SU/BOS/Sci & Tech/ ५९९

Date: 18 /08/2025

To,

The Principal,	The Head/ Director/ Co-ordinator
All Concerned Affiliated Colleges/Institutions	All Concerned Department (Science)
Shivaji University, Kolhapur	Shivaji University, Kolhapur

Subject: Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0)

Ref: No. SU/BOS/Science/271 & 274 Date: 03/05/2025 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc. Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	B.Sc.Part II Biochemistry	5.	Computer Science (Entire)
2.	Animation (Entire)	6.	Computer Science (Optional)
3.	B.Sc. - M.Sc. AI&ML)	7.	Information Technology (Entire)
4.	BCA		

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk (Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dr. S. M. Kubal
Dy. Registrar

Encl. : As above.
Copy to: For Information and necessary action.

1	I/c Dean, Faculty of Science & Technology	7	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	8	Affiliation Section (T.1) (T.2)
3	The Chairpersan, Respective Board of Studies	9	P.G.Admission Section,
4	B.Sc. Exam Section	10	Computer Centre / IT Cell
5	Eligibility Section	11	Internal Quality Assorance Cell (IQAC)
6	P.G Seminar Section		

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SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA

PHONE:EPABX-2609000,www.unishivaji.ac.in, bos@unishivaji.ac.in

शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४

०२३१—२६०९४८७

Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

Ref.No.SU/BOS/Science/271   Date: 03/05/2025

To,

     The Principal,
     All Concerned Affiliated Colleges/Institutions
     Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

Sir/Madam,

     With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper B.Sc. Part-II (Sem. III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

	B.Sc.Part-II (Sem. III & IV) as per NEP-2020 (2.0)		
1.	Pollution	8.	Food Science (Entire)
2.	Biochemistry	9.	Biotechnology (Entire)
3.	Food Science and Quality Control	10.	Environmental Science (Entire)
4.	Computer Science (Optional)	11.	Information Technology (Entire)
5.	Biotechnology (Optional/Vocational)	12.	Food Science and Technology (Entire)
6.	Animation (Entire)	13.	Food Technology & Management (Entire)
7.	Computer Science (Entire)	14.	All Faculty UG Part II Environmental Studies (VEC)

     This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

     The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

     You are, therefore, requested to bring this to the notice of all students and teachers concerned.

     Thanking you,

                               Yours faithfully,

                               Dy Registrar
                               Dr. S. M. Kubal

Encl: As above
         for Information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

SHIVAJI UNIVERSITY, KOLHAPUR

NAAC A++ Grade with CGPA 3.52

Multiple Entry and Multiple Exit Option (NEP-2020)

Syllabus for

B.Sc. Animation

With Animation as Major

(Under Faculty of Science and Technology)

PART-II SEMESTER - III & IV

(Syllabus to be implemented from Academic year 2025-26)

B.Sc. Animation Part-II (Level-5.0)

		Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
Sr. No.	Course Code	Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam minutes	Maximum Marks	Minimum Marks	Exam minutes
1	**Subject I Major V:** Basics of 2D Animation	2	-	2	40	14	90	10	04	20
2	**Subject I Major VI**: Basics of 3D Animation	2	-	2	40	14	90	10	04	20
3	**Subject I Practical IV:** Practical Based on Subject I Major V & Major VI	-	4	2	40	14	90	10	04	-
4	**Subject II Minor V:** As per students choice and availability but must be continued with Minor I and Minor IV	2	-	2	40	14	90	10	04	20
5	**Subject II Minor VI** As per students choice and availability but must be continued with Minor I and Minor IV	2	-	2	40	14	90	10	04	20
6	**Subject II Practical III:** Practical based on Minor V and Minor VI	-	4	2	40	14	90	10	04	-
7	**OE– III(T):** As per students choice and can be opted from other than BSc. (ie. B.Com or BA) Basket	2	-	2	40	14	90	10	04	20

SEMESTER-III (Duration- Six Month)

Sr. No.	Course Code	Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam minutes	Maximum Marks	Minimum Marks	Exam minutes
8	**VSC–I (P) Major Specific:** Motion Graphics	-	4	2	40	14	90	10	04	20
9	**SEC - I(T):** Digital Editing	2	-	2	40	14	90	10	04	20
10	**AEC-I:** Formal Communication	2	-	2	40	14	--	10	04	20
11	**CC-I:** Basics of Yoga	2	-	2	40	14	90	10	04	20
	Total (A)			22	440			110		

SEMESTER-IV (Duration-Six Month)

Sr. No.	Course Code	Teaching Scheme Theory and Practical			Examination Scheme University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam minutes	Maximum Marks	Minimum Marks	Exam minutes
1	**Subject II Major VII:** Advanced 2D Animation	2	-	2	40	14	90	10	04	20
2	**Subject II Major VIII**: Advanced 3D Animation	2	-	2	40	14	90	10	04	20
3	**Subject II Practical IV:** Practical Based on Subject II Major VII & Major VIII	-	4	2	40	14	90	10	04	-
4	**Subject II Minor VII:** As per students choice and availability but must be continued with Minor I and Minor III	2	-	2	40	14	90	10	04	20
5	**Subject II Minor VIII:** As per students choice and availability but must be continued with Minor II and Minor IV	2	-	2	40	14	90	10	04	20
6	**Subject II Practical VI:** Practical Based on Subject Minor VII and VIII	-	4	2	40	14	90	10	04	-
7	**OE– IV (T):** As per students choice and can be opted from other than BSc. (ie. B.Com or BA) Basket	2	-	2	40	14	90	10	04	20
8	**SEC-II (P):** Classical Animation	-	4*	2	40	14	2	10	04	-

9	AEC-II: Soft skills	2	-	2	40	14	2	10	04	2
10	**VEC – II (T):** Environment Studies	2	-	2	40	14	2	10	04	2
11	CEP-I (P): Field Study	-	4*	-	-	-	-	50	18	2
	Total (A)			22	440			110		

*Practical hours per batch with batch size 30 students

• **OE:** Open Elective	• **SEC:** Skill Enhancement Course
• **VSC:** Vocational Skill Course	• **AEC:** Ability Enhancement Course
• **CC:** Co-Curricular Course	• **CEP:** Community Engagement Program

Multiple Entry and Multiple Exit Option (NEP-2020)

B.Sc. Animation (Entire) Part - II (Level-5.0)

With Electronics as Minor

SEMESTER-III(Duration-Six Month)									
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V** :Computer Organization	2	-	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Electronic Communication	2	-	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	-	10	04	-

SEMESTER-IV(Duration- Six Month)									
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment(UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V:** Computer Networking	2	2	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Micro-Controller & Interfacing	2	2	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	2	10	04	-

Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation (Entire Part - II (Level-5.0)

With Electronics as Minor

SEMESTER-III(Duration-Six Month)									
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V** : Linear Algebra	2	-	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Linear Programming and Game Theory	2	-	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	-	10	04	-

SEMESTER-IV(Duration- Six Month)									
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment(UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V:** Computational Geometry	2	2	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Optimization Techniques	2	2	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	2	10	04	-

B.Sc. Part II-Animation Semester –III
Basics of 2D Animation (Major)
Total Contact Hours: 30 hours (60 minutes / Lecture)

Credits: 02 **Theory: 2 Lectures/Week** **Total Marks: 50**

Course Outcomes:

After completion of this course students will be able to;

1. To introduce students to the fundamental principles and techniques of 2D animation.
2. To familiarize students with traditional and digital tools used in 2D animation.
3. To encourage creativity and storytelling through character motion and scene design.
4. To provide hands-on practice in designing basic 2D animation sequences.

UNIT I: **(15 Hours)**

Definition and scope of animation, History and types of animation (Traditional, Rotoscoping, Cutout, Digital), Evolution of 2D animation from cel animation to digital workflows, The 12 Principles of Animation by Disney, Squash and Stretch, Anticipation, Staging, Straight Ahead vs. Pose to Pose, Timing, Spacing, Arcs, Follow Through & Overlapping Action, Practical application of principles in simple animation sequences

UNIT II   **(15 Hours)**

Flipbook animation, Pencil test animation, In-betweening and keyframe animation, Use of lightbox and peg bars, Introduction to digital animation software (Toon Boom Harmony, Adobe Animate, Krita, etc.), Interface and basic tools, Layers, frames, and timelines

Reference Books:

1. The Animator's Survival Kit – Richard Williams
2. Animation: The Mechanics of Motion – Chris Webster
3. Cartoon Animation – Preston Blair
4. Timing for Animation – Harold Whitaker & John Halas
5. Character Animation Crash Course – Eric Goldberg
6. Digital Animation Bible – George Avgerakis

B.Sc. Part II- Animation Semester –III

DSC-AN-C1: Basics of 3D Animation (Major)

Total Contact Hours: 30 hours (60 minutes / Lecture)

Credits: 02   **Theory: 2 Lectures/Week**   **Total Marks: 50**

Course Outcomes:

After completion of this course students will be able to;

1. To familiarize the students with various approaches, methods, and techniques of Animation Technology.
2. To develop competencies and skills needed for becoming an effective Animator.
3. To enable students to manage Animation Projects from its conceptual stage to the final product creation.
4. To apply audio and video production techniques to an animation project.

UNIT I

(15 Hours)

Working in Maya–Creating and Editing May Nodes, Creating Maya Projects, Organizing Complex

Node Structures with Assets, File References, Convert NURBSS ur faces to Polygons, Boolean Operations, Sculpting Polygons Using Artisan, Advanced Polygon Editing Tools Using Subdivision Surfaces, Sub D Levels.

UNIT II

(15 Hours)

Polygon Modeling Understanding Polygon Geometry Working with Smooth Polygons Using Smooth Mesh Polygons Editing Polygon Components, Adding Components, Modeling with Deformers

Combining Meshes Polygon Modeling with Paint Effects NURBS Modeling in Maya-Understanding NURBS, Employing Image Planes Modeling NURBSS ur faces Creating Realism NURBS Tessellation.

Reference Books:

1. Mastering Maya 2017 by Eric Keller.
2. Introducing Maya 2017 by Dariush Derakhshani.
3. Complete Maya Programming Volume II: An In-depth Guide to 3D Fundamentals, Geometry, and Modeling.
4. Game Character Development with Maya.
5. 2D Artwork and 3D Modeling for Game Artists.

B.Sc. Animation (Part-II)(Semester-III)(NEP)

Major   Practical- III
Practical based on Major V and VI **(Major)**

Credits: 02   Teaching Scheme: Practical – 4 Lectures/Week/batch   Total Marks: 50

Course Outcomes;

Following is a sample list of assignments for practical, in structures are advised to provide more lab assignments to students to meet the course specified outcomes

1. Create a flipbook animation (8-10 frames)

2. Demonstrate squash and stretch using a bouncing ball animation

3. Make an anticipation and follow-through scene using stick figures

4. Draw a keyframe-based walk cycle (8 key poses)

5. Perform a pencil test animation and shoot using mobile scanner

6. Introduction to Adobe Animate or Toon Boom: UI and basic tools

7. Create a short looping animation using Krita (e.g., flapping wings)

8. Use layers and timeline in digital animation software

9. Animate a scene with staging and overlapping action

10. In-betweening a simple bouncing ball sequence

11. Create a basic project in Autodesk Maya and navigate node editor

12. Perform Boolean operations and convert NURBS to polygons

13. Sculpt a 3D object using Artisan tools

14. Model a simple object using Subdivision Surfaces

15. Use Deformers to modify geometry in Maya

16. Import and model using an image plane (e.g., cartoon character)

17. Practice NURBS modeling (basic shapes and merging)

18. Demonstrate polygon smoothing and tessellation

19. Combine multiple meshes into one cohesive model

B.Sc. Part II-Animation Semester –III

Motion Graphics (Major)

Total Contact Hours: 30 hours (60 minutes / Lecture)

Credits: 02   **Theory: 2 Lectures/Week**   **Total Marks: 50**

Course Learning Outcomes:

This course will enable the students to:

1. Employ the terminology of motion graphic design when presenting, critiquing, or discussing motion graphic design ideas and solutions.
2. Analyze motion graphics in contemporary and historical contexts.
3. Apply graphic design principles to time-based works.
4. Produce motion graphics in a range of professionally recognized forms.
5. Utilize appropriate content and techniques to tell a story.

UNIT I   (15 Hours)

Motion Graphics: A Perspective: History of Motion Graphics, Motion Graphics in Film and Television, The Pictorial Composition, Space and Composition: An Overview, Principles of Composition, Constructing Space, The Sequential Composition: Overview, Forms of continuity, Forms of Discontinuity, Montage.

UNIT II   (15 Hours)

Conceptualization: Assessment, Formulation, Cultivation, Storyboards, Animatics9, Animation Processes: Frame-by-frame Animation, Interpolation, Spatial Interpolation, Visual Interpolation, Temporal Interpolation, Coordinating Movement, Motion Graphics Compositing: Compositing: An Overview, Blend Operations, Keying Alpha Channels, Mattes, Masks.

Reference:

1. Motion Graphic Design: Applied History and Aesthetics – Author: Jon Krasner
2. Design for Motion: Fundamentals and Techniques of Motion Design – Author: Austin Shaw, Publisher: Focus Press, 2015, ISBN-10: 1138812099.
3. Creating Motion Graphics with After Effects.
4. Hands-On Motion Graphics with Adobe After Effects CC.
5. Adobe after Effects CC Classroom in a Book.

B.Sc. Part II – Animation Semester –III

Digital Editing (Major)

Total Contact Hours: 30 hours (60 minutes / Lecture)

Credits: 02   **Theory: 2 Lectures/Week**   **Total Marks: 50**

Course Learning Outcomes:

This course will enable the students to:

1. Learn sound editing for songs and understand various digital audio formats.

2. Gain skills in recording and mixing songs.

3. Learn special effects for audio and understand loops and playlists.

4. Learn special effects for movies, such as the Star Trek transporter effect, blurring a part of an image.

5. Apply ghost effect, and highlighting a part of an image.

UNIT I   **(15 Hours)**

Manipulating audio: Auto trim/crop, mute, DC offset, resample, reverse, smooth/enhance, fade in/out, insert silence, bit depth converter.

Understanding digital audio formats: .WAV, .AIFF, .MP3, .SWF, .WMA, etc.

Audio plug-ins; importing and exporting audio in multiple formats like MP3, RealAudio, QuickTime.

Event tools: Move, split, slip, trim events, create fades, apply ASR (Attack/Sustain/Release).

Analysis tools: Spectrum analyzer, scrub tool, statistics (Max, RMS, DC offset, zero crossings), sampler tool.

Audio editing workflow: Real-time and event-based editing, waveform volume and pan envelopes.

Editing techniques: Drag and drop, crossfading tracks, balancing sound, creating smooth fades.

Multichannel audio recording, synchronization of audio and video.

Working with: Regions, playlists, field editing, name markers, loops, time and frame control.

Audio effects: EQ, volume, chorus, distortion, delay/echo, pitch shift/bend, reverb, vibrato, normalize.

Track management: Insert track markers, add multiple tracks, adjust track time, handle musical instrument files.

UNIT II   **(15 Hours)**

Adobe Premiere Pro: Introduction to non-linear editing.

Editing basics: Import/export audio, video, and graphic files in various formats.

Timeline editing: Arrange clips, manipulate tracks in the visual timeline.

Toolbox tools: Understanding each editing tool.

Panels overview: Tools Panel, Project Panel, Source & Program Monitors, Timeline, Audio Meters.

Editing tasks: Titling, transitions, speed and duration adjustments, effects, and keyframes.

Types of edits: Opacity control, trimming techniques.

Applying special effects: Star Trek transporter effect, blurring image parts, ghost effect, highlighting parts of images.

Reference:

1. Film Editing: Great Cuts Every Filmmaker and Movie Lover Must Know – Author: Gael.

2. Apple Final Cut Pro X: In-Depth with Larry Jordan – Professional Video Editing Made Easy.

3. Professional Video Editing Made Easy.

4. In the Blink of An Eye: 2nd Edition – New Edition.

5. The Technique of Film and Video Editing: History, Theory, and Practice by Ken Dancyger.

	B.Sc. Animation (Semester–III)(NEP2.0)(Level–5.0) Ability Enhancement Course (AEC) – I **(Major)**	
	Course Title: Formal Communication	
Teaching Scheme: Theory-02Lectures/Week	**TotalMarks:**50	**Credits:**02

Course Outcomes:

After successful completion of this course, students will able to:

1. Introduce communication techniques

2. Have professional correspondence techniques

3. Enhance writing skills

Unit	Contents	Hours Allotted
1	Communication: Nature and Importance of Communication, Objectives of Communication, Importance of Communication, Process and barriers to Communication, Elements of Communication, Forms of Communication Verbal Communication Techniques: Art of Speaking, Speech Styles. Oral Presentation- Preparation of Formal Speech, Meetings, Interviews, Group Discussion, Debate, Elocution, Extempore.	15
2	Non-verbal Communication-Meaning, Characteristics & classification of Non-verbal Communication, Body Language, Gestures, Postures. Listening & observation skills. Rapid review of Grammar:- Corrections of common errors, Verb and its subject, forms of verb, Use of phrases and idioms, Use of infinitive Gerund and Participle, Errors & Use of Adjective and adverb, Punctuation and capitalisation.	15

Reference Books:

1. R.K. Chaddha Communication Techniques and skills – DhanpalRai Publication, NewDelhi.

2. Pravil S. R. Bhatia, Professional Communication Skills- S. Chand and Co.,NewDelhi.

3. J.D.O'Connor, Better English pronounciation.

4. Wren and Martin, Highschool English Grammer and Composition – Chand and Co.,New Delhi.

B.Sc. Animation (Semester–III)(NEP2.0)(Level–5.0)

(CC) – I: Basics of Yoga (Major)

Teaching Scheme: Theory-02 Lectures/Week   **Total Marks:** 50   **Credits:** 02

Course Outcomes:

After successful completion on this course, students will able:

      1. To understand the importance of Yoga

      2. To understand various Asans

Unit	Contents	Hours Allotted
1	Yoga Definition, Objectives of yoga Education Difference between Yoga Asana, and physical exercises, Importance of Yoga in daily life, Methods and benefits of Asanas, Pranayama and Concentration, Knowledge of five yama with more emphasis on 'Asteya', Knowledge of five Niyama with emphasis on 'Santosh', Knowledge of Aahar-Vihar, Methods and benefits of Sukshma,Vyayama, Asanas and prayers. Types of Yoga: Jnana Yoga, Bhakti Yoga, Karma Yoga, Hatha Yoga,Raja Yoga.	15
2	Role of yoga in character building, Therapeutic values of yoga, Introduction of yoga literature, Life history of Arvindo, Vivekanand and other yogis, Knowledge of Bandha, Mudra and Chakras,Methods and benefits of Asans, Pranayama and Concentration Effects of Asanas and Pranayama on physiology of human body, Concept of Nishkama Karma Yoga, Role of Yoga practices in developing concentration, will power and discipline, Techniques of stress management, Methods and benefits of Asanas, Pranayama and concentration.	15

References:

1. Light on Yoga by B.K.S. Iyengar

2. The Yamas & Niyamas: Exploring Yoga's Ethical Practice by Deborah Adele

B.Sc. Part II – Animation Semester –IV

Major VII: Advanced 2D Animation (Major)

Total Contact Hours: 30 hours (60 minutes / Lecture)

Credits: 02 **Theory: 2 Lectures/Week** **Total Marks:50**

Course Learning Outcomes:

1. Apply advanced principles of 2D animation to create expressive character movement and storytelling.
2. Demonstrate proficiency in using 2D animation software like Toon Boom Harmony, Adobe Animate, or Krita.
3. Analyze and implement advanced timing, spacing, and motion techniques in animated scenes.

UNIT I **(15 Hours)**

Recap of 12 Principles of Animation with advanced applications, Anticipation, timing, spacing in complex sequences, Squash and stretch for expressive animation, Follow through and overlapping action in character movement, Secondary action and exaggeration for dynamic storytelling, Character design for advanced animation, Animation cycles (run, walk, jump with variation), Acting for animation: expressions, mood, and gesture, Lip-sync and dialogue animation, Weight and balance in character movement

UNIT II **(15 Hours)**

Staging and camera angles in 2D animation, Layout design and background integration, nimating natural elements: fire, water, smoke, rain, Lighting and shadow in 2D animation, Parallax and multiplane animation techniques, Pre-production: storyboarding and animatics, Animation production pipeline, Sound syncing and post-production integration, Portfolio development: presenting animation for industry, Industry trends in 2D animation (web, TV, games)

Reference:

1. The Animator's Survival Kit – Richard Williams
2. Cartoon Animation – Preston Blair
3. Animation from Pencils to Pixels: Classical Techniques for the Digital Animator – Tony White
4. The Illusion of Life: Disney Animation – Frank Thomas and Ollie Johnston
5. Acting for Animators – Ed Hooks
6. Digital 2D Animation – Peggi Burch

B.Sc. Part II – Animation Semester –IV

Major VIII: Advanced 3D Animation (Major)

Total Contact Hours: 30 hours (60 minutes / Lecture)

Credits: 02   **Theory: 2 Lectures/Week**   **Total Marks:50**

Course Learning Outcomes:

This course will enable the students to:

1. Demonstrate advanced proficiency in 3D modeling, rigging, and animation workflows.
2. Create complex character animations using advanced keyframing and motion capture techniques.
3. Integrate simulations such as cloth, hair, particles, and dynamics into 3D scenes.

UNIT I   **(15 Hours)**

Using Joint sand Constraints, Inverse Kinematics, Keyframe Animation, The Graph Editor, Play blast and F Check, Driven Keys, Animation Using Expressions, Motion Path Animation, Animating Constraints. Organic and Hard Surface Modeling, Character topology and edge flow, High poly to low poly workflows (normal maps, baking), Rigging with advanced skeletons, IK/FK systems and controllers, Blend shapes and corrective shape keys

UNIT II   **(15 Hours)**

Animation Layers, Creating an Animation Layer, Animating Facial Expressions Using Blend Shapes, Animating Blend Shapes Sequentially, Animating with Lattices, Animating Object Components with Clusters, Animating a Scene Using Nonlinear Deformers, Creating a Jiggle Effect, Optimizing Animations with the Geometry Cache, Cloth simulation (nCloth, Marvelous Designer overview), Hair and fur systems, Particle systems and emitters, Rigid body and soft body dynamics

Reference:
1. Mastering Maya 2017 by Eric Keller.
2. Introducing Maya 2017 by Dariush Derakhshani.
3. Complete Maya Programming Volume II: An In-depth Guide to 3D Fundamentals, Geometry.
4. Game Character Development with Maya.
5. 3D Animation Essentials by Andy Beane

Major Practical- IV (Major)
Practical Based on Subject II Major VII & Major VIII
Credits: 02   Teaching Scheme: Practical – 4 Lectures/Week/batch   Total Marks: 50

Course Outcomes;

1. Demonstrate expertise in core animation principles

2. Develop animation cycles with character expression

3. Construct rigs using IK/FK and advanced controls

4. Adjust timing and spacing graphically

List of practical's

1. Apply advanced timing, spacing, and squash & stretch

2. Create varied run, walk, and jump loops

3. Animate gestures, mood, and expressions

4. Animate a character with accurate lip movement to dialogue

5. Weight, balance, follow-through, overlapping action

6. Design and integrate 2D backgrounds

7. Implement depth with multi-layer scrolling backgrounds

8. Animate fire, water, smoke, and rain

9. Implement lighting for mood and depth

10. Develop a short sequence with storyboard and animatic

11. Build and test skeletons for character rigging

12. Apply joints and constraints for animation control

13. Refine animation curves for smooth motion

14. Use expressions to automate animation behaviour

15. Animate objects along paths with precise control

16. Create expressive face animations with blend shapes

17. Simulate cloth using nCloth or Marvelous Designer

18. Design and simulate realistic hair and fur

19. Create effects like smoke, fire, sparks using particles

20. Use lattices and clusters for stylized motion

B.Sc. Animation Semester – IV (NEP 2.0) (Level – 5.0)

Course: SEC-II (P):

Course Title: Classical Animation (Major)

Total Contact Hours: 30 Hrs.   **(30 Lectures of 60 minutes)**

Marks: 50   **Credits: 02**

Course Outcomes:

After completing this course, students will be able to:

1. Understand the historical development and foundational principles of classical animation.
2. Apply drawing skills to create backgrounds, characters, and effects using traditional animation techniques.
3. Develop storyboards and scripts for animation sequences and short films.
4. Demonstrate knowledge of color theory, perspective, and layout in animation design.

Unit I   **(15 hours)**

History and evolution of classical animation, The animation production pipeline: Pre-production, production, and post-production, Principles of animation (Squash & stretch, anticipation, staging, etc.), Perspective and background design, Introduction to scriptwriting for animation, Introduction to storyboarding and its importance, Storyboard layout and timing techniques, Character and environment design fundamentals, Assisting animation – Clean-up and in-betweening, Color theory in animation

Unit II   **(15 hours)**

Art direction and visual development, Layout techniques and review, Introduction to editing with Adobe Premiere, Sound breakdown and audio planning, Digital ink and paint process, 2D digital animation tools overview, Adobe Photoshop, Adobe Flash (Animate CC), Toon Boom Harmony

Reference Books:

1. "The Animator's Survival Kit" by Richard Williams

2. "Animation: The Mechanics of Motion" by Chris Webster

3. "Cartoon Animation" by Preston Blair

4. "The Illusion of Life: Disney Animation" by Frank Thomas and Ollie Johnston

5. "Setting the Scene: The Art & Evolution of Animation Layout" by Fraser MacLean

B.Sc. Animation Semester – IV (NEP 2.0) (Level – 5.0)

Course: AEC-II

Course Title: Soft Skills (Major)

Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)

Marks: 50   Credits: 02

Course Outcomes:

The course will enable students to;

1. To empower the students towards general and technical writing, oral communications

2. To empower listening skills: letter writing, technical report writing, and business communication.

UNIT I   (15 Hours)

Expression: Practical communication skill development, business presentation with multimedia, speaking skill, prepared speech, extempore speech.

UNIT II   (15 Hours)

Writing: Technical/business letter, Resume Preparation, organization of writing material, poster presentation, writing technical document, preparing software user manual, preparing project documentation.

Reference Books:

1. Business Correspondence & Report Writing, Sharma, TMH

2. Business Communication Strategies, Monipally, TMH

3. English for Technical communication, Laxminarayanan,Scitech

4. Business Communication, Kaul,PHI

5. Communication Skill for Effective Mgmt., Ghanekar,EPH

B.Sc. Animation (Semester – IV) (NEP 2.0) (Level – 5.0) Course: VEC-II

Course Title: Environment Studies (Major)

Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)

Marks: 50   Credits: 02

- To be taken from Environmental Science BoS

Course: CEP-I

Title of course: CEP-I: Field work

- **Field work as per NEP 2.0 (CEP, CC), University circular enclosed**

Course III, Minor V Course Title: Computer Organization (Minor)

Total Contact Hours: 30 hrs. (30 lectures of 60 min.)

Credits: 02   Teaching Scheme: Theory–2Lectures/Week   Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to

1. Understand the designing of Combinational circuits & Sequential circuits,
2. Understand the Internal organization of Memory,
3. TostudyandunderstandtheInput&Outputdevicesorganizationinacomputer,
4. To study the architecture CPU & internal organization of CPU,

Units	Contents	Hours
1.	**A) Digital System Design:** **Combinational circuits design**: Design of Full Adder, Full Subtractor, Design of Binary to Gray code converter, Gray to Binary code converter, Design of 1-bit & 2-bit Digital Comparator or (i.e. Magnitude Comparator), **Sequential circuit design:** Excitation tables of different Flip-flops, Design of 2-bit Synchronous Up counter or Down counter by using JK flip-flops or T-flip-flops, Design of 3-bit Non-sequential Counter (i.e. Random sequence Counter), **B) Memory Organization:** Classification &Characteristics of memory systems, Internal organization of RAM memory& ROM memory, Memory maps, **Memory Expansion**: Horizontal memory expansion with example, Vertical memory expansion with example, Memory interfacing diagrams with CPU, Cache memory, Cache memory mapping techniques, Virtual memory &Swapping process,Pagingtechnique&Segmentationtechnique,ComparisonbetweenPaging & Segmentation,	15
2.	**A) Input/Output Organization:** I/O devices, System bus, I/O bus, Addressing methods: I/O mapped I/O Isolated I/O) & Memory mapped I/O, Comparison between I/O mapped I/O & Memory mapped I/O, **I/O interfaces:** Internal block diagram of Parallel I/O interface, Internal block diagram of Serial I/O Interface (i.e. **UART**),Internal block diagram of **DMA controller,** DMA I/O data transfer with the interfacing diagram of DMA controller with the CPU**,** IOP processor, Interfacing diagram between IOP processor & Master CPU **B) CPU Organization:** Functions of CPU, Internal block diagram of CPU, Control unit: Introduction of Hard wired control unit & Micro-programmed	15

	control unit, **RISC & CISC** Architecture CPU, Comparison between RISC & CISC CPU, Pipelining technique inside the CPU, Combinational ALU, Sequential ALU, Internal Organization of CPU: Accumulator based CPU, Register based CPU, Stack based CPU	

Reference Books:

1. Computer Organization, by J. P. Hays,

2. Digital System Design, by Techmax/ Nirali publication,

3. Computer System Architecture by Morris Mano,

B.Sc. Animation (Entire)(Part-II)(Semester-III)(NEP)
Course III Minor VI Course Title: Electronic Communication(Minor)
Total Contact Hours: 30 hrs. (30 lectures of 60 min.)
Credits: 02   Teaching Scheme: Theory–2Lectures/Week

Course Outcomes (COs): On completion of the course, the students will be able to**:**

1. Understand the concept to Electronic communication,
2. Understand Different Modulation techniques,
3. Understand Different Multiplexing techniques,
4. Understand wireless telecommunication systems,

Unit	Contents	Hours
1	**A) Introduction to Electronic Communication Systems:** Block diagram of Electronic communication system, Electromagnetic spectrum, Types of Electronic communication, Applications of different Communication system, Noise signal , types of Noise signal, Signal to Noise ratio, Signal bandwidth, Channel bandwidth, Nyquist Sampling theorem, Shannon's theorem for channel capacity, **B) Analog Modulation:** Need of modulation, classification of modulation techniques, Baseband signal, carrier signal, Modulation, demodulation, Analog modulation: **Amplitude modulation** & demodulation , Representation of AM signal in Time domain & Frequency domain, Modulation index, Equation of AM signal, Power distribution in AM signal, **Frequency Modulation** & Demodulation, Representation of FM signal in time domain & frequency domain, Modulation index, Comparison between AM & FM modulation,	15
2	**A) Digital Modulation & Multiplexing:** Classification of Pulse modulation: PAM, Pulse code modulation(PCM), Delta modulation, block diagrams & working of each, Digital modulation: ASK, FSK, PSK, Block diagram of FSK-MODEM, **Multiplexing:** Time division multiplexing, frequency division multiplexing, Code division multiplexing, **B) Wireless Communication:** Introduction to mobile communication, Cellular concept, Working of GPS, Handover mechanism in mobile communication, Introduction to	15

| | GPRS, **Wireless Protocols:** RFID, ZigBee, BlueTooth & WiFi protocols, Comparison between these wireless protocols, | |

Reference Books:

1. Electronic Communication by Roddy Coolen,

2. Electronic Communication by Robert Kennedy,

3. Communication Electronics by L.E .Frenzel

Sr. No.	Name of the Practical
B.Sc. Animation (Entire)(Part-II) **(Semester-III)(NEP) Minor Practical- III** **Electronics Practical based on Computer Organization and Electronic Communication (Minor)** **Credits:02 Teaching Scheme: Practical–4 Lectures/Week/batch** **Total Marks:50**	
1	Study of Amplitude Modulation & Demodulation
2	Study of Frequency Modulation & Demodulation,
3	Study of ASK Modulator & Demodulation,
4	Study of FSK Modulation & Demodulation
5	Study of PAM modulation & Demodulation
6	Study of PWM modulation & Demodulation
7	Study of Pulse code Modulation & Demodulation
8	Study of BPSK modulation & demodulation
9	Study of 2 bit Synchronous Up & Down counter,
10	Study of 4 bit Asynchronous counter
11	Study of Binary to Gray & Gray to Binary code convertor
12	Study of 1 bit Digital Comparator
13	Study of Schmitt Trigger by using OPAMP
14	Study of Integrator & Differentiator, by using Op-Amp
15	Study of 3 bit flash ADC circuit
16	Study of LDR based light control system
17	Study of architecture of Motherboard of Computer
18	Study of Passive filters &Active filters using Op-Amp
19	Study of wave form generations using Op-Amp,
20	Study of Oscillators using Op-Amp,

B.Sc. Animation (Entire)(Part-II)(Semester-IV) (NEP)

Course III   Miner VII Course Title: Computer Networking (Minor)

Total Contact Hours: 30 hrs. (30 lectures of 60min)

Credits: 02   Teaching Scheme: Theory–2Lectures/Week   Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to:

1. Understand the concept of Networks & Network Models,
2. Understand different Networking Devices & Transmission media,
3. Understand the data linking, data flow control & error detection,
4. Understand Network Layer, Transport Layer, Application Layer,

Unit	Contents	Hours
1	**A) Computer Networks & Network Models:** Classification of Networks, Network Topologies, Network Models: TCP/IP Model, 7 Layered ISO/OSI Model, Applications of each Layer of ISO/OSI Model, **B) Physical Layer:** Transmission Media: Guided & Unguided Media,Co-axial Cable, Optical fiber, Ground-wave Propogation, Sky-wave Propogation, Microwave linking, Satellite linking, Networking devices: Hub, Switch, Router, Bridge, Gateway, Data Modems, Multiplexing techniques, **C) Data-Link Layer:** Data-flow control- Framing, Data Error detection & Data Error correction, Stop and Wait Protocol, Sliding Window Protocols,	15
2	**A) Network Layer:** Logical Addressing, IPv4 addressing: address space, classes of addressing, IPv6 addressing, Comparison between IPv4 & IPv6 addressing, Internet Protocol(IP): IP Datagram format, Fragmentation, ICMP Protocol &Messages, **B) Transport Layer:** Services-Connection-less & Connection-Oriented Service, UDP Protocol: User Datagram, UDP services & applications, TCP Protocol: TCP services, TCP features, TCP segment structure, TCP connection, SCTP Protocol: SCTP services, SCTP features, SCTP packet format,	15

C) Application Layer: World-Wide-Web(www), Domain Name System(DNS), HTTP Protocols, FTP Protocols, Email Protocols: SMTP protocol, POP protocol, IMAP protocol, SNMP protocol, DHCP Protocol, Remote Login Protocols: TELNET Protocol, SSH Protocol,	

Reference Books:

1. Computer Networking by Andrew Tannenbaum,

2. Data & Computer communication by William Stallings,

3. Advanced Computer Networking by Nirali Publication,

4. Computer Networking & Data Communication by Nirali Publication,

Course III, Miner _VIII Course Title: Micro-Controller & Interfacing (Minor)

Total Contact Hours: 30 hrs.(30 lectures of 60 min.)

Credits: 02   Teaching Scheme: Theory–2 Lectures/Week   Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to

1. Understand the difference between Microprocessor & Micro-controller,
2. Learn & Understand the Instruction set of Micro-controller,
3. To study different features of Micro-controller,
4. To study interfacing of different peripheral devices with Micro-controller

Units	Contents	Hours
1.	**A) Introduction to Micro-controller-8051:** Comparison between Micro-controller&Microprocessor,4-bit,8-bit,16-bit&32-bit Micro-controllers & their applications, Study of 8051 Micro-controller & its family, Comparative study of 89c51, 8031, 8032,8052, 8751, 89c51RD2, 89c51VRD2, Architecture of 8051: Internal Block diagram of 8051, Reset & Clock signal, Registers, Flags, Internal memory, SFR registers, I/O ports, **B) 8051 Instruction Set:** Instruction Set, Addressing Modes, Types of Instructions: Arithmetic & Logical, Data transfer, Jump, loop, CALL, Bit Manipulation, Serial Communication instructions, machine control instructions, Assembly language programming, Embedded C programming,	15
2.	**A) Facilitiesin8051:** **Timers & Counters:** Timer Modes ,Programming of Timers & Counters, Assembly language programming , Embedded C programming, Time-delay generation, **Serial Port:** Programming of Serial Port,RS-232standards,ICMAX-232,Baud Rate, Programming for transmitting character through serial port in assembly & Embedded C, **B) Interfacing of Peripheral devices with 8051:** Interfacing of LED, Relay, Opto-coupler, Thumb-wheel switch,7-segmentdisplay, Interfacing of Stepper motor, DC motor(PWM), LCD (16x2)	15

	with 8051, with Assembly language & Embedded C programming,	

Reference Books:

1. 8051Micro-controllers&InterfacingbyMohammadMazidi,

2. 8051Micro-controller by K. J. Ayala,

3. 8051 Micro-controller by Ajay Deshmukh,

4. Micro-controller & Interfacing by A. P. Godse, Technical publication,

5. Micro-controller Architecture & Programming, by Nirali Publication,

B.Sc. Animation (Entire)
(Part-II)(Semester-IV)(NEP)
Practical-I (Minor)
(Electronics Practical based on Miner VII & VIII)

1. Interfacing of LED, Relay & Opto-coupler with Microcontroller-8051,

2. Interfacing of a Thumb-wheels witch or 7-segmentdisplaywith 8051,

3. Time delay generation using Timers(inMode1orMode2)of 8051,

4. Interfacing of a Stepper motor with 8051,

5. Interfacing of DC motor (PWM) with 8051,

6. Arithmetic&Logicaloperationsbyusing8051,

7. InterfacingofDACwith8051togenerateSquarewave&Triangularwave,

8. Interfacing of LCD display & Keyboard with micro-controller 8051,

9. Interfacing of ADC to sample a signal & convert into digital with 8051,

10. Programming & transmission of Serial data through serial port of 8051,

11. Introduction to Networking devices, cables & connectors, Crimping tool & LAN tester,

12. Preparation of Patch cord & Cross connection cable to connect devices in a LAN,

13. Configuration of LAN: setting of IP addresses manually & DHCP addressing,

14. Prepare & configure a LAN of 3 computers using HUB/Switch, for sharing of Resources,

15. Study of different Networking commands on command line interface in a LAN,

16. Study of different Networking software: Cisco Packet Tracer, Network Simulator (NS),

17. Configure Internet connectivity of your computer in a LAN with LAN Network drivers,

18. Study of sharing of resources by FTP protocol to transfer a file from ones system to another

19. Interconnect two computers by using RS-232 cable & transfer data between computers,

20. Install &configure Router/Repeater/Bridge of your LAN network,

B.Sc. Animation (Entire) (Part-II)(Semester-III)(NEP2.0)(Level–5.0)

Course III, Minor V Course Title: Computer Organization (Minor)

Total Contact Hours: 30 hrs. (30 lectures of 60 min.)

Credits: 02   Teaching Scheme: Theory–2Lectures/Week   Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to

1. Understand the designing of Combinational circuits & Sequential circuits,
2. Understand the Internal organization of Memory,
3. TostudyandunderstandtheInput&Outputdevicesorganizationinacomputer,
4. To study the architecture CPU & internal organization of CPU,

Units	Contents	Hours
1.	**C) Digital System Design:** **Combinational circuits design**: Design of Full Adder, Full Subtractor, Design of Binary to Gray code converter, Gray to Binary code converter, Design of 1-bit & 2-bit Digital Comparator or (i.e. Magnitude Comparator), **Sequential circuit design:** Excitation tables of different Flip-flops, Design of 2-bit Synchronous Up counter or Down counter by using JK flip-flops or T-flip-flops, Design of 3-bit Non-sequential Counter (i.e. Random sequence Counter), **D) Memory Organization:** Classification &Characteristics of memory systems, Internal organization of RAM memory& ROM memory, Memory maps, **Memory Expansion**: Horizontal memory expansion with example, Vertical memory expansion with example, Memory interfacing diagrams with CPU, Cache memory, Cache memory mapping techniques, Virtual memory &Swapping process,Pagingtechnique&Segmentationtechnique,ComparisonbetweenPaging & Segmentation,	15
2.	**C) Input/Output Organization:** I/O devices, System bus, I/O bus, Addressing methods: I/O mapped I/O Isolated I/O) & Memory mapped I/O, Comparison between I/O mapped I/O & Memory mapped I/O, **I/O interfaces:** Internal block diagram of Parallel I/O interface, Internal block diagram of Serial I/O Interface (i.e. **UART**),Internal block diagram of **DMA controller,** DMA I/O data transfer with the interfacing diagram of DMA controller with the CPU**,** IOP processor, Interfacing diagram between IOP processor & Master CPU **D) CPU Organization:** Functions of CPU, Internal block diagram of CPU, Control unit: Introduction of Hard wired control unit & Micro-programmed	15

control unit, **RISC & CISC** Architecture CPU, Comparison between RISC & CISC CPU, Pipelining technique inside the CPU, Combinational ALU, Sequential ALU, Internal Organization of CPU: Accumulator based CPU, Register based CPU, Stack based CPU

Reference Books:

1. Computer Organization, by J. P. Hays,

2. Digital System Design, by Techmax/ Nirali publication,

3. Computer System Architecture by Morris Mano,

B.Sc. Animation (Entire)(Part-II)(Semester-III)(NEP)
Course III Minor VI Course Title: Electronic Communication (Minor)
Total Contact Hours: 30 hrs. (30 lectures of 60 min.)
Credits: 02   Teaching Scheme: Theory–2Lectures/Week

Course Outcomes (COs): On completion of the course, the students will be able to**:**

1. Understand the concept to Electronic communication,
2. Understand Different Modulation techniques,
3. Understand Different Multiplexing techniques,
4. Understand wireless telecommunication systems,

Unit	Contents	Hours
1	**C) Introduction to Electronic Communication Systems:** Block diagram of Electronic communication system, Electromagnetic spectrum, Types of Electronic communication, Applications of different Communication system, Noise signal , types of Noise signal, Signal to Noise ratio, Signal bandwidth, Channel bandwidth, Nyquist Sampling theorem, Shannon's theorem for channel capacity, **D) Analog Modulation:** Need of modulation, classification of modulation techniques, Baseband signal, carrier signal, Modulation, demodulation, Analog modulation: **Amplitude modulation** & demodulation , Representation of AM signal in Time domain & Frequency domain, Modulation index, Equation of AM signal, Power distribution in AM signal, **Frequency Modulation** & Demodulation, Representation of FM signal in time domain & frequency domain, Modulation index, Comparison between AM & FM modulation,	15
2	**C) Digital Modulation & Multiplexing:** Classification of Pulse modulation: PAM, Pulse code modulation(PCM), Delta modulation, block diagrams & working of each, Digital modulation: ASK, FSK, PSK, Block diagram of FSK-MODEM, **Multiplexing:** Time division multiplexing, frequency division multiplexing, Code division multiplexing, **D) Wireless Communication:** Introduction to mobile communication, Cellular concept, Working of GPS, Handover mechanism in mobile communication, Introduction to	15

	GPRS, **Wireless Protocols:** RFID, ZigBee, BlueTooth & WiFi protocols, Comparison between these wireless protocols,	

Reference Books:

4. Electronic Communication by Roddy Coolen,

5. Electronic Communication by Robert Kennedy,

6. Communication Electronics by L.E .Frenzel

Sr. No.	Name of the Practical
	B.Sc. Animation (Entire)(Part-II) **(Semester-III)(NEP) Minor Practical- III** **Electronics Practical based on Computer Organization and Electronic Communication** **(Minor)** **Credits:02 Teaching Scheme: Practical–4 Lectures/Week/batch** **Total Marks:50**
1	Study of Amplitude Modulation & Demodulation
2	Study of Frequency Modulation & Demodulation,
3	Study of ASK Modulator & Demodulation,
4	Study of FSK Modulation & Demodulation
5	Study of PAM modulation & Demodulation
6	Study of PWM modulation & Demodulation
7	Study of Pulse code Modulation & Demodulation
8	Study of BPSK modulation & demodulation
9	Study of 2 bit Synchronous Up & Down counter,
10	Study of 4 bit Asynchronous counter
11	Study of Binary to Gray & Gray to Binary code convertor
12	Study of 1 bit Digital Comparator
13	Study of Schmitt Trigger by using OPAMP
14	Study of Integrator & Differentiator, by using Op-Amp
15	Study of 3 bit flash ADC circuit
16	Study of LDR based light control system
17	Study of architecture of Motherboard of Computer
18	Study of Passive filters &Active filters using Op-Amp
19	Study of wave form generations using Op-Amp,
20	Study of Oscillators using Op-Amp,

Course III   Miner VII Course Title: Computer Networking (Minor)

Total Contact Hours: 30 hrs. (30 lectures of 60min)

Credits: 02   Teaching Scheme: Theory–2Lectures/Week   Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to:

5. Understand the concept of Networks & Network Models,

6. Understand different Networking Devices & Transmission media,

7. Understand the data linking, data flow control & error detection,

8. Understand Network Layer, Transport Layer, Application Layer

Unit	Contents	Hours
1	**D) Computer Networks & Network Models:** Classification of Networks, Network Topologies, Network Models: TCP/IP Model, 7 Layered ISO/OSI Model, Applications of each Layer of ISO/OSI Model, **E) Physical Layer:** Transmission Media: Guided & Unguided Media,Co-axial Cable, Optical fiber, Ground-wave Propogation, Sky-wave Propogation, Microwave linking, Satellite linking, Networking devices: Hub, Switch, Router, Bridge, Gateway, Data Modems, Multiplexing techniques, **F) Data-Link Layer:** Data-flow control- Framing, Data Error detection & Data Error correction, Stop and Wait Protocol, Sliding Window Protocols,	15
2	**D) Network Layer:** Logical Addressing, IPv4 addressing: address space, classes of addressing, IPv6 addressing, Comparison between IPv4 & IPv6 addressing, Internet Protocol(IP): IP Datagram format, Fragmentation, ICMP Protocol &Messages, **E) Transport Layer:** Services-Connection-less & Connection-Oriented Service, UDP Protocol: User Datagram, UDP services & applications, TCP Protocol: TCP services, TCP features, TCP segment structure, TCP connection, SCTP Protocol: SCTP services, SCTP features, SCTP packet format,	15

	F) Application Layer: World-Wide-Web(www), Domain Name System(DNS), HTTP Protocols, FTP Protocols, Email Protocols: SMTP protocol, POP protocol, IMAP protocol, SNMP protocol, DHCP Protocol, Remote Login Protocols: TELNET Protocol, SSH Protocol,	

Reference Books:

1. Computer Networking by Andrew Tannenbaum,

2. Data & Computer communication by William Stallings,

3. Advanced Computer Networking by Nirali Publication,

4. Computer Networking & Data Communication by Nirali Publication,

Course III, Miner _VIII Course Title: Micro-Controller & Interfacing (Minor)

Total Contact Hours: 30 hrs.(30 lectures of 60 min.)

Credits: 02   Teaching Scheme: Theory–2 Lectures/Week   Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to

1. Understand the difference between Microprocessor & Micro-controller,
2. Learn & Understand the Instruction set of Micro-controller,
3. To study different features of Micro-controller,
4. To study interfacing of different peripheral devices with Micro-controller

Units	Contents	Hours
1.	**C) Introduction to Micro-controller-8051:** Comparison between Micro-controller&Microprocessor,4-bit,8-bit,16-bit&32-bit Micro-controllers & their applications, Study of 8051 Micro-controller & its family, Comparative study of 89c51, 8031, 8032,8052, 8751, 89c51RD2, 89c51VRD2, Architecture of 8051: Internal Block diagram of 8051, Reset & Clock signal, Registers, Flags, Internal memory, SFR registers, I/O ports, **D) 8051 Instruction Set:** Instruction Set, Addressing Modes, Types of Instructions: Arithmetic & Logical, Data transfer, Jump, loop, CALL, Bit Manipulation, Serial Communication instructions, machine control instructions, Assembly language programming, Embedded C programming,	15
2.	**C) Facilitiesin8051:** **Timers & Counters:** Timer Modes ,Programming of Timers & Counters, Assembly language programming , Embedded C programming, Time-delay generation, **Serial Port:** Programming of Serial Port,RS-232standards,ICMAX-232,Baud Rate, Programming for transmitting character through serial port in assembly & Embedded C, **D) Interfacing of Peripheral devices with 8051:** Interfacing of LED, Relay, Opto-coupler, Thumb-wheel switch,7-segmentdisplay, Interfacing of Stepper motor, DC motor(PWM), LCD (16x2)	15

	with 8051, with Assembly language & Embedded C programming,	

Reference Books:

1. 8051Micro-controllers&InterfacingbyMohammadMazidi,

2. 8051Micro-controller by K. J. Ayala,

3. 8051 Micro-controller by Ajay Deshmukh,

4. Micro-controller & Interfacing by A. P. Godse, Technical publication,

5. Micro-controller Architecture & Programming, by Nirali Publication,

B.Sc. Animation (Entire)
(Part-II)(Semester-IV)(NEP)
Practical-I (Minor)
(Electronics Practical based on Miner VII & VIII)

1. Interfacing of LED, Relay & Opto-coupler with Microcontroller-8051,

2. Interfacing of a Thumb-wheels witch or 7-segmentdisplaywith 8051,

3. Time delay generation using Timers(inMode1orMode2)of 8051,

4. Interfacing of a Stepper motor with 8051,

5. Interfacing of DC motor (PWM) with 8051,

6. Arithmetic&Logicaloperationsbyusing8051,

7. InterfacingofDACwith8051togenerateSquarewave&Triangularwave,

8. Interfacing of LCD display & Keyboard with micro-controller 8051,

9. Interfacing of ADC to sample a signal & convert into digital with 8051,

10. Programming & transmission of Serial data through serial port of 8051,

11. Introduction to Networking devices, cables & connectors, Crimping tool & LAN tester,

12. Preparation of Patch cord & Cross connection cable to connect devices in a LAN,

13. Configuration of LAN: setting of IP addresses manually & DHCP addressing,

14. Prepare & configure a LAN of 3 computers using HUB/Switch, for sharing of Resources,

15. Study of different Networking commands on command line interface in a LAN,

16. Study of different Networking software: Cisco Packet Tracer, Network Simulator (NS),

17. Configure Internet connectivity of your computer in a LAN with LAN Network drivers,

18. Study of sharing of resources by FTP protocol to transfer a file from ones system to another

19. Interconnect two computers by using RS-232 cable & transfer data between computers,

20. Install &configure Router/Repeater/Bridge of your LAN network,