality.
5. Compare Final cut pro vs Adobe premiere pro video editing tools.
6. Describe the steps to use final cut pro for video editing.
7. Explain the tools used in final cut pro software.
8. Explain the features, pros and cons of final cut pro software.

Course Outcome 5 (CO5):

1. Write about the features and uses of Avid Xpress DV 4 video editing software.
2. Explain the starting of a new project in Avid Xpress DV 4 video editing tool.
3. Compare Avid Xpress dv 4 video editing software with adobe premiere Pro.
4. Explain the importance of Bins display in Avid Xpress dv 4 and explain working with Bin in detail.
5. Demonstrate i) Setting up the record tool ii) Preparing for audio tool.
6. Discuss the following terms with respect to Avid Xpress dv 4.

i) Text view ii) Frame view iii) Script view iv) Custom bin view.

7. Explain about script integration in detail in Avid Xpress dv 4.
8. How are media files managed by Avid Xpress dv 4?
9. Write Notes on viewing and managing footage in Avid Xpress dv 4.
10. Illustrate with an example the use of timeline in Avid Xpress dv 4.

Model Question Paper

QP CODE:

Reg No: _____

Name: _____ **PAGES : 4**

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CXT 433
Course Name: Video Editing

Max.Marks:100 **Duration: 3 Hours**

PART A
Answer All Questions. Each Question Carries 3 Marks

1. What are the ways to study film history?
2. Define video editing.
3. Mention the storytelling techniques.
4. Differentiate cross cut and cutaway.
5. What are the best practices for video storage?
6. How to store digital video files?
7. What is purpose of canvas in final cut pro?
8. List down the audio files supported by final cut pro.
9. Express the purpose of Avid Xpress Pro editing tool.
10. Identify the options for backing up media files.

(10x3= 30)

Part B

(Answer any one question from each module. Each question carries 14 Marks)

11 (a) Demonstrate linear video editing techniques with its advantages and disadvantages. (**7 marks)**

(b)What is meant by economy of expression? Identify the ways to achieve video editing. (**7 marks)**

OR

12 (a) Explain video editing process with various stages. (**7 marks)**

(b) Discuss the risks associated with altering reality through editing. **(7 marks)**

13 (a) Explain the purpose of story board in digital video editing with suitable diagrams. **(7 marks)**

(b) Describe different types of resolutions. Mention advantages and disadvantages of higher video resolution. **(7 marks)**

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OR

14(a) Illustrate the various cuts used in video editing with applications. **(7 marks)**

(b)Write about digitization process of images with necessary steps. **(7 marks)**

15 (a) Write about various video file formats supported by android phone.

List the steps to convert video files to different formats. **(7 marks)**

(b)Enumerate the difficulties faced by editors with audio and video files. **(7 marks)**

OR

16 (a) Explain audio compression techniques in detail. **(7 marks)**

(b)Describe and compare various video compression techniques. **(7 marks)**

17 (a) Explain about animation effects created by Final cut pro editing tool. **(7 marks)**

(b)Describe the steps to use final cut pro for video editing. **(7 marks)**

OR

18 (a) Illustrate the effects associated with Final cut pro editing to improve video quality. **(8 marks)**

(b) Explain the tools used in final cut pro. **(6 marks)**

19 (a) Describe the starting of a new project in Avid Xpress DV 4 video editing tool. **(7 marks)**
(b) Explicate the viewing and managing footage in Avid Xpress dv4. **(7 marks)**

OR

20 (a) Define the following terms related to respect to Avid Xpress dv 4 **(8 marks)**

i) Text view.
ii) Frame view.
iii) Script view
iv) Custom bin view

(b) Illustrate the use of timeline in Avid Xpress dv 4**.** **(6 marks)**

	Lesson Plan	**No. of lecture hours (36 Hrs.)**
No	**Contents**	
Module 1(Introduction to editing) (7 hours)		
1.1	Evolution of filmmaking	1
1.2	Introducing Digital Video	1
1.3	Getting Your Digital Video Gear	1
1.4	Linear editing	1
1.5	Non-linear digital video	1
1.6	Economy of Expression	1
1.7	Risks associated with altering reality through editing	1
Module 2(Story telling) (8 hours)		
2.1	Storytelling styles in a digital world through jump cuts.	1
2.2	L-cuts, match cuts	1
2.3	Cutaways, dissolves, split edits	1
2.4	Consumer and pro NLE systems	1
2.5	Digitizing images	1

2.6	Managing resolutions	1
2.7	Mechanics of digital editing, Pointer files	1
2.8	Media management	1

	Module 3 (Using audio and video) (7 hours)	
3.1	Capturing digital and analog video	1
3.2	Importing audio	1
3.3	Working with Clips	1
3.4	Turning Your Clips into a Movie	1
3.5	Fixing Color and Light Issues	1
3.6	Using Transitions and Titles	1
3.7	Working with Audio	1
	Module 4(Advanced Video Editing) (7 hours)	
4.1	Using Video Effects in iMovie	1
4.2	Working with Still Photos and Graphics	1
4.3	Previewing video	1
4.4	Exporting Movies for the Online World	1
4.5	Exporting Digital Video to Tape	1
4.6	Recording CDs and DVDs	1
4.7	Tools for digital video production	1

Module 5(Working with Avid Xpress DV 4 6) (7 hours)		
5.1	Starting Projects and Working with Project Window	1
5.2	Using Basic Tools and Logging	1
5.3	Preparing to Record and Recording	1
5.4	Importing Files	1
5.5	Organizing with Bins	1
5.6	Viewing and Making Footage.	1
5.7	Using Timeline and Working in Trim Mode, Working with Audio - Output Options	1

CXT 453	DESIGN PROCESS AND PERSPECTIVES	Category	L	T	P	Credit	Year of Introduction
		PEC	2	1	0	3	2021

Preamble: This course helps the learner to understand the stages involved in the design process, the methods used by the designers to generate and refine creative ideas, the key considerations that help shape them and the feedback and review elements that allow design teams to learn from each job and contribute to future commissions. It covers varied skills a learner needs to strategically and creatively interpret good design and write for advertising across multiple media platforms.

Prerequisite: NIL

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

CO1	Discuss the fundamentals of the graphic design process. **(Cognitive Knowledge Level: Understand)**
CO2	Make use of various graphic design thinking process and phases. **(Cognitive Knowledge Level: Apply)**
CO3	Learn the concepts of design and development for Interactive Media. **(Cognitive Knowledge Level: Understand)**
CO4	Illustrate embedding of media content, aesthetics and authoring interactive digital media. **(Cognitive Knowledge Level: Understand)**
CO5	Create a website using different design concepts. **(Cognitive Knowledge Level: Apply)**

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										✓
CO2	✓	✓	✓			✓		✓				✓
CO3	✓	✓										✓
CO4	✓	✓										✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and team work
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Lifelong learning

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination Marks**
	Test 1 (%)	**Test 2 (%)**	
Remember	**30**	**30**	**30**
Understand	**30**	**30**	**30**
Apply	**40**	**40**	**40**
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks	**CIE Marks**	**ESE Marks**	**ESE Duration**
150	**50**	**100**	**3 hours**

Continuous Internal Evaluation Pattern:

Attendance : **10 marks**
Continuous Assessment - Test : **25 marks**
Continuous Assessment - Assignment :**15 marks**

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. The first internal evaluation test is to be conducted based on the first two modules of the Syllabus. The second internal evaluation test is to be conducted based on the third and fourth modules of the Syllabus. There will be two parts: Part A and Part B. Students should answer all questions from Part A. Part B contains 7 questions each with 7 marks. Out of the 7 questions, a student should answer any 5. An assignment/quiz/open book test is to be given based on the fifth module of the Syllabus. The time duration for each internal evaluation test is 1 hour and 30 minutes.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have a maximum 2 subdivisions and carries 14 marks.

Syllabus

Module – 1 (Graphic design process)

Graphic design, Group structures and working methods, Industrialization, Technology, Typography, Consumerism, Identity and branding, Social responsibility, Modernism and post- modernism, Nostalgia and rhetoric, Semiotics, Vernacular, Design as problem solving, Creative thinking.

Module - 2 (Elements of design thinking)

Define the problem – Research the problem: Identifying drivers - Information gathering - Target groups – Idea Generation for the problem - Basic design directions - Questions and answers - Themes of thinking - Brainstorming- Deciding elements to design - Sketching and Drawing - Lines, shapes, Negative space/white space, Volumes, Value, Color, Texture- Color: Colors Theories-Color wheel - Color Harmonies or Color Schemes- Color Symbolism – Font - Layout.

Module - 3 (Refinement and prototyping design)

Refinement of Design : Thinking in images - Thinking in signs - Appropriation - Humor- Personification -

Visual metaphors - Modification - Thinking in words- Thinking in technology – Prototyping - Developing designs - 'Types' of prototype- Vocabulary – Risk management – Implementation: Format - Materials- Finishing – Case study.

Module - 4 (Introduction to Interactive digital media)

Introduction - Interactive Digital Media, Forms of Interactive Digital Media, Developing Interactive Digital Media, Essential Skills for the Interactive Digital Media Developer, The Impact of Interactive Digital Media, The Interactive Digital Media Development Process and Team, Fundamental Components of Interactive Digital Media - Analog vs. Digital Media, Bits and Bytes, File Formats, Analog to Digital, The Pros of Digital Media, Compression, Description vs. Command-Based Encoding of Media, Color on the Screen.

Module - 5 (Media content, aesthetics and authoring in Interactive Digital Media)

Media content - Graphics, Pixel-based Images, Vector-based Images, 2D Animation, 3D Graphics and Animation, Audio, Video in Interactive Digital Media, Text.
Aesthetics - Typography, Color, Layout Principles.
Authoring - Multimedia Authoring, Making Video Games: Casual and Console, Building Apps, Building Interactive Media for Performance and Public Spaces, Building Websites.

Text Books

1. Gavin Ambrose and Paul Harris, "The Fundamentals of Graphics Design", 1st Edition, 2008, Bloomsbury Publishing.
2. Design Thinking for Visual Communication, Gavin Ambrose, Edition 1, 2017, Bloomsbury Publishing.
3. Juliya V Griffey, "Introduction to Interactive Digital Media: Concept and Practice", 1st Edition, 2019, Taylor & Francis.

Reference Books

1. David Raizman; History of Modern Design, Prentice Hall, 2004
2. Jamie Steane, The Principles and Processes of Interactive Design, 2015, Bloomsbury Publishing

Sample Course Level Assessment Questions:

Course Outcome 1 (CO1):

1. Explain the Hierarchy of group structures.
2. What are the roles of account handlers and project managers?
3. What is glyph switching?
4. Differentiate between modernism and postmodernism views.
5. Explain Typography.

Course Outcome 2 (CO2):

1. How does color contribute to the visual impact of a design?
2. Discuss the role of texture in design thinking.
3. How does color contribute to the visual impact of a design?
4. Imagine you're tasked with creating a promotional video for a new product using 3D graphics and animation. Describe the steps you would take to plan, design, and execute the production process, ensuring that the final video effectively showcases the product's features and benefits to the target audience.
5. Imagine you're redesigning the branding and website for a high-end fashion brand. Describe how you would approach selecting and incorporating typography to reflect the brand's identity, convey its values, and enhance the overall user experience for potential customers browsing the website.

Course Outcome 3 (CO3):

1. What is Interactive Digital Media?
2. What are the different forms of Interactive Digital Media?
3. Compare description-based encoding and command-based encoding of media.
4. Explain analog to digital conversion in Interactive Digital Media.
5. What are wireframes?

Course Outcome 4 (CO4):

1. What is sampling?
2. Find an example of a visual hierarchy. Why is it effective?
3. Explain the components of Unity.
4. Differentiate Pixel based images and vector-based images
5. Find an example of a visual hierarchy. Why is it effective?

Course Outcome 5 (CO5):

1. Develop an UI for a social media website and chat.
2. Develop a publication that tells comic stories
3. Develop a Blog that publishes educational posts.

4. Develop an advertisement for electronic products
5. Develop an interactive website for the hospital management system.

Model Question Paper

QP CODE:

Reg No: _____

Name: _____ **PAGES: 4**

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CXT 453
Course Name: Design Process and Perspective

Max.Marks:100 **Duration: 3 Hours**

PART A
Answer All Questions. Each Question Carries 3 Marks

1. Explain Consumerism.
2. Differentiate between Identity and Branding.
3. Who are the target groups in the research stage?
4. "Asking questions and answers help in identifying the true needs". Justify.
5. What is Refinement of Design?
6. Explain different developing designs used for developing an idea
7. What are the phases in interactive digital media development?
8. Explain the pros of digital media.
9. Explain different file formats of pixel-based images.
10. Why do you think video has become increasingly integrated into interactive digital media applications?

(10x3= 30)

Part B

(Answer any one question from each module. Each question carries 14 Marks)

11 (a) What is the role of semiotics in the Graphics Design Process? (7)

(b) Explain vernacular design principles and their applications. (7)

OR

12 (a) What are the various approaches adopted by a designer to solve a problem. (7)

(b) Nostalgia and Rhetoric play an instrumental role in the design of a product. Justify your answer. (7)

13 (a) What is Brainstorming? List out the rules of brainstorming. (7)

(b) What are the seven elements of design? Explain. (7)

OR

14 (a) Explain the significance of negative space in design thinking. (7)

(b) What are the basic design directions in design thinking? (7)

15 (a) Explain different types of prototyping? (7)

(b) Explain Thinking in signs and its categories. (7)

OR

16 (a) Explain appropriation and its key forms. (7)

(b)Explain different vocabularies or styles used for design development. (7)

17 (a) Explain the compression in Interactive Digital Media. (6)

(b) Explain the Interactive Digital Media Development Team members. (8)

OR

18 (a) Explain the process of interactive digital media development and its team. (8)

(b) Explain Color on the Screen in Interactive Digital Media. (6)

19 (a) Explain distinct phases of 3D production that can be accomplished in a 3D animation program. (7)

(b) Explain different types of writings needed for interactive documents. (7)

OR

20 (a) Explain basic layout principles which creates an interactive media (6)

(b) Explain the process involved in developing a website. (8)

Teaching Plan

No	Contents	No. of lecture hours. 36
Module 1(Graphic Design Process) (7 hours)		
1.1	Introduction to Graphic design	1
1.2	Group structures and working methods	1
1.3	Industrialization, Technology, Typography, Consumerism	1
1.4	Identity and branding, social responsibility	1
1.5	Modernism and post- modernism	1
1.6	Nostalgia and rhetoric, Semiotics, Vernacular	1
1.7	Design as problem solving, Creative thinking	1
Module 2 (Elements of design thinking) (7 hours)		
2.1	Define the problem – Research the problem: Identifying drivers	1
2.2	Information gathering - Target groups – Idea Generation for the problem	1
2.3	Basic design directions - Questions and answers	1
2.4	Themes of thinking - Brainstorming- Deciding elements to design	1
2.5	Sketching and Drawing - Lines, shapes, Negative space/white space, Volumes, Value	1
2.6	Color, Texture- Color: Colors Theories-Color wheel - Color Harmonies or Color Schemes- Color Symbolism	1
2.7	Font - Layout	1

Module 3 (Refinement and prototyping design) (8 hours)		
3.1	Refinement of Design: Thinking in images	1
3.2	Thinking in signs - Appropriation	1

3.3	Humor- Personification - Visual metaphors	1
3.4	Modification - Thinking in words, Thinking in technology – Prototyping, Developing designs	1
3.5	Types of prototypes- Vocabulary	1
3.6	Risk management	1
3.7	Implementation: Format - Materials- Finishing	1
3.8	Case study	1
Module 4 (Introduction to Interactive Digital Media) (7 hours)		
4.1	Introduction - Interactive Digital Media, Forms of Interactive Digital Media	1
4.2	Developing Interactive Digital Media, Essential Skills	1
4.3	The Impact of Interactive Digital Media	1
4.4	The Interactive Digital Media Development Process and Team	1
4.5	Fundamental Components of Interactive Digital Media - Analog vs. Digital	1
4.6	Analog to Digital, The Pros of Digital Media, Compression	1
4.7	Description vs. Command-Based Encoding of Media, Color on the Screen.	1

Module 5 (Media content, aesthetics and authoring in Interactive Digital Media) (7 hours)		
5.1	Media content - Graphics, Pixel-based Images	1
5.2	Vector-based Images, 2D Animation, 3D Graphics and Animation	1
5.3	Audio, Video in Interactive Digital Media, Text, Aesthetics - Typography	1
5.4	Color, Layout Principles	1
5.5	Authoring - Multimedia Authoring	1
5.6	Making Video Games: Casual and Console	1

5.7	Building Apps, Interactive Media for Performance and Public Spaces and websites	1

CXT463	HIGH PERFORMANCE COMPUTING	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PEC	2	1	0	3	2021

Preamble: This course helps the learners to understand the different architectural features of high-end processors. This course discusses the Basics of high-end processors Architecture, Instruction-Level Parallelism, Data-Level Parallelism, Thread Level Parallelism, and GPU Architectures. This course enables the students to provide solutions to real-world problems making use of the capabilities of HPC systems.

Prerequisite: Basic knowledge in Computer System architecture, Microprocessors, Operating systems, and System software.

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

CO1	Describe different types of modern processing environments and parallel computing hardware (**Cognitive Knowledge Level: Understand**)
CO2	Summarize the concepts of Instruction Level Parallelism (**Cognitive Knowledge Level: Understand**)
CO3	Use the idea of Data Level Parallelism (**Cognitive Knowledge Level: Apply**)
CO4	Demonstrate the concept of Thread Level Parallelism(**Cognitive Knowledge Level: Apply**)
CO5	Describe the basics of GPU architecture.(**Cognitive Knowledge Level: Understand**)

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										✓
CO2	✓	✓										✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓									✓
C05	✓	✓										✓

Abstract Pos defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and team work
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Life long learning

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination Marks(%)
	Test1 (%)	Test2 (%)	
Remember	**20**	**20**	**20**
Understand	**50**	**50**	**50**
Apply	**30**	**30**	**30**
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks.	ESE Duration
150	**50**	**100**	**3**

Continuous Internal Evaluation Pattern:

Attendance	**10 marks**
Continuous Assessment Tests (Average of Internal Tests1&2)	**25 marks**
Continuous Assessment Assignment	**15 marks**

Internal Examination Pattern

Each of the two internal examinations has to be conducted out of 50 marks. The first internal evaluation test is to be conducted based on the first two modules of the Syllabus. The second internal evaluation test is to be conducted based on the third and fourth modules of the Syllabus. There will be two parts: Part A and Part B. Students should answer all questions from Part A. Part B contains 7 questions each with 7 marks. Out of the 7 questions, a student should answer any 5. An assignment/quiz/open book test is to be given based on the fifth module of the Syllabus. The time duration for each internal evaluation test is 1 hour and 30 minutes.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 full questions from each module of which students should answer anyone. Each question can have a maximum of 2 sub-divisions and carries 14 marks.

Syllabus

Module-1(Basics of Architecture)

Classes of Computers - Classes of Parallelism and Parallel Architectures – Defining Computer Architecture– Dependability – Quantitative Principles of Computer Design – Basics of Memory Hierarchies– Virtual Memory and Virtual Machines – Pipelining

Module-2(Instruction-Level Parallelism)

Instruction-Level Parallelism: Concepts and Challenges–Basic Compiler Techniques for Exposing ILP – Reducing Branch Costs With Advanced Branch Prediction – Hardware-Based Speculation – Multithreading: Exploiting Thread-Level Parallelism to Improve Uniprocessor Throughput

Module-3(Data-Level Parallelism)

Vector Architecture – SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units– Detecting and Enhancing Loop-Level Parallelism

Module-4(Thread Level Parallelism)

Multiprocessor Architecture: Issues and Approach – Centralized Shared-Memory Architectures – Performance of Symmetric Shared-Memory Multiprocessors– Distributed Shared-Memory and Directory-Based Coherence–Synchronization: The Basics–Introduction to Memory Consistency

Module-5(GPU Architectures)

The CPU-GPU system as an accelerated computational platform – The GPU and the thread engine – Characteristics of GPU memory spaces – The PCI bus: CPU to GPU data transfer over head–Multi-GPU platforms–Potential benefits of GPU–accelerated platforms

Text Books

1. JohnL.Hennessy, David A. Patterson. Computer Architecture, Sixth Edition. A Quantitative Approach, Morgan Kaufman, Fifth Edition, 2012.
2. Robert Robey, Yuliana Zamora, Parallel and High-Performance Computing, Manning Publications, First Edition, 2021.

Reference Books

1. Thomas Sterling, Matthew Anderson, and Maciej Brodowicz, High-Performance Computing– Modern Systems and Practices, First Edition,2017.
2. Charles Severance, Kevin Dowd, High-Performance Computing, O'Reilly Media, Second Edition, 1998.
3. Kai Hwang, Faye Alaye Briggs, Computer Architecture and Parallel Processing,McGraw-Hill,1984.

Course Level Assessment Questions

Course Outcome1 (CO1):

1. Differentiate different classes of computer-based on features like microprocessor cost, system cost, and system design issues.
2. Explain the different methods by which computer hardware exploits application-level parallelism.
3. Explain in detail the instruction set architecture
4. Describe the encoding scheme specified as part of ISA

Course Outcome2(CO2):

1. Differentiate data, name, and control dependencies with suitable examples.
2. Explain loop unrolling with suitable coding demonstration
3. Explain in detail about Tournament Predictors.
4. Describe the unique features of very long instruction word processors.

Course Outcome3 (CO3):

1. What are the three things conveyed through a data dependence? Explain the Data Dependencies of the following code:

```
Loop:  fld     f0,0(x1)    //f0=array element
       fadd.d  f4,f0,f2    //add scalar in f2
       fsd     f4,0(x1)    //store result
       addi    x1,x1,-8    //decrement pointer 8 bytes
       bne     x1,x2,Loop  //branch x1≠x2
```

2. Assume a single-issue pipeline. Unroll the loop as many times as necessary to schedule it without any stalls, collapsing the loop overhead instructions. How many times must the loop be unrolled? Show the instruction schedule. What is the execution time per element of the result?
3. Explain the SIMD Instruction Set Extensions for Multimedia.

Course Outcome4(CO4):

1. With the help of a neat diagram illustrate a single-chip multicore with a distributed cache.
2. Demonstrate the Implementation of cache coherence in a distributed-memory multiprocessor by adding a directory to each node with a suitable diagram.
3. Consider the following code segments running on two processors P1 and P2.Assume A, and B, are initially 0. Explain how an optimizing compiler might make it impossible for B to be ever set to 2 in a sequentially consistent execution model.

P1:	P2:
A=1;	B=1;
A=2;	While (A <> 1);
While (B == 0);	B= 2;

Course Outcome5 (CO5):

1. Explain the benefits of potential GPU.
2. Illustrate GPU system as an accelerated computational platform.
3. Discuss CPU to GPU data transfer overhead.

Model Question Paper

QPCODE:

Reg No:_____

Name:_____ **PAGES:4**

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CXT463

Course Name: High Performance Computing

Max.Marks:100 **Duration:3 Hours**

PART A

Answer All Questions. Each Question Carries 3 Marks

1. Differentiate between Data level parallelism and Task level parallelism.
2. Explain the principle of locality
3. Define Instruction Level Parallelism with an example.
4. Devise the importance of loop unrolling with an example.
5. What is the equation of CPI (cycles per instruction) for a pipelined processor? How can we set the ideal pipeline CPI?
6. Explain the two types of name dependencies between an instruction i that precedes instruction j in program order.
7. Differentiate between module reliability and module availability measures with suitable examples.
8. Why SMP architectures are called UMA multiprocessors and DSM multiprocessors as NUMA processors.

9. Explain the need for GPU.

10. List the characteristics of GPU memory spaces.

3x10=30

Part B

(Answer any one question from each module. Each question carries14 Marks)

11. (a) Describe the quantitative principle of computer design with Amdahl's law. (8)

(b) Discuss in detail the importance of considering processor performance for the design of an efficient computer system. (6)

OR

12. (a) Illustrate how processes are protected with the help of virtual memory. (7)

(b) Discuss the role played by virtual machines in providing protection for processes. (7)

13. (a) Explain in detail data dependence and hazards. **(8)**

(b) With neat sketches explain how data-level parallelism is achieved in vector, and SIMD architectures. **(6)**

OR

14. (a) Describe the unique features of very long instruction word processors. **(8)**

(b) Consider a three-way superscalar machine renaming these three instructions concurrently: **(6)**

```
addi x1, x1, x1
addi x1, x1, x1
addi x1, x1, x1
```

If the value of x1 starts at 5, then what will be its value when after this sequence is executed?

15. (a) The following loop has multiple types of dependences. Find all the true dependences, output dependencies, and anti-dependencies, and eliminate the output dependencies and anti-dependencies by renaming. **(8)**

```
for (i=0; i<100; i=i+1) {
    Y[i] = X[i] / c;  /* S1 */
    X[i] = X[i] + c;  /* S2 */
    Z[i] = Y[i] + c;  /* S3 */
    Y[i] = c - Y[i];  /* S4 */
}
```

(b) Describe the limitations of Symmetric Shared-Memory Multiprocessors and Snooping Protocols **(6)**

OR

16. (a) Demonstrate the different types of hardware approaches required for the working of multithreading. **(8)**

(b) Consider the following loop: **(6)**

```
for (i=0;i<100;i++) {
 A[i] = A[i] + B[i]; /* S1 */
 B[i+1] = C[i] + D[i]; /* S2 */
}
```

Are there exist dependencies between S1 and S2? Determine whether the above loop is parallel? If not, show how to make it parallel.

17. (a) Consider an 8-processor multicore where each processor has its own L1 and L2 caches. Here snooping is performed on a shared bus among the L2 caches. Assume that the average L2 request is 15 cycles for a coherence miss or other miss and a clock rate of 3.0 GHz, a CPI of 0.7, and a load/store frequency of 40%.If the goal set is that no more than 50% of the L2bandwidth is consumed by coherence traffic, then what is the maximum coherence miss rate per processor? **(8)**

(b) Explain the basic structure of a centralized shared-memory multiprocessor **(6)**

Based on a multicore chip.

OR

18. (a) Suppose an application running on a 100-processor multiprocessor use 1,50, or 100 processors. If for 95% of the time all 100 processors are used, illustrate how the remaining 5% of the execution time employs 50 processors for a speed up of 80? **(6)**

(b) With a neat diagram, demonstrate invalidate cache coherence protocol for a private write-back cache, showing the states and state transitions for each block in the cache. **(8)**

19. (a) Explain the multi-GPU platform. **(8)**

(b) Explain some of the benefits of GPU. **(6)**

OR

20. (a) Discuss in detail the characteristics of GPU memory spaces. **(8)**

(b) Explain about GPU thread engine. **(6)**

Teaching Plan

No	Contents	No. of Lecture Hours (36hrs)
	Module1-Basics of Architecture (7hours)	
1.1	Classes of Computers	1 hour
1.2	Classes of Parallelism and Parallel Architectures	1 hour
1.3	Dependability	1 hour
1.4	Quantitative Principles of Computer Design.	1 hour

1.5	Basics of Memory Hierarchies	1 hour
1.6	Virtual Memory and Virtual Machines	1 hour
1.7	Pipelining	1 hour
Module-2 (Instruction Level Parallelism) (7hours)		
2.1	Instruction-Level Parallelism: Concepts and Challenges	1 hour
2.2	Basic Compiler Techniques for Exposing ILP	1 hour
2.3	Reducing Branch Costs With Advanced Branch Prediction	1 hour
2.4	Hardware-Based Speculation	1 hour
2.5	Multithreading	1 hour
2.6	Exploiting Thread-Level Parallelism to Improve Uniprocessor Throughput – Lecture1.	1 hour
2.7	Exploiting Thread-Level Parallelism to Improve Uniprocessor Throughput – Lecture2.	1 hour
Module-3-Data-Level Parallelism (7hours)		
3.1	Vector Architecture- Lecture1	1 hour
3.2	Vector Architecture- Lecture2	1 hour
3.3	SIMD Instruction Set Extensions for Multimedia– Lecture1	1 hour
3.4	SIMD Instruction Set Extensions for Multimedia– Lecture2	1 hour
3.5	Graphics Processing Units	1 hour
3.6	Detecting and Enhancing Loop-Level Parallelism– Lecture1	1 hour
3.7	Detecting and Enhancing Loop-Level Parallelism– Lecture2	1 hour
Module4–Thread Level Parallelism (8hours)		
4.1	Multiprocessor Architecture: Issues and Approach	1 hour
4.2	Centralized Shared-Memory Architectures– Lecture1	1hour
4.3	Centralized Shared-Memory Architectures– Lecture2	1hour
4.4	Performance of Symmetric Shared-Memory Multiprocessors	1hour
4.5	Distributed Shared-Memory	1hour
4.6	Directory-Based Coherence	1hour
4.7	Synchronization	1hour

4.8	Introduction to Memory Consistency	1hour
Module5–GPU Architectures (7hours)		
5.1	The CPU-GPU system as an accelerated computational platform	1 hour
5.2	The GPU and the thread engine–Lecture 1	1 hour
5.3	The GPU and the thread engine–Lecture 2	1 hour
5.4	Characteristics of GPU memory spaces	1hour
5.5	PCI bus: CPU to GPU data transfer overhead	1hour
5.6	Multi-GPU platforms	1hour
5.7	Potential benefits of GPU-accelerated platforms	1hour

CXL 411	COMPUTER GRAPHICS LAB	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PCC	0	0	3	2	2021

Preamble:
This laboratory course encourages students to explore and implement different CG concepts. Students can develop animation programs using the CG concepts. This course also encourages students to do different image processing operations

Prerequisite: Basic understanding of computer programming, Computer Graphics and Image Processing.

CO1	Implement computer graphics algorithms for drawing Line and circle **(Cognitive Knowledge Level: Apply)**
CO2	Apply Polygon filling and clipping concepts in CG **(Cognitive Knowledge Level: Apply)**
CO3	Implementation of geometric transformations of 2D and 3D objects. **(Cognitive Knowledge Level: Apply)**
CO4	Develop animation programs using CG concepts. **(Cognitive Knowledge Level: Apply)**
CO5	Implement different image Processing operations **(CognitiveKnowledge Level: Apply)**

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓	✓			✓		✓		✓
CO2	✓	✓	✓	✓	✓			✓		✓		✓
CO3	✓	✓	✓	✓	✓			✓		✓		✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓

Abstract POs defined by National Board of Accreditation			
PO#	Broad PO	PO#	Broad PO
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and team work
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Lifelong learning

Assessment Pattern

Bloom's Category	**Continuous Assessment Test (Internal Exam)** ***Percentage***	**End Semester Examination** ***Percentage***
Remember	**20**	**20**
Understand	**20**	**20**
Apply	**60**	**60**
Analyse		
Evaluate		
Create		

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	75	75	3hours

Continuous Internal Evaluation Pattern:

Attendance : **15 marks**
Continuous Evaluation in Lab : **30 marks**
Continuous Assessment Test : **15 marks**
Viva-voce : **15 marks**

Internal Examination Pattern: The marks will be distributed as Algorithm 30 marks, Program 20 marks, Output 20 marks and Viva 30 marks. Total 100 marks which will be converted out of 15 while calculating Internal Evaluation marks.

End Semester Examination Pattern: The marks will be distributed as Algorithm 30 marks, Program 20 marks, Output 20 marks and Viva 30 marks. Total 100 marks will be converted out of 75 for End Semester Examination.

Fair Lab Record:

All Students attending the Lab should have a Fair Record. The fair record should be produced in the University Lab Examination. Every experiment conducted in the lab should be noted in the fair record. For every experiment in the fair record the right-hand page should contain Experiment Heading, Experiment Number, Date of Experiment, Aim of Experiment, Details of Experiment including algorithm and Result of Experiment. The left-hand page should contain a print out of the code used for the experiment and sample output obtained for a set of input.

Syllabus

1. Introduction To 2D graphics:Line drawing algorithms- DDA, Bresenham's algorithm. Circle drawing algorithms- Midpoint Circle generation algorithm, Bresenham's algorithm.

2. Polygon filling and 2D transformations: Polygon filling algorithms,flood fill and boundary fill algorithms,2d transformations-translation,rotation,scaling, composite transformations

3. 3D transformations: Basic 3 D transformations-translation,rotation,scaling

4. Clipping algorithms: Line clipping,Polygon clipping

5. Image Enhancement operations:Basic gray level transformation functions in images, contrast stretching-Histogram equalisation,Smoothing,Sharpening
6. Fundamentals of image Segmentation: Thresholding,Region based approaches

List of Lab Experiments/Exercises

1. Implementation of DDA Line drawing algorithm. *
2. Implementation of Bresenham's Line drawing algorithm*
3. Implementation of Bresenham's circle drawing algorithm.
4. Implementation of Midpoint circle drawing algorithm.*
5. Implementation of boundary filling algorithm .*
6. Implementation of 2D transformations.*
7. Implementation of 3D transformations
8. Implementation of Line clipping algorithm. *
9. Implementation of Polygon clipping algorithm.*
10. Implementation of animation programs using CG concepts*
11. Implementation of relationship between pixels in an image
12. Implementation of transformations on images.*
13. Implementation of contrast stretching and histogram equalisation.*
14. Implementation of Image Smoothing Filters.*
15. Implementation of image Sharpening filters and Edge Detection using Gradient Filters.*
16. Implementation of segmentation operations.*

Note: *Students can be given a group micro project, so that they learn to work in a team environment. They can also be trained on project management tools.*

*All programs are mandatory and should be completed in the lab.

Reference Books

1. Donald Hearn and M. Pauline Baker, Computer Graphics, PHI, 2e, 1996
2. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing. Pearson, 4e, 2017
3. William M. Newman and Robert F. Sproull, Principles of Interactive Computer Graphics. McGraw Hill, 2001
4. M. Sonka, V. Hlavac, and R. Boyle, Image Processing, Analysis, and Machine Vision, Thomson India Edition, 4e, 2017

CXT499	CLOUD, MULTIMEDIA AND IOT	Category	L	T	P	Credit	Year of Introduction
		T	3	1	0	4	2021

Preamble:

This is the foundational course for awarding B. Tech. Honors in Computer Science and Design with specialization in Internet of Things. The purpose of this course is to introduce IoT protocols for communication and to implement various cloud deployment models necessary for developing applications for IoT devices. Concepts in this course help the learners to understand internet technologies and protocols for multimedia transmission and interaction.

Prerequisite: IOT ARCHITECTURE AND ITS PROTOCOLS

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

CO 1	Identify the impacts of embedded systems, IOT, cloud computing and multimedia. (**Knowledge Level: Understand**)
CO 2	Use IoT protocols for communication and to implement various cloud deployment models necessary for developing applications for IoT devices. (**Knowledge Level: Apply**)
CO 3	Gain the necessary knowledge to construct IoT systems and use cloud services for processing and storage of the data. (**Knowledge Level: Apply**)
CO 4	Explain basics of multimedia, various Image Data Representations and Color models in image and video (**Knowledge Level: Understand**)
CO 5	Articulate internet technologies and protocols for multimedia transmission and interaction. (**Knowledge Level: Understand**)
CO6	**Explain multimedia cloud computing and internet of things in the cloud. (Knowledge Level: Understand)**

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO7	PO8	PO9	PO 10	PO1 1	PO1 2
CO 1	✓	✓	✓									✓
CO 2	✓	✓	✓	✓								✓
CO 3	✓	✓	✓	✓								✓
CO 4	✓	✓	✓		✓							✓
CO 5	✓	✓	✓		✓							✓
CO 6	✓	✓	✓									✓

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and team work
PO4	Conduct investigations of complex problems	**PO 10**	Communication
PO5	Modern tool usage	**PO 11**	Project Management and Finance
PO6	The Engineer and Society	**PO 12**	Lifelong learning

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination Marks
	Test 1	Test 2	
Remember	20%	20%	20%
Understand	40%	40%	40%
Apply	40%	40%	40%
Analyses			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	**50**	**100**	**3 hours**

Continuous Internal Evaluation Pattern:

Attendance: 10 marks

Continuous Assessment Tests: 25 marks

Continuous Assessment Assignment: 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. The first internal evaluation test is to be conducted based on the first two modules of the Syllabus. The second internal evaluation test is to be conducted based on the third and fourth modules of the syllabus. There will be two parts: Part A and Part B. Students should answer all questions from Part A. Part B contains 7 questions each with 7 marks. Out of the 7 questions, a student should answer any 5. An assignment/quiz/open book test is to be given based on the fifth module of the Syllabus. The time duration for each internal evaluation test is 1 hour and 30 minutes.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer anyone. Each question can have a maximum of 2 subdivisions and carries 14 marks.

Syllabus

Module 1 9 hours

Cloud Computing: Definition, roots of cloud computing, characteristics, cloud architecture and cloud Service Models: IaaS, PaaS, SaaS**.** Cloud Deployment Models: Public, Private, Hybrid**,** Virtualization: Benefits & drawbacks of virtualization, server virtualization, virtualization of - operating system, platform, CPU, network, application, memory and I/O devices, Cloud security: issues, threats, data security and information security.

Module 2 9 hours

Internet of Thing (IoT): Overview, conceptual framework, architecture, major components, IOT definitions and framework, Basic nodal capabilities, Physical design of IOT, IOT protocols – Link layer protocols, network layer protocols, application layer protocols, Logical design of IOT, IOT functional blocks, IOT enabling technologies, Embedded systems, Applications of embedded systems.

Module 3 8 hours

Architectural Models for IoT and Cloud Convergence - Cloud Platforms and Services for IoT - Deploying IoT Applications on Cloud - Data Management and Analytics in IoT using Cloud - Security Aspects of IoT in Cloud Environments - IoT and Cloud Interoperability Challenges Real-time Processing and Edge Computing in IoT and Cloud - IoT Cloud Case Studies: Healthcare, Smart Cities, Industrial IoT - Future Trends in IoT and Cloud Integration

Module 4 10 hours

Introduction to Multimedia-Definition-Components of Multimedia. Multimedia and Hypermedia, World Wide Web. Overview of Multimedia Software Tools -Music Sequencing and Notation -Digital Audio -Graphics and Image Editing-Video Editing-Animation-Multimedia Authoring-Some useful editing and authoring tools- VMRL- Graphics and Image Data Representations-Graphics image Data Types-Popular File Formats **-**Color in Image and Video-Color Science-Color Models in Images-Color Models in Video-Fundamental Concepts in Video-Basics of Digital Audio

Module 5 **9** Hours

Multimedia Communications and Networking: Internet Technologies and Protocols-Multicast Extension-Quality-of-Service for Multimedia Communications-Protocols for Multimedia Transmission and Interaction.

Cloud Computing for Multimedia Services- Multimedia Cloud Computing-Cloud-Assisted Media Sharing-Computation Offloading for Multimedia Services-Interactive Cloud Gaming. The internet of things in the cloud: Cloud Middleware-NIST's SPI Architecture and Cloud Standards-Cloud Providers and Systems-The Cloud of Things.

Text book:

1. Kayla Little and Ron Pascuzzi,A Reference Guide to the Internet of Things', Bridgera LLC, 500 West Peace Street, Raleigh, NC 27603.
2. Arshdeep Bahga and Vijay Madisetti , Integration of "Internet of Things (A Hands-on Approach)" for IoT components
3. Rajkumar Buyyaet ,"Cloud Computing: Principles and Paradigms" for cloud components.(Module 3)
4. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson Education
5. Zhou H. The internet of things in the cloud. Boca Raton, FL: CRC press; 2012

Reference books:

1. Raj Kamal, Internet of things, Architecture and design principles', McGraw Hill Education
2. Douglas Comer, The Cloud Computing Book',
3. Jitendra Kumar Verma, Deepak Saxena, Vicente González-Prida, 'IoT and Cloud Computing for Societal Good',

Sample Course Level Assessment Questions.

Course Outcome 1 (CO1):

1. Describe the Characteristics of Cloud Computing.
2. Define the architectural view of IoT and functional blocks.

Course Outcome 2 (CO2):

1. What are the protocols that are used in IoT?
2. Explain the advantages of next generation IP based protocols used in IoT.
3. Design a smart home automation system using IoT devices such as sensors and actuators. Utilize MQTT (Message Queuing Telemetry Transport) as the communication protocol between these devices and a cloud-based platform. Discuss how you would implement a hybrid cloud deployment model to ensure both local processing for real-time responses and cloud storage for long-term data analysis.

Course Outcome 3 (CO3):

1. Explain the advantages and disadvantages of deploying IoT applications on cloud platforms compared to on-premises solutions, considering factors such as scalability, cost, and security.
2. Explore the challenges of achieving interoperability between IoT devices and cloud platforms. How can standardization efforts address these challenges effectively?
3. Develop a mobile health monitoring application that collects data from wearable IoT devices like fitness trackers and heart rate monitors. Employ CoAP (Constrained Application Protocol) as the communication protocol to transmit sensor data to a cloud infrastructure. Evaluate the suitability of various cloud deployment models (public, private, hybrid) for hosting the backend services of the application, considering factors such as data privacy, scalability, and cost-effectiveness.

Course Outcome 4 (CO4):

1. Explain the components of Multimedia.
2. Explore the basics of digital audio, including sampling, quantization, and compression techniques. How do these concepts contribute to the efficient storage and transmission of audio data?

Course Outcome 5 (CO5):

1. Describe the role of multimedia in modern communication?
2. Explain the functionality and significance of real-time control protocol?

Course Outcome 6 (CO6):

1. Explain the role of cloud computing in multimedia services?
2. Discuss the Integration of Internet of Things (IoT) devices with cloud computing.

Model Question paper

	QP Code:	**CLOUD, MULTIMEDIA AND IOT**	**Total Pages:3**
Reg No.:			**Name:**

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
VII SEMESTER B. TECH (HONOURS) DEGREE EXAMINATION, MONTH and YEAR

Course Code: CXT 499

Course Name: CLOUD, MULTIMEDIA AND IOT

Max. Marks: 100		**Duration: 3 Hours**

PART A

	Answer all questions, each carries 3 marks.	Marks
1	What is cloud computing.	(3)
2	What are the different cloud deployment models?	(3)
3	Specify any three real world design constraints for IOT applications	(3)
4	What are the components of physical design of IOT?	(3)
5	What are the primary security considerations for IoT devices and data when operating within cloud environments?	(3)
6	How do IoT and cloud technologies collaborate to address specific industry needs.	(3)
7	Define multimedia.	(3)
8	Explain various graphics/image Data Types.	(3)
9	Which of the following is a key feature of quality of service for multimedia communications?	(3)
10	What does NIST's SPI architecture primarily focus on in the context of the cloud of	(3)

	things?	

PART B			
Answer any one Question from each module. Each question carries 14 Marks			
11	a)	Describe the essential characteristics of cloud computing. How do these characteristics differentiate cloud computing from traditional computing?	(8)
	b)	Differentiate between the three primary service models of cloud computing: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).	(6)
		OR	
12	a)	Discuss the benefits and drawbacks of virtualization in the context of cloud computing.	(7)
	b)	Identify the main security issues and threats in cloud computing and suggest strategies to mitigate these risks, focusing on data security and information security.	(7)
13	a)	Explain various IOT protocols.	(8)
	b)	Write a short note on the major components of IOT?	(6)
		OR	
14	a)	Describe the simplified IoT Architecture. Also describe about application layer protocols: (a) CoAP (b) MQTT.	(6)
	b)	Explain about IOT functional blocks.	(8)
15	a)	How do architectural models facilitate the convergence of IoT and cloud technologies?	(8)
	b)	What are some key cloud platforms and services commonly utilized for IoT deployments, and how do they support IoT applications?	(6)
		OR	
16	a)	How does real-time processing and edge computing enhance IoT	(8)

		functionality within cloud environments?	
	b)	What are the advantages and challenges associated with deploying IoT applications on cloud infrastructure?	(6)
17	a)	Explain the components of multimedia.	(6)
	b)	Describe the different multimedia software tools.	(8)
		OR	
18	a)	Describe the role of VRML (Virtual Reality Modeling Language) in creating immersive multimedia experiences. Provide examples of applications where VRML is commonly used and discuss its potential impact on multimedia development.	(6)
	b)	Explain the different MIDI messages.	(8)
19	a)	Describe the role of network layer protocols such as IP in packet addressing and forwarding, and compare circuit switching and packet switching techniques in terms of their suitability for different data transmission requirements.	(8)
	b)	Discuss how routing tables and protocols contribute to guiding packet forwarding across various network segments.	(6)
		OR	
20	a)	Discuss the challenges and solutions in implementing cloud gaming, focusing on interaction delay, video streaming, and real-world deployment and evaluate the trade-offs between interaction delay and video quality?	(6)
	b)	Examine the essential requirements for effective computation offloading and illustrate various approaches employed to enhance energy efficiency and performance in mobile computing.	(8)

Teaching Plan		
No	**Topic**	**No. of Lectures (45 Hrs.)**
	Module-1	**9 hrs.**
1.1	Cloud Computing: Definition, roots of cloud computing, characteristics.	1
1.2	Cloud architecture and cloud Service Models: IaaS, PaaS **.**	1
1.3	Cloud Service Models-Saas.	1
1.4	Cloud Deployment Models: Public, Private, Hybrid.	1
1.5	Virtualization: Benefits & drawbacks of virtualization.	1
1.6	Server virtualization, virtualization of - operating system, platform, CPU, network, application.	1
1.7	Virtualization of memory and I/O devices.	1
1.8	Cloud security: issues, threats.	1
1.9	Data security and information security.	1
	Module-2	**9 hrs.**
2.1	Internet of Thing (IoT): Overview.	1
2.2	Conceptual framework, architecture, major components.	1
2.3	IOT definitions and framework, Basic nodal capabilities.	1
2.4	Physical design of IOT, IOT protocols – Link layer protocols, network layer protocols.	1

2.5	Application layer protocols.	1
2.6	Logical design of IOT.	1
2.7	IOT functional blocks.	1
2.8	IOT enabling technologies, Embedded systems.	1
2.9	Applications of embedded systems.	1
	Module-3	**8 hrs.**
3.1	Architectural Models for IoT and Cloud Convergence.	1
3.2	Cloud Platforms and Services for IoT - Deploying IoT Applications on Cloud.	1
3.3	Data Management and Analytics in IoT using Cloud.	1
3.4	Security Aspects of IoT in Cloud Environments.	1
3.5	IoT and Cloud Interoperability Challenges.	1
3.6	Real-time Processing and Edge Computing in IoT and Cloud.	1
3.7	IoT Cloud Case Studies: Healthcare, Smart Cities, Industrial IoT.	1
3.8	Future Trends in IoT and Cloud Integration.	1
	Module-4	**10 hrs.**
4.1	Introduction to Multimedia: Definition, Components of Multimedia.	1

4.2	Multimedia and Hypermedia, World Wide Web.	1
4.3	Overview of Multimedia Software Tools: Music Sequencing and Notation, Digital Audio, Graphics and Image Editing, Video Editing, Animation, Multimedia Authoring.	1
4.4	Some useful editing and authoring tools, VMRL.	1
4.5	Graphics and Image Data Representations, Graphics image Data Types.	1
4.6	Popular File Formats.	1
4.7	Color in Image and Video-Color Science.	1
4.8	Color Models in Images, Color Models in Video.	1
4.9	Fundamental Concepts in Video.	1
4.10	Basics of Digital Audio.	1
	Module-5	**9 hrs.**
5.1	Internet Technologies and Protocols, Multicast Extension.	1
5.2	Quality-of-Service for Multimedia Communications.	1
5.3	Protocols for Multimedia Transmission and Interaction.	1
5.4	Multimedia Cloud Computing.	1
5.5	Cloud Assisted Media Sharing.	1

5.6	Computation Offloading for Multimedia Services-Interactive Cloud Gaming.	1
5.7	The internet of things in the cloud: Cloud Middleware, NIST's SPI Architecture and Cloud Standards. (Lecture -1)	1
5.8	The internet of things in the cloud: Cloud Middleware, NIST's SPI Architecture and Cloud Standards. (Lecture -2)	1
5.9	Cloud Providers and Systems-The Cloud of Things.	1

CXQ 413	SEMINAR	CATEGORY	L	T	P	CREDIT
		PWS	0	0	3	2

Preamble: The course 'Seminar' is intended to enable a B.Tech graduate to read, understand, present and prepare report about an academic document. The learner shall search in the literature including peer reviewed journals, conference, books, project reports etc., and identify an appropriate paper/thesis/report in her/his area of interest, in consultation with her/his seminar guide. This course can help the learner to experience how a presentation can be made about a selected academic document and also empower her/him to prepare a technical report.

Course Objectives:

- To do literature survey in a selected area of study.
- To understand an academic document from the literate and to give a presentation about it.
- To prepare a technical report.

Course Outcomes [COs]: After successful completion of the course, the students will be able to:

CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: **Apply**).
CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: **Analyze**).
CO3	Prepare a presentation about an academic document (Cognitive knowledge level: **Create**).
CO4	Give a presentation about an academic document (Cognitive knowledge level: **Apply**).
CO5	Prepare a technical report (Cognitive knowledge level: **Create**).

Mapping of course outcomes with program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1		2	1					3
CO2	3	3	2	3		2	1					3
CO3	3	2			3			1		2		3
CO4	3				2			1		3		3
CO5	3	3	3	3	2	2		2		3		3

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct investigations of complex problems	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Life long learning

General Guidelines

- The Department shall form an Internal Evaluation Committee (IEC) for the seminar with academic coordinator for that program as the Chairperson/Chairman and seminar coordinator & seminar guide as members. During the seminar presentation of a student, all members of IEC shall be present.
- Formation of IEC and guide allotment shall be completed within a week after the University examination (or last working day) of the previous semester.
- Guide shall provide required input to their students regarding the selection of topic/ paper.
- Choosing a seminar topic: The topic for a UG seminar should be current and broad based rather than a very specific research work. It's advisable to choose a topic for the Seminar to be closely linked to the final year project area. Every member of the project team could choose or be assigned Seminar topics that covers various aspects linked to the Project area.
- A topic/paper relevant to the discipline shall be selected by the student during the semester break.
- Topic/Paper shall be finalized in the first week of the semester and shall be submitted to the IEC.
- The IEC shall approve the selected topic/paper by the second week of the semester.
- Accurate references from genuine peer reviewed published material to be given in the report and to be verified.

Evaluation pattern

Total marks: 100, only CIE, minimum required to pass 50

Seminar Guide: 20 marks (Background Knowledge – 10 (The guide shall give deserving marks for a candidate based on the candidate's background knowledge about the topic selected), Relevance of the paper/topic selected – 10).

Seminar Coordinator: 20 marks (Seminar Diary – 10 (Each student shall maintain a seminar diary and the guide shall monitor the progress of the seminar work on a weekly basis and shall approve the entries in the seminar diary during the weekly meeting with the student), Attendance – 10).

Presentation: 40 marks to be awarded by the IEC (Clarity of presentation – 10, Interactions – 10 (to be based on the candidate's ability to answer questions during the interactive session of her/his presentation), Overall participation – 10 (to be given based on her/his involvement during interactive sessions of presentations by other students), Quality of the slides – 10).

Report: 20 marks to be awarded by the IEC (check for technical content, overall quality, templates followed, adequacy of references etc.).

CXD415	PROJECT PHASE I	CATEGORY	L	T	P	CREDIT
		PWS	0	0	6	2

Preamble: The course 'Project Work' is mainly intended to evoke the innovation and invention skills in a student. The course will provide an opportunity to synthesize and apply the knowledge and analytical skills learned, to be developed as a prototype or simulation. The project extends to 2 semesters and will be evaluated in the 7th and 8th semester separately, based on the achieved objectives. One third of the project credits shall be completed in 7th semester and two third in 8th semester. It is recommended that the projects may be finalized in the thrust areas of the respective engineering stream or as interdisciplinary projects. Importance should be given to address societal problems and developing indigenous technologies.

Course Objectives

- To apply engineering knowledge in practical problem solving.
- To foster innovation in design of products, processes or systems.
- To develop creative thinking in finding viable solutions to engineering problems.

Course Outcomes [COs] : After successful completion of the course, the students will be able to:

CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: **Apply**).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: **Apply**).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: **Apply**).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: **Apply**).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: **Analyze**).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: **Apply**).

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	2	1	1	1	1	2
CO2	2	2	2		1	3	3	1	1		1	1
CO3									3	2	2	1
CO4					2			3	2	2	3	2
CO5	2	3	3	1	2							1
CO6					2			2	2	3	1	1

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct investigations of complex problems	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong learning

PROJECT PHASE I

Phase 1 Target

- Literature study/survey of published literature on the assigned topic
- Formulation of objectives
- Formulation of hypothesis/ design/ methodology
- Formulation of work plan and task allocation.
- Block level design documentation
- Seeking project funds from various agencies
- Preliminary Analysis/Modeling/Simulation/Experiment/Design/Feasibility study
- Preparation of Phase 1 report

Evaluation Guidelines & Rubrics

Total: 100 marks (Minimum required to pass: 50 marks).

- Project progress evaluation by guide: 30 Marks.
- Interim evaluation by the Evaluation Committee: 20 Marks.
- Final Evaluation by the Evaluation Committee: 30 Marks.
- Project Phase - I Report (By Evaluation Committee): 20 Marks.

(The evaluation committee comprises HoD or a senior faculty member, Project coordinator and project supervisor).

Evaluation by the Guide

The guide/supervisor shall monitor the progress being carried out by the project groups on a regular basis. In case it is found that progress is unsatisfactory it shall be reported to the Department Evaluation Committee for necessary action. The presence of each student in the group and their involvement in all stages of execution of the project shall be ensured by the guide. Project evaluation by the guide: 30 Marks. This mark shall be awarded to the students in his/her group by considering the following aspects:

Topic Selection: innovativeness, social relevance etc. (2)

Problem definition: Identification of the social, environmental and ethical issues of the project problem. (2)

Purpose and need of the project: Detailed and extensive explanation of the purpose and need of the project. (3)

Project Objectives: All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified. (2)

Project Scheduling & Distribution of Work among Team members: Detailed and extensive Scheduling with timelines provided for each phase of project. Work breakdown structure well defined. (3)

Literature survey: Outstanding investigation in all aspects. (4)

Student's Diary/ Daily Log: The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily/weekly activity diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students. The daily/weekly activity diary shall be signed after every day/week by the guide. (7)

Individual Contribution: The contribution of each student at various stages. (7)

EVALUATION RUBRICS for PROJECT Phase I: Interim Evaluation						
No.	**Parameters**	**Marks**	**Poor**	**Fair**	**Very Good**	**Outstanding**
1-a	Topic identification, selection, formulation of objectives and/or literature survey. (Group assessment) [CO1]	10	The team has failed to come with a relevant topic in time. Needed full assistance to find a topic from the guide. They do not respond to suggestions from the evaluation committee and/or the guide. No literature review was conducted. The team tried to gather easy information without verifying the authenticity. No objectives formed yet.	The team has identified a topic. The originally selected topic lacks substance and needs to be revised. There were suggestions given to improve the relevance and quality of the project topic. Only a few relevant references were consulted/ studied and there is no clear evidence to show the team's understanding on the same. Some objectives identified, but not clear enough.	Good evidence of the group thinking and brainstorming on what they are going to build. The results of the brainstorming are documented and the selection of topic is relevant. The review of related references was good, but there is scope of improvement. Objectives formed with good clarity, however some objectives are not realistic enough.	The group has brainstormed in an excellent manner on what they were going to build. The topic selected is highly relevant, real world problem and is potentially innovative. The group shows extreme interest in the topic and has conducted extensive literature survey in connection with the topic. The team has come up with clear objectives which are feasible.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)
1-b	Project Planning, Scheduling and Resource/ Tasks Identification and allocation. (Group assessment) [CO4]	10	No evidence of planning or scheduling of the project. The students did not plan what they were going to build or plan on what materials / resources to use in the project. The students do not have any idea on the budget required. The team has not yet decided on who does what. No project journal kept.	Some evidence of a primary plan. There were some ideas on the materials /resources required, but not really thought out. The students have some idea on the finances required, but they have not formalized a budget plan. Schedules were not prepared. The project journal has no details. Some evidence on task allocation among the team members.	Good evidence of planning done. Materials were listed and thought out, but the plan wasn't quite complete. Schedules were prepared, but not detailed, and needs improvement. Project journal is presented but it is not complete in all respect / detailed. There is better task allocation and individual members understand about their tasks. There is room for improvement.	Excellent evidence of enterprising and extensive project planning. Gantt charts were used to depict detailed project scheduling. A project management/version control tool is used to track the project, which shows familiarity with modern tools. All materials / resources were identified and listed and anticipation of procuring time is done. Detailed budgeting is done. All tasks were identified and incorporated in the schedule. A well-kept project journal shows evidence for all the above, in addition to the interaction with the project guide. Each member knows well about their individual tasks.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)
Phase 1 Interim Evaluation Total Marks: 20						

EVALUATION RUBRICS for PROJECT Phase I: Final Evaluation						
Sl. No.	**Parameters**	**Marks**	**Poor**	**Fair**	**Very Good**	**Outstanding**
1-c	Formulation of Design and/or Methodology and Progress. (Group assessment) [CO1]	5	None of the team members show any evidence of knowledge about the design and the methodology adopted till now/ to be adopted in the later stages. The team has not progressed from the previous stage of evaluation.	The students have some knowledge on the design procedure to be adopted, and the methodologies. However, the team has not made much progress in the design, and yet to catch up with the project plan.	The students are comfortable with design methods adopted, and they have made some progress as per the plan. The methodologies are understood to a large extent.	Shows clear evidence of having a well- defined design methodology and adherence to it. Excellent knowledge in design procedure and its adaptation. Adherence to project plan is commendable.
			(0 – 1 Marks)	(2 – 3 Marks)	(4 Marks)	(5 Marks)
1-d	Individual and Teamwork Leadership (Individual assessment) [CO3]	10	The student does not show any interest in the project activities, and is a passive member.	The student show some interest and participates in some of the activities. However, the activities are mostly easy and superficial in nature.	The student shows very good interest in project, and takes up tasks and attempts to complete them. Shows excellent responsibility and team skills. Supports the other members well.	The student takes a leadership position and supports the other team members and leads the project. Shows clear evidence of leadership.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)
1-e	Preliminary Analysis/ Modeling / Simulation/ Experiment / Design/ Feasibility study [CO1]	10	The team has not done any preliminary work with respect to the analysis/modeling/ simulation/experiment/desig n/feasibility study/ algorithm development.	The team has started doing some preliminary work with respect to the project. The students however are not prepared enough for the work and they need to improve a lot.	There is some evidence to show that the team has done good amount of preliminary investigation and design/ analysis/ modeling etc. They can improve further.	Strong evidence for excellent progress in the project. The team has completed the required preliminary work already and are poised to finish the phase I in an excellent manner. They have shown results to prove their progress.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)

1-f	Documentation and presentation. (Individual & group assessment). [CO6]	5	The team did not document the work at all. The project journal/diary is not presented. The presentation was shallow in content and dull in appearance. The individual student has no idea on the presentation of his/her part.	Some documentation is done, but not extensive. Interaction with the guide is minimal. Presentation include some points of interest, but overall quality needs to be improved. Individual performance to be improved.	Most of the project details were documented well enough. There is scope for improvement. The presentation is satisfactory. Individual performance is good.	The project stages are extensively documented in the report. Professional documentation tools like LaTeX were used to document the progress of the project along with the project journal. The documentation structure is well-planned and can easily grow into the project report. The presentation is done professionally and with great clarity. The individual's performance is excellent.
			(0 – 1 Marks)	(2 – 3 Marks)	(4 Marks)	(5 Marks)
Total		**30**	**Phase - I Final Evaluation Marks: 30**			

EVALUATION RUBRICS for PROJECT Phase I: Report Evaluation						
Sl. No.	**Parameters**	**Marks**	**Poor**	**Fair**	**Very Good**	**Outstanding**
1-g	Report [CO6]	20	The prepared report is shallow and not as per standard format. It does not follow proper organization. Contains mostly Unacknowledged content. Lack of effort in preparation is evident.	Project report follows the standard format to some extent. However, its organization is not very good. Language needs to be improved. All references are not cited properly in the report.	Project report shows evidence of systematic documentation. Report is following the standard format and there are only a few issues. Organization of the report is good. Most of references are cited properly.	The report is exceptionally good. Neatly organized. All references cited properly. Diagrams/Figures, Tables and equations are properly numbered, and listed and clearly shown. Language is excellent and follows standard styles.
			(0 - 7 Marks)	(8 - 12 Marks)	(13 - 19 Marks)	(20 Marks)
Phase - I Project Report Marks: 20						

CXD481	MINI PROJECT	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PWS	0	0	4	4	2021

Preamble: The objective of this course is to apply the fundamental concepts of different courses learned in respective Minor Streams: Software Engineering, Machine Learning and Computer graphics. This course helps the learners to get an exposure to the development of application software/hardware solutions/ software simulations in the field of Computer Science and Design. It enables the learners to understand the different steps to be followed such as literature review and problem identification, preparation of requirement specification &design document, testing, development and deployment. Mini project enables the students to boost their skills, widen the horizon of thinking and their ability to resolve real life problems.

Prerequisite:

A sound knowledge in courses studied in respective minor stream.

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

CO#	CO
CO1	Identify technically and economically feasible problems **(Cognitive Knowledge Level: Apply)**
CO2	Identify and survey the relevant literature for getting exposed to related solutions. **(Cognitive Knowledge Level: Apply)**
CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (**Cognitive Knowledge Level: Apply)**
CO4	Prepare technical report and deliver presentation **(Cognitive Knowledge Level: Apply)**
CO5	Apply engineering and management principles to achieve the goal of the project **(Cognitive Knowledge Level: Apply)**

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and team work
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Lifelong learning

Assessment Pattern

Mark Distribution

Total Marks	CIE Marks	ESE Marks
150	**75**	**75**

Continuous Internal Evaluation Pattern:

Attendance **10 marks**

Project Guide **15 marks**

Project Report **10 marks**

Evaluation by the Committee (will be evaluating the level of completion and demonstration of functionality/specifications, presentation, oral examination, work knowledge and involvement) : **40 marks**

Student Groups with 4 or 5 members should identify a topic of interest in consultation with a Faculty Advisor/Project Coordinator/Guide. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design/fabrication or develop codes/programs to achieve the objectives by strictly following steps specified in the teaching plan. Innovative design concepts, performance, scalability, reliability considerations, aesthetics/ergonomic, user experience and security aspects taken care of in the project shall be given due weight.

The progress of the mini project is evaluated based on a minimum of two reviews. The review committee may be constituted by a senior faculty member, Mini Project coordinator and project guide. The internal evaluation shall be made based on the progress/outcome of the project, reports and a viva-voce examination, conducted internally by a 3-member committee. A project report is required at the end of the semester. The project has to be demonstrated for its full design specifications.

End Semester Examination Pattern:

The marks will be distributed as

Presentation : **30 marks**
Demo : **20 marks**
Viva : **25 marks.**
Total : **75 marks**.

TEACHING PLAN

Students are expected to follow the following steps.

1. Review of Literature and Identification of a problem
2. Create an abstract with a problem statement, solution approach, technology stack, team, etc.
3. Create Requirements Specification
4. Create Design Document . This may include designs like,
    a. System Architecture Design
    b. Application Architecture Design
    c. GUI Design
    d. API Design
    e. Database Design
    f. Technology Stack
5. Deployment, Test Run & Get Results
6. Prepare Project Report

Guidelines for the Report preparation

A bonafide report on the mini project shall be submitted within one week after the final presentation. Minimum number of pages should be 40.

- Use Times New Roman font for the entire report – Chapter/Section Title – Times New Roman18, Bold; Heading 2 – Times New Roman16, Bold; Heading 3 – Times New Roman14, Bold; Body- Times New Roman 12, Normal.
- Line Spacing – Between Heading 2 – 3 lines, between lines in paragraph 1.5 lines.
- Alignments – Chapter/Section Title – Center, Heading 2 & 3 should be Left Aligned. Ensure that all body text is paragraph justified.

- Figures & Tables – Ensure that all Figures and Tables are suitably numbered and given proper names/headings. Write figure title under the figure and table title above the table.

- **Suggestive order of documentation:**
  i. Top Cover
  ii. Title page
  iii. Certification page
  iv. Acknowledgement
  v. Abstract
  vi. Table of Contents
  vii. List of Figures and Tables
  viii. Chapters
  ix. Appendices, if any
  x. References/Bibliography

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