INNOVATIONS IN TEACHING AND LEARNING

LEARNING MANAGEMENT SYSTEM

The learning management system is an interactive platform wherein the faculty and students Communicate and develop with utmost ease. It provides a common area in which all students can access study material, lectures and other additional reference papers, which help them to hone their academic skills and perform to the best of their abilities. LMS also delivers and manages all types of content, including video, recorded sessions of courses, and documents.

The Department of Biomedical Engineering has taken a step forward by effectively utilizing this platform, and it allows students to keep up with assignment deadlines with the in-built LMS calendar. Especially during lockdown, this platform allows students to keep up their academic excellence while maintaining a systematic schedule. Students kept in touch with their education and continually improved their knowledge through assignments and case studies. At SSNCE, the LMS offers classroom management for instructor-led trainings or a flipped classrooms for advanced learning and better understanding of concepts and courses.

Sample LMS Page for Theory

Assignment 1

Reg No. 1 to 10: Advantage and Disadvantage of Nanofibers in Wound Dressing

Reg No. 11 to 20: Hydrogels and its medical application

Reg No. 21 to 30: Polymeric Bone Plates and its Advantage and Disadvantage

Reg No. 31 to 40: Injectable ceramics for bone defect restoration

Reg No. 41 to 50: Nanobiosensors using nanoparticles.

Reg No. 51 to 302: Recent advancement in Dental Implants

Last Date to submission: 9/5/2021

Grading summary

Participants:	63
Submitted	81
Needs grading	1
Due date	Sunday, 9 May 2021, 11:59 PM
Time remaining	Assignment is due

View all submissions   Grade

Sample Assignment Submission Page
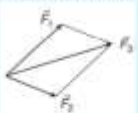
Write the equation for $\vec{F_3}$

Select one:

- a. $\vec{F_3} = \vec{F_1} - \vec{F_2}$
- b. $\vec{F_3} = \vec{F_1} + \vec{F_2}$ ✔
- c. $\vec{F_3} = \vec{F_1}$
- d. $\vec{F_3} = \vec{F_1} \times \vec{F_2}$

Your answer is correct.

The correct answer is: $\vec{F_3} = \vec{F_1} + \vec{F_2}$

Make comment or override mark

Response history

Step	Time	Action	State	Marks
1	18/06/21, 10:31	Started	Not yet answered	
2	18/06/21, 10:38	Saved: \(\ \vec{F_3} = \ \vec{F_1} + \ \vec{F_2} \ \)	Answer saved	
3	**18/06/21, 10:48**	**Attempt finished**	**Correct**	**2.00**
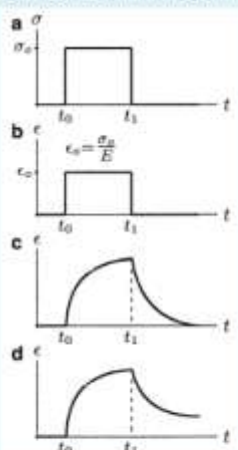
Sample MCQ Test/ Class Quiz Question Page

Started on	Friday, 18 June 2021, 11:00 AM
State	Finished
Completed on	Friday, 18 June 2021, 12:30 PM
Time taken	1 hour 30 mins
Grade	29.00 out of 30.00 (97%)

Question 1
Complete
Mark 10.00 out of 10.00

Deformation behavior of different materials for the applied stress shown in (a) are shown below as (b), (c) and (d). Explain how these behaviors can be modelled.

BM CAT 1 sach 1.pdf

Sample Descriptive Test Question Page

First name / Surname	ID number	Email address	Department	State	Started on	Completed	Time taken	Grade/30.00	Q. 1 /10.00	Q. 2 /10.00	Q. 3 /10.00
Sachin Raj S P Review attempt	2020010	sachin2020010@ssn.edu.in	Bio-Medical Engineering	Finished	18 June 2021 11:00 AM	18 June 2021 12:30 PM	1 hour 30 mins	29.00	9.00	10.00	10.00

Sample Grading Page

UBM1412---Analog and Digital Integrated Circuits Lab ---2021 Edition'

ANALOG EXPERIMENTS

DIGITAL EXPERIMENTS

http://lms.ssn.edu.in/course/index.php?categoryid=5

Sample LMS page for a Practical Subject

MESH CENTRAL FOR REMOTE LABS

Mesh central is a project under Apache 2.0 license that allows administrators to remotely manage computers over the Internet using a single web portal.Meshcentral features can be separated into in-band and out-of-band features. In-band features are available on all devices, out-of-band features are only available on computers with Intel AMT.

- Remote desktop (in-band and Intel AMT hardware KVM)
- Remote terminal access (in-band and Intel AMT serial-over-lan)
- Remote file access
- Remote web access
- Remote power control (in-band and Intel AMT power control)
- General monitoring
- Video chat with Android*

Mesh central facility has been effectively employed by the Department of Biomedical Engineering to enable students to do bio signal acquisition and analysis at his home. Lab assistant, acted as the participant, with the electrodes linked for EMG recording and the software for data collection and analysis controlled by the student from his home. The student has to login through the SSN login id in the link, meshcentral.ssn.edu.in. Each student's admission and exit will be monitored by the Lab Assistant when they log in and out of their lab sessions. Other labs that utilize mesh central access include the Data Acquisition and Processing lab, as well as the Diagnostic and Therapeutic lab. During virtual classrooms, students gave positive feedback on the lab session using mesh central.

https://drive.google.com/drive/folders/1cMchPGB79p56Ibj88fSzDTMJRjXINmd?usp=sharing
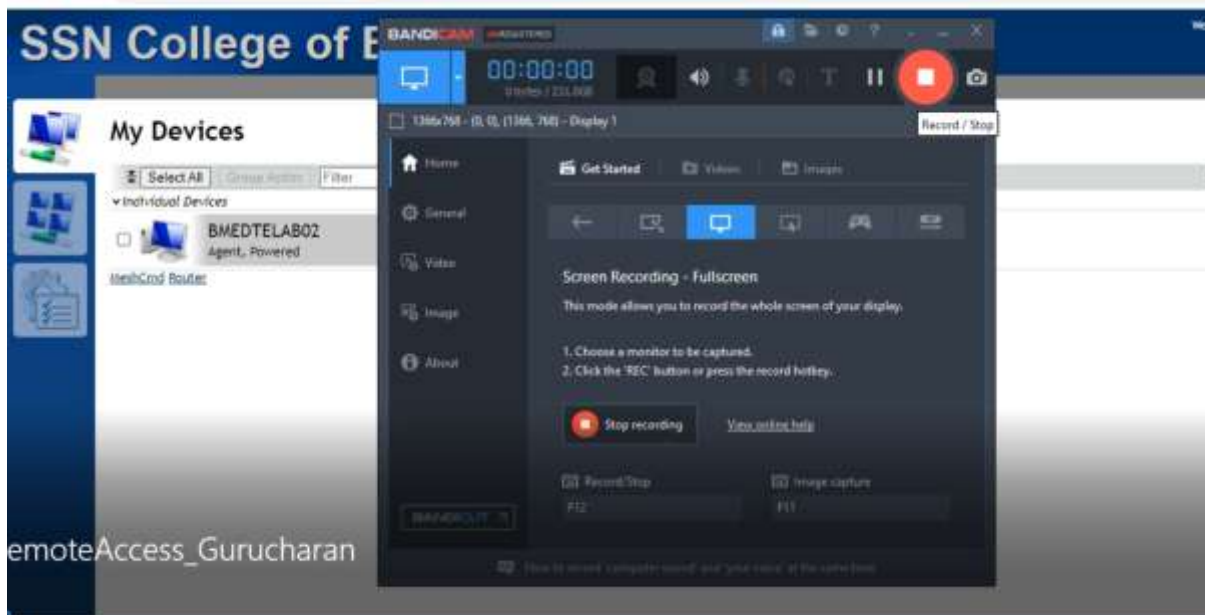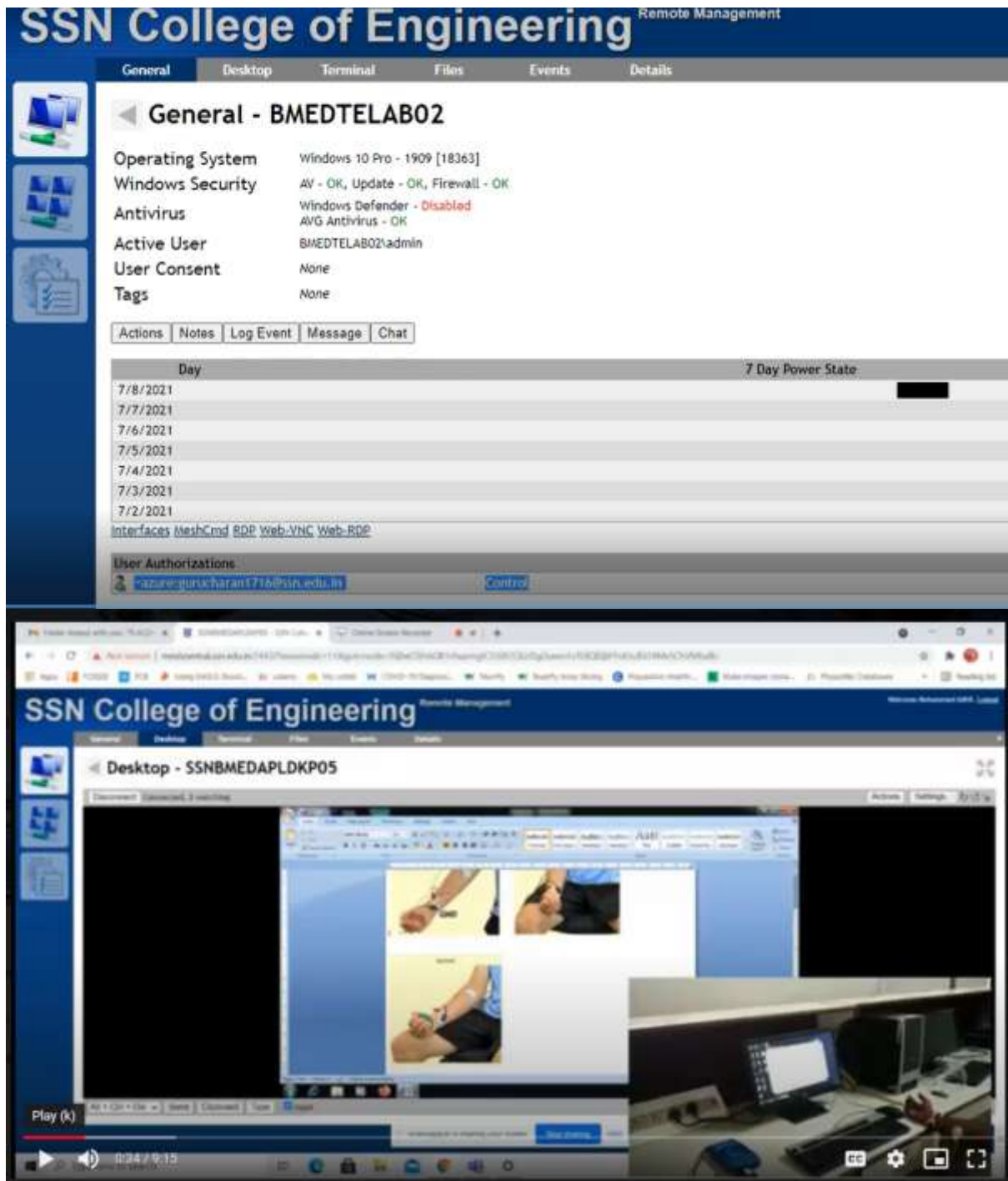
PANOPTO SOFTWARE FOR COURSE DELIVERY

SSN has got a licensed version of Panopto, and faculty are using it effectively for the course delivery. Panopto is **a video hosting and editing software** that facilitates the recording of lectures on the screen with PowerPoint, Animations and or any other multimedia interactions. It can be used to create **flipped classes** concept videos for known issues with course concepts for students to review. Panopto videos have been created for all the theory/lab subjects during the virtual sessions and it gave students a very good feel of learning the concepts.

ɪMOVIE VIDEOS FOR COURSE DELIVERY
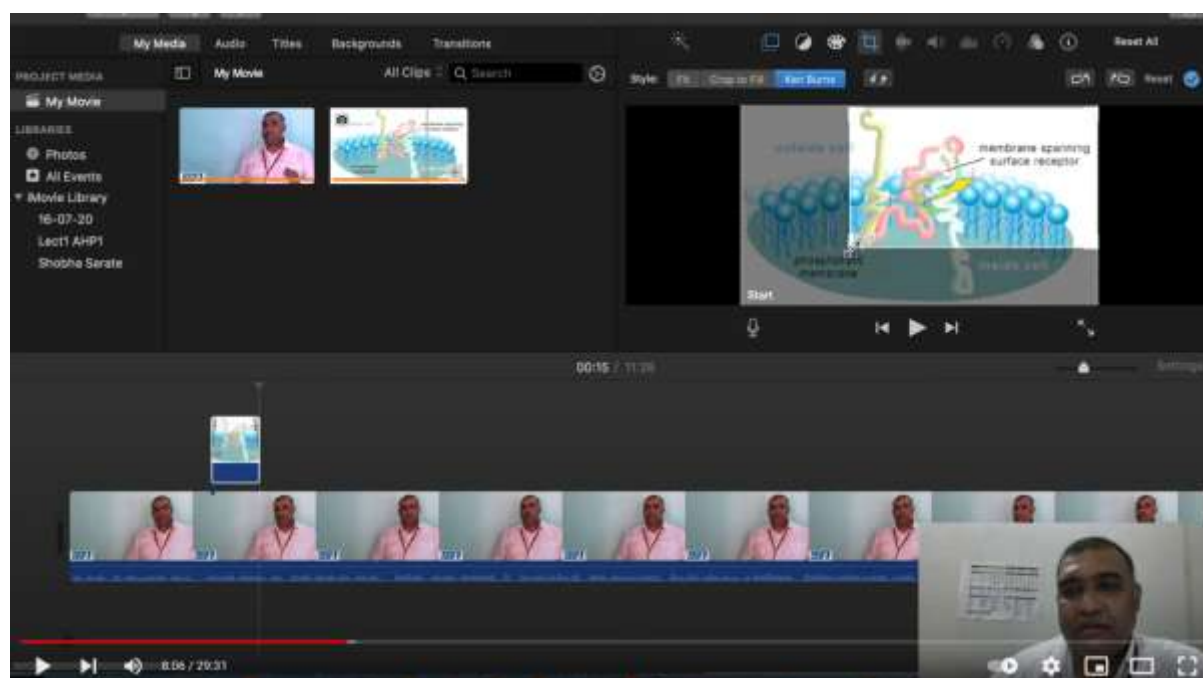
Dr. Sachin Gaurishankar Sarate gave a talk on "Using iMovie software for making educational videos" for Faculty members of Sri Sivasubramaniya Nadar College of Engineering on 30th of July 2020. In this talk, he discusses in depth on the usage of various softwares available free of cost on computers with Mac Operating System. He made some instructional videos for the subject "Human Anatomy and Physiology" [https://www.youtube.com/watch?v=rB-fGWJnoO4&t=88s]in which he speaks on the screen while some animations are playing around in the background. He described the user interface and showed how images and gifs can be inserted into videos which can make learning more interesting for the students.

Link for the video: https://www.youtube.com/watch?v=45rX-5cFwp4

METRICS FOR EVALUATING INSTRUCTIONAL VIDEOS

The videos made by the faculty were given to the Department Co-Ordinator for evaluation of the quality of the videos to check their utility to the students. Following rubric is followed to evaluate the quality of videos made by all the faculty members.

Video Quality Evaluation Rubrics

Name of Faculty:

Designation:

Time of Video:

Topic Discussed:

A. Physical Design

"Physical design" refers to design that directs the users to the message and content of the video.

1. Can viewers easily navigate through the video when looking for a specific clip or segment of the video?

1	2	3	4	5

2. What is the quality of the video's 'view-ability' (are there too many visual distractions, or irrelevant visual materials)?

1	2	3	4	5

3. Is the pace of the narration appropriate; is the timing of the 'slides' or 'segments' displayed too quickly/slowly?

1	2	3	4	5

4. Are the slides, clips, transitions neatly composed and stitched together?

1	2	3	4	5

B. Cognitive Design

"Cognitive Design" is a design that helps users comprehend the message being communicated in the instructional video.[SEP]

1. Is the content relevant, concise and meaningful?

1	2	3	4	5

2. Are the benefits explained at the beginning and reinforces at the end?

1	2	3	4	5

3. Have the objectives and main goals of the video been fulfilled?

1	2	3	4	5

4. Does the verbal content match the visual data (does the audio compliment what is being displayed on screen)?

1	2	3	4	5

5. Are complex terms simplified and explained?

1	2	3	4	5

6. Is the video overwhelming, covering too much?

1	2	3	4	5

7. Is content organised in small manageable parts ('chunks')?

1	2	3	4	5

C. Affective Design

"Affective design" is design that promotes learners to engage with and feel comfortable with the content in the instructional video.[SEP]

1. Are frames lit well? Can viewers see the content clearly? [SEP]

1	2	3	4	5

2. Spoken clearly, objectively, credibly, with authority (established speaker) and engaging way? [SEP]

1	2	3	4	5

3. Speaks directly to viewer (not speaking 'at' viewers)?

1	2	3	4	5

4. Is the sound clear, or is there 'back-noise', hiss, clicks or other sounds that distracts from the main subject?

1	2	3	4	5

Total: 75/75

CONDUCTION OF LABS

a) a brief note on methodology – Youtube/ video of experiments/ different data set etc

b) info on any external virtual lab used [pl provide link]

❖ **SEMESTER: III**

Subject Code & Name: 3UBM1303 - Biochemistry and Human Physiology lab
Lab Incharge   : Dr.R.Subashini

a) **Methodology Used**

The methodology for each experiment was explained through the Zoom and Teams platform. Some experiments were done through demonstration using the college laboratory facility and uploaded in the LMS page. Working procedure of well known experiments shown through youtube video (eg given below)

1.   Identification of blood groups
         https://www.youtube.com/watch?v=KXTF7WehgM8
         https://www.youtube.com/watch?v=0gK8mv4i42k
2.   Estimation of Hemoglobin
         https://www.youtube.com/watch?v=qMTJ05l855Q

● Students were asked to prepare a record and post it in LMS.
● Record with tabulated values for simulation has to be uploaded in the LMS page
● The model and End semester practical examination were conducted virtually. Marks were allotted based on students performance in viva, answer script evaluation and report verification.

b) **External Virtual Lab Details**

1.   pH meter calibration and preparation of buffer solution using Online Resources for Teaching and Learning Chemistry (Carnegie mellon university chemcollective platform)
         Link: http://chemcollective.org/about_us/sponsors
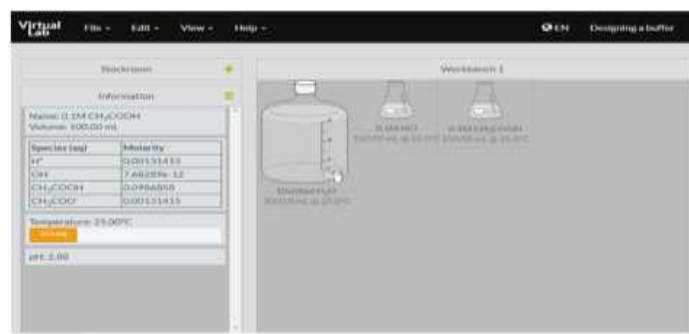
2. Determination of absorption maxima (λmax) using
   Link: http://biomodel.uah.es/en/lab/abs/espectro.htm
   Example: Results uploaded in LMS
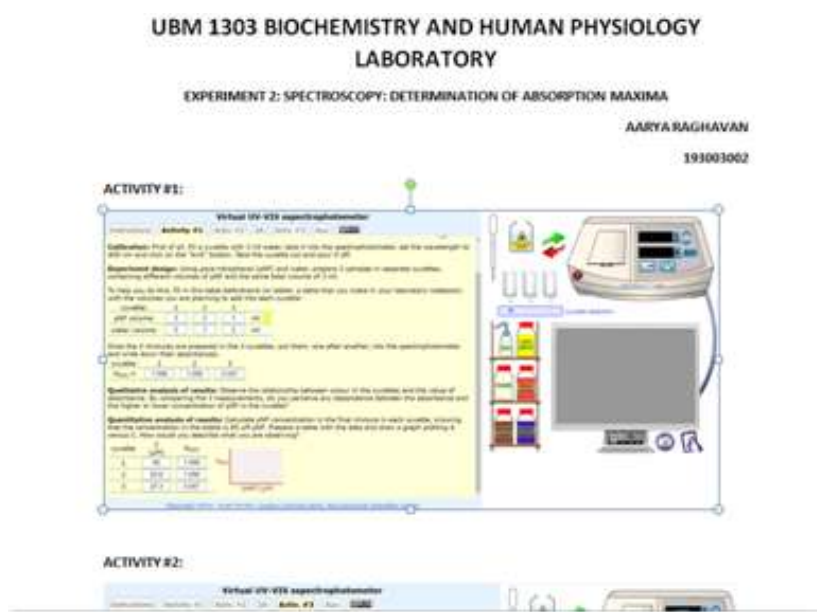
3. Test for carbohydrates
   Test for Proteins
   Tests for Lipids using virtual platform Amrita Viswa Vidyapeetham
   Link: https://vlab.amrita.edu/?sub=3&brch=63&sim=1094&cnt=1

❖ **SEMESTER: IV**

Subject Code & Name: UBM1401- Pathology and Microbiology Lab
Lab Incharge : Dr.R.Subashini

a) **Methodology Used**

The methodology for each experiment was explained through the Zoom and Teams platform. Some experiments were done through demonstration using the college laboratory facility and uploaded in the LMS page. Working procedure of well known experiments shown through youtube video

● Students were asked to prepare a record and post it in LMS.
● Record with tabulated values has to be uploaded in the LMS page
● The model and End semester practical examination were conducted virtually. Marks were allotted based on students performance in viva, answer script evaluation and report verification.

❖ **SEMESTER: IV**
Subject Code & Name: UBM1412- Integrated Circuit Lab
Lab Incharge : Dr. Mahesh Veezhinathan

a) **Methodology Used**

Multisim Experiments

Step 1: Instuctions were given on What is Multisim software tool and its installation procedure.

Step 2: A detailed Demostration was done for Analog and Digital Experiment

Step 3: During the lab session the individual students were monitored, they were asked to share their laptop / desktop screen in the microsoft team environment and the correction / suggestions were given to them individually for all the experiments.

Step 4: The Model and End Semster Exam were conduted in the same platform and it was individually monitored.

Procedure

1. After logging into the computer, open Multisim. One will be able to see the Basic workbench screen as in Figure 1.
2. Selecting Components
   Begin by drawing your schematic in the Multisim environment.
   Select **Place»Component**. The **Select a Component** window appears (also known as the **Component Browser**), as shown in Figure 2a.
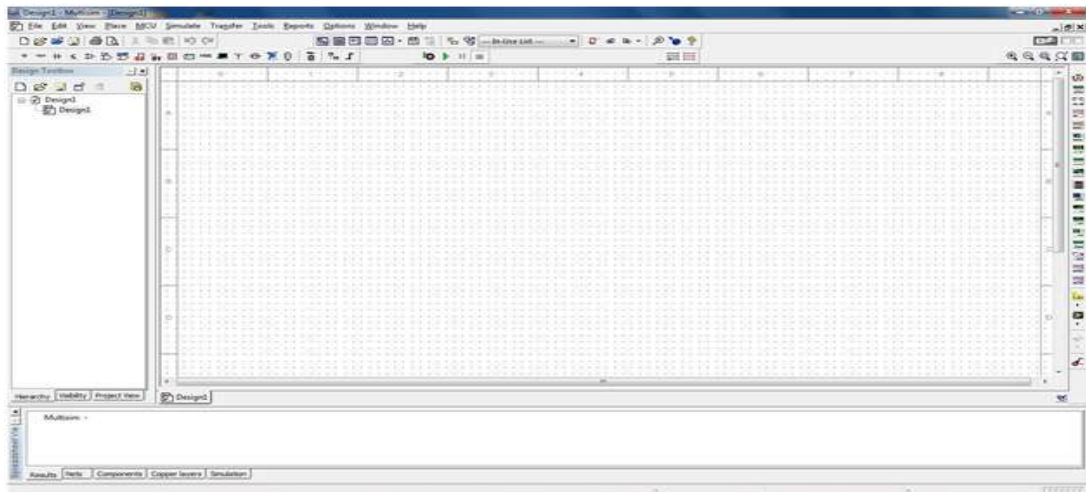
Figure 1:Basic workbench screen
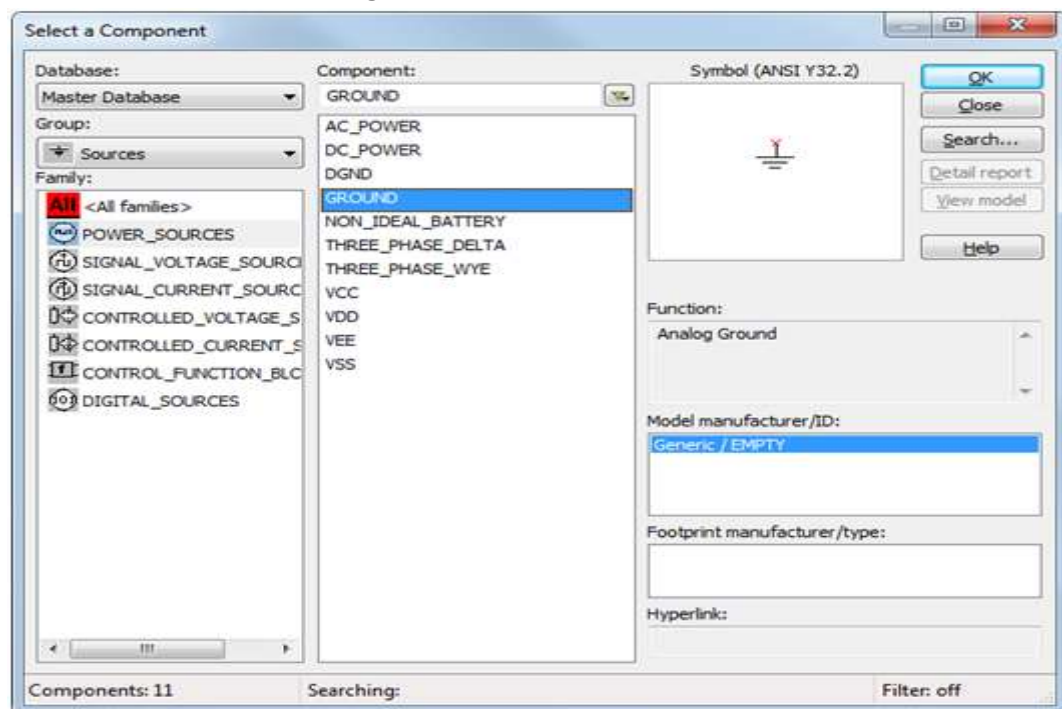
Figure 2 a: Select a Component Window
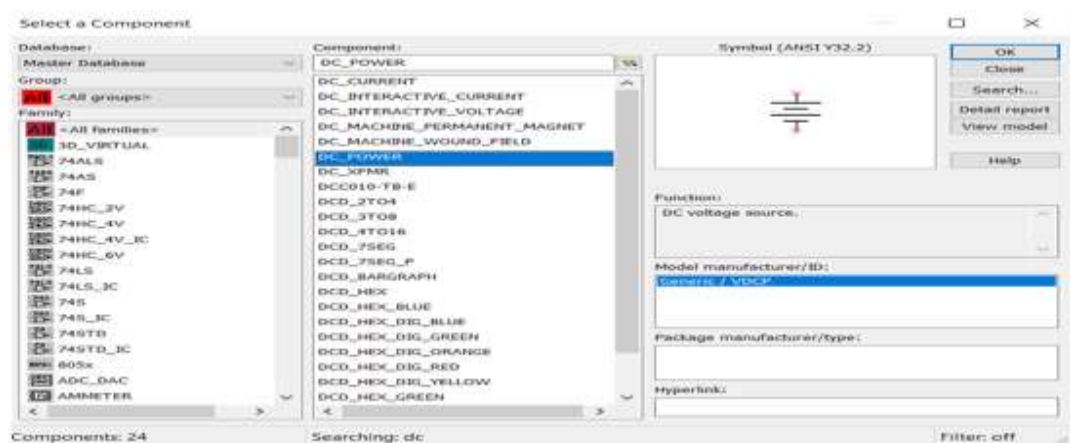
Figure 2b: DC power source

3. Additional Points
   a. The Component Browser shows the component name, symbol, functional description, model, and footprint all in a single pop-up.
   b. Select the GROUND component (as shown in Figure 2a).
   c. On clicking OK, the "Select Component" window temporarily closes and the ground symbol is 'ghosted' to the mouse pointer.
      d. Move the mouse to the appropriate place on the workspace and left-click once to place the component. After placing the component, the "Select Component" window will open again automatically.
      e. Go to the Sources Group and highlight the POWER_SOURCES Family
      f. Select the DC_POWER component (Figure 2b) and place it on the workspace.
4. Select the OPAMP family.
      a. Type 741 in the Component field.
      b. From the drop down list, select the 741 component, as shown in the figure 3
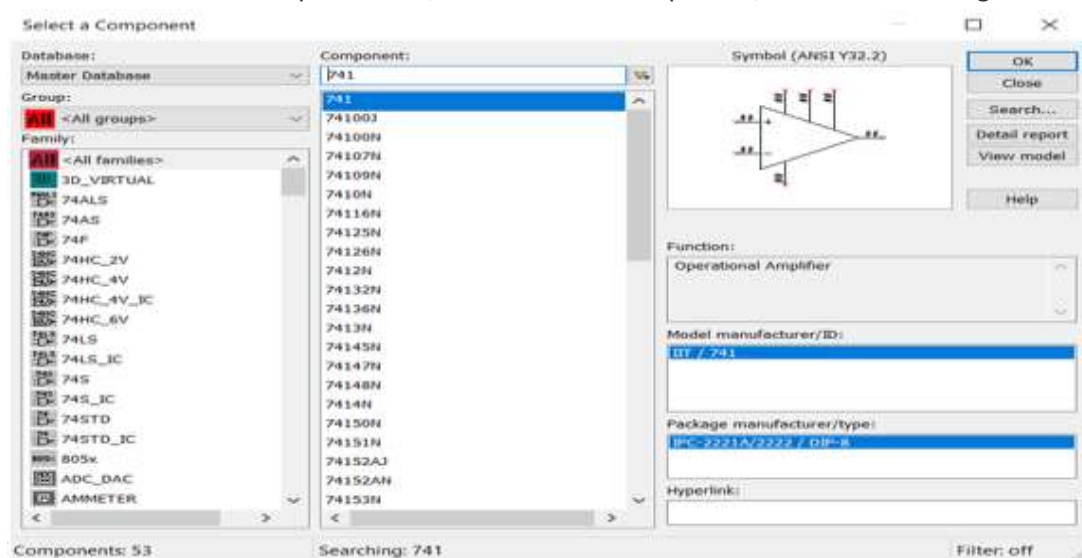
Figure 3: Opamp 741 selection

   c. Return to the Select a Component window.
   d. Select the Basic Group > Resistor Family and edit the resistor value by placing the component in the workspace. (Figure 4)
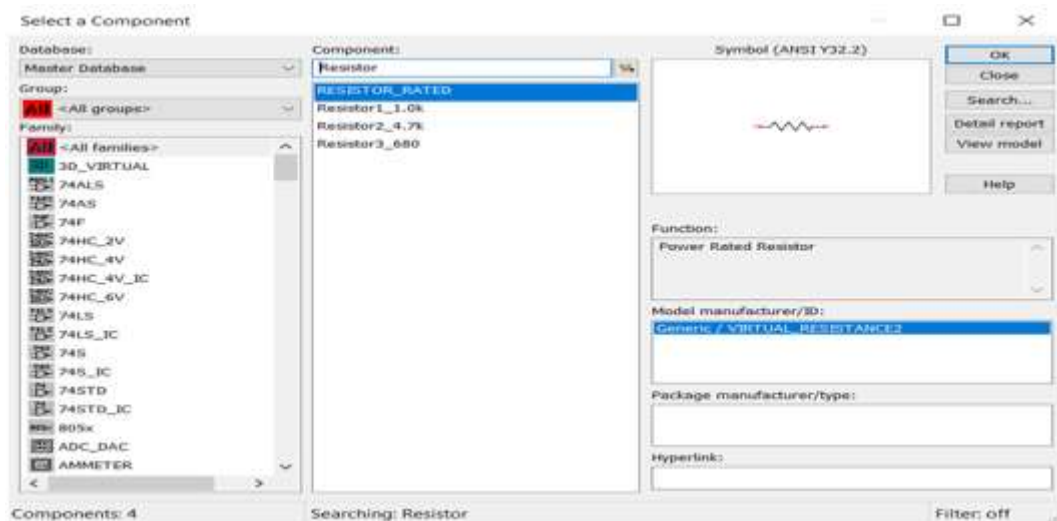
Figure 4: Selection of Resistor

5. Selection of Function generator and Oscilloscope

  Once you see the instrument panel on the right of the workspace (Figure 5)

  Choose the required function generator and oscilloscope to view the output

Figure 5: Instrument panel

  To change the values of frequency, amplitude and signal type in signal generator (Figure 6), double click on the component in the workspace (Figure 7)and make the changes.
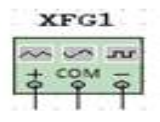
Figure 6: Signal Generator
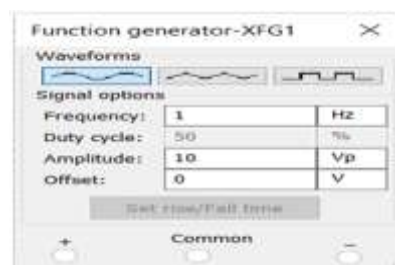
Figure 7: Changing the value of signal generator

6. Selection of Oscilloscope

The oscilloscope can be selected from the instrument panel (Figure 5)

Two channel oscilloscope is shown in Figure 8. Same way a 4 channel oscilloscope can be selected.
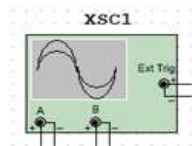
Figure 8: Two channel oscilloscope

Wiring of components and Running the simulation

1. Begin wiring by moving the mouse pointer close to a pin of a component. The mouse will appear as a crosshair rather than the default mouse pointer.
2. Place an initial wire junction by clicking on the pin/terminal of the part.
3. Complete the wire by moving the mouse to another terminal or just double-click to anchor the termination point of the wire to a floating location somewhere in the schematic window.
4. Create a copy of the ground symbol using Copy <Ctrl+C> and Paste <Ctrl+V>.
5. Once the wiring is done, run the circuit by clicking the run button or F5.
6. Sample analog circuit is Figure 9 and its output is shown in Figure 10.
7. The same process can be used for digital experiments for which an example is shown in Figure 11.
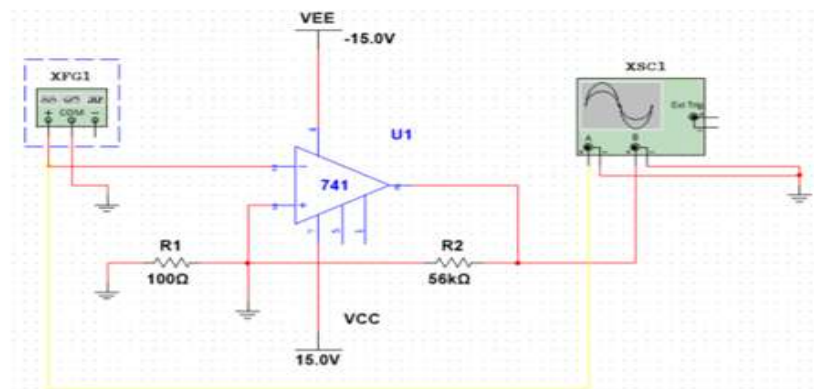
Figure 9: Schmitt Trigger Circuit
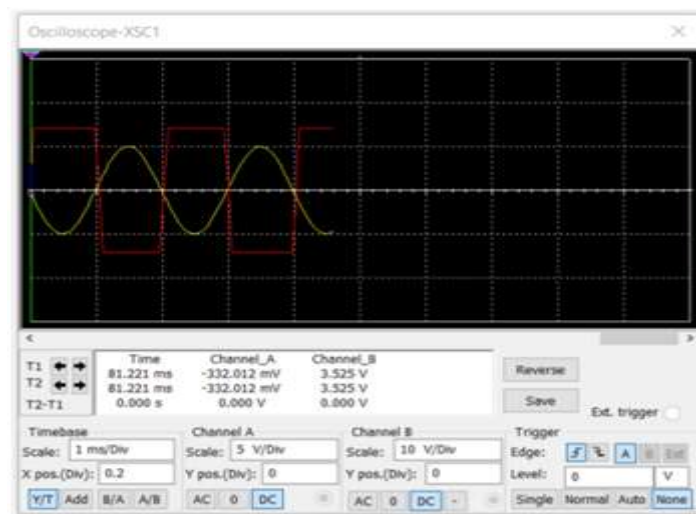
Figure 10: Output waveform of the Schmitt Trigger
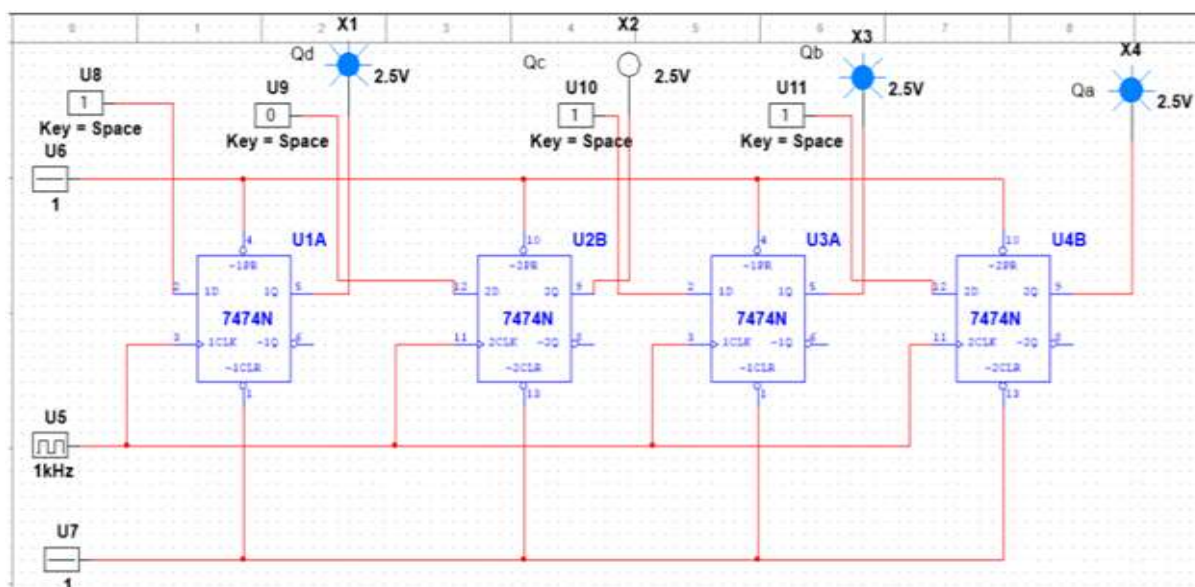
Figure 11: Shift Register

❖ **SEMESTER: V**

Subject Code & Name: UBM1512- Digital Signal Processing Lab
Lab Incharge : Ms. M. Dhanalakshmi/Ms. R.Nithya

a) **Methodology Used**

The concepts were explained through online lab classes using teams and zoom links. The demonstration about the experiments were created using PANOPTO and are uploaded in the LMS page for further reading. The MATLAB experiments are implemented by creating student login in mathworks.com. The DSP processor based experiments were conducted through CC studio software (Package mailed to students).

MATLAB based experiments:
1. Experiment 1: Generation of elementary discrete-time sequences
    https://pro.panopto.com/Panopto/Pages/Viewer.aspx?tid=6d5229e4-7606-4948-a4b3-ac20010bfd87

2. Experiment 2: Linear and circular convolution
    https://pro.panopto.com/Panopto/Pages/Viewer.aspx?tid=0b3e45e1-2b3d-43ce-a4db-ac20010c3c81

3. Experiment 3: Auto correlation and cross correlation
    https://pro.panopto.com/Panopto/Pages/Viewer.aspx?tid=0a6e8eb1-6139-4b60-ace3-ac20010c5caa

PROCESSOR based experiments

1. CCstudio installation and how to open CCstudio
   https://pro.panopto.com/Panopto/Pages/Viewer.aspx?tid=339059db-c18d-4c8f-9890-ac6800f7a005

2. Waveform generation
   https://pro.panopto.com/Panopto/Pages/Viewer.aspx?tid=e60ede71-9175-4a7c-b380-ac6800faade1

3. Finite word length effects
   https://pro.panopto.com/Panopto/Pages/Viewer.aspx?tid=361e8fa4-2e6d-463d-af9c-ac68010228

❖ **SEMESTER: V**

Subject Code & Name: UBM1511- Biomedical Instrumentation Lab
Lab Incharge : Ms. B.Divya/Dr.S.Pravin Kumar

a) **Methodology used**
   1. Video explanation of the theory, procedure and conduct of lab and lab manual in DOC format in the LMS.
   2. Explanation of the lab experiment in PANOPTO/PPT through ZOOM
   3. Video presentation of doing the experiment in the college laboratory setup.
   4. Demonstration of Multisim simulation through ZOOM

Assessment Method
· Online submission of record in LMS.
· Record with tabulated values for simulation has to be uploaded in the LMS   page of BMI lab within two days of the lab session.

Sl. No	Course Content	Knowledge Level	Delivery Method	No of Hrs handled
1	Explanation of the need for experiment and design considerations. Demo video of implementation of the circuit will be shown with explanation	U	Recorded Video(using Panopto) & In class (word Doc)	0.5
2	Demo video of implementation of the circuit will be shown with explanation	Ap	In class -Video sharing through Zoom and explanation	1
3	Discussions about the implementation and clarification of doubts	U	In class	0.5
4	Demo of software simulation	Ap	In class -Video sharing through Zoom and explanation	1

● **Video lecture using Panopto**

❖ **SEMESTER: VI & SEMESTER VII**

Subject Code & Name: UBM1612 - Medical Image Processing lab (Sem VI)
Subject Code & Name: EC8762 - Digital Image Processing lab (SEM VII)
Lab Incharge : Dr.J.Vijay & Dr.K.Nirmala

a) **Methodology Used**

The students were asked to create a MATLAB account in the link https://in.mathworks.com/login. As our institution has a MATLAB campuswide licence, the MATLAB virtual environment can be accessed by the students with all features.

● The basics of MATLAB operations, syntax, account creation, file handling, and concepts of each experiment were explained through Microsoft Teams.
● The images to be used for the experiments were uploaded in a common drive.

- The results were verified and corrected by asking the students to share their screen.
- The students were asked to consolidate and draft the results in a document. This document must be uploaded in the LMS page before the due date.
- The model and End semester practical examination conducted by the following modalities
  - Quiz
  - Experiment execution
  - Viva voce
  - Document verification
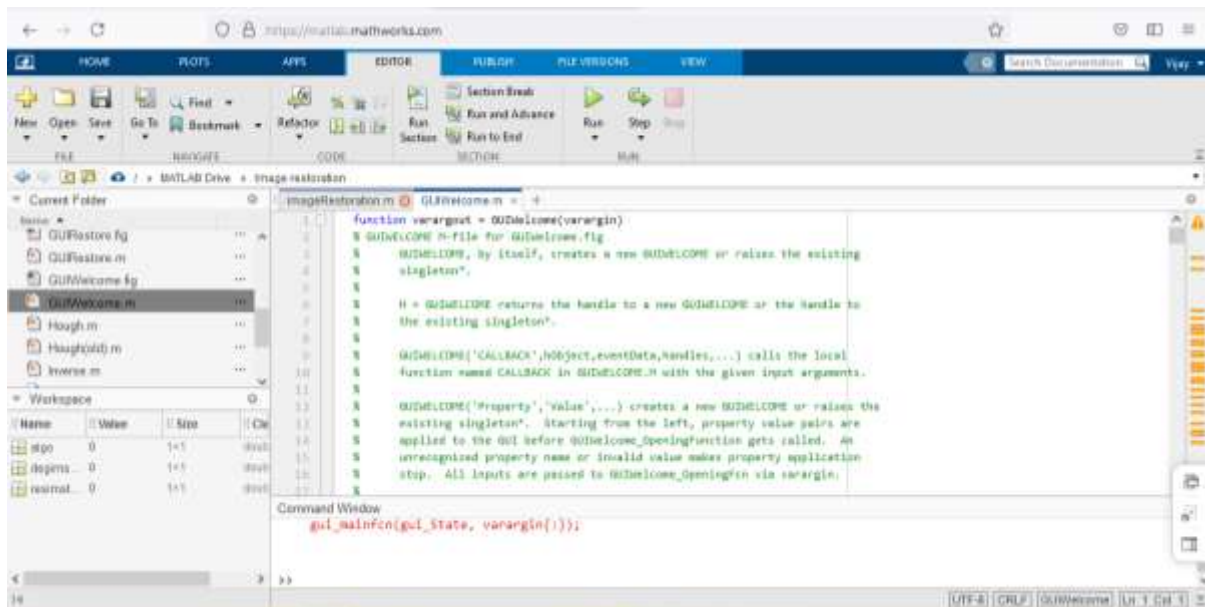
❖ **Semester: I Semester PG**

Subject Code & Name: - Biosignal Processing (lab integrated course)
Lab Incharge : Dr. S. Pravin Kumar

a) **Methodology Used**

Through the SSN campuswide licence, the students had been given access to the Matlab and signal processing toolbox.

- MATLAB Live Scripts were introduced for better documentation.
- Students were trained with the basics of arithmetic operations, variable declaration, functions, and file handling.
- The instructions for each experiment were explained in the class through Microsoft Teams.
- The biosignals to be used for the experiments were uploaded in a common drive.
- The results were verified and corrected by asking the students to share their screen.
- The students were asked to consolidate and draft the results in a document. This document must be uploaded in the LMS page before the due date.
- The model and End semester practical examination conducted by the following modalities
  - Quiz
  - Experiment execution
  - Viva voce

○ Report verification

Sample Experiment

GENERATION OF AMPLITUDE MODULATED SIGNAL

AIM:

To write a Matlab program to obtain the amplitude modulation of the message and carrier signal.

ALGORITHM:

- Choose a constant value m.
- Give the frequency and amplitude values for message signal and the carrier signal
- Message signal is given by the expression
- M=Am*sin(2*pi*fm*t);
- Carrier signal is given by the expression

C=Ac*sin(2*pi*fc*t);

- Amplitude modulation is calculated using

S=(1+m.*M).*C;

- Compute the Amplitude modulation of a signal by varying modulating index as m=1,0.1,10;

CODE:

```
%message signal
clc;
clear all;
close all;

Am=1;   %Amplitude of message signal
fm=10;  %Frequency of message signal
t=0:0.001:1; %Time period of message signal
M=Am*sin(2*pi*fm*t); %Equation of message signal
figure(1);
subplot(3,1,1);
plot(t,M);
title('Modulating signal');
xlabel('time');
ylabel('amplitude');

Ac=2;  %Amplitude of carrier signal
fc=50; %Frequency of carrier signal
t1=0:0.001:1; %Time period of carrier signal
C=Ac*sin(2*pi*fc*t1); %Equation of carrier signal
subplot(3,1,2);
plot(t1,C);
title('Carrier signal');
```

```
xlabel('time');
ylabel('amplitude');

m=10;
S=(1+m.*M).*C; % of  Amplitude modulated signal
subplot(3,1,3);
plot(t,S);
title('AM signal for m=1');
xlabel('time');
ylabel('amplitude');
```
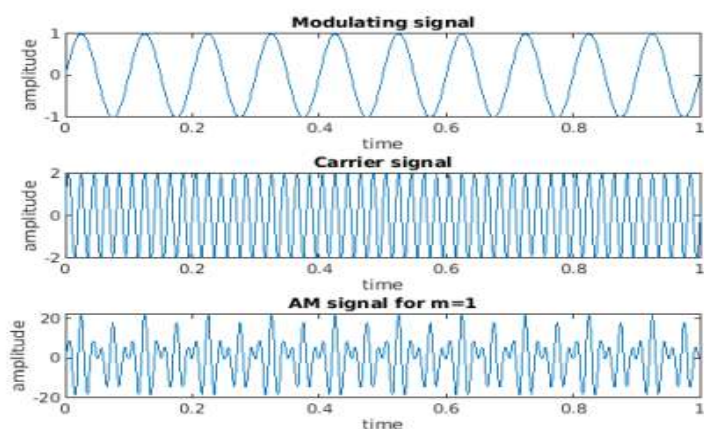

RESULT:

The two input modulating and carrier waves are modulated to give a new output signal

Subject Code & Name: - Applied Medical Image Processing (lab integrated course)
Lab Incharge : Dr. A. Kavitha/M. Dhanalakshmi

a)   **Methodology Used**

The students used campus wide license to virtually work with MATLAB tool.

- The concepts were explained to students through online lab classes using zoom and teams
- Students were asked to write programs on their own with the concepts explained
- The MATLAB scripts and executed program outputs were verified online by viewing their screen.
- Students were asked to prepare record and post it in LMS.
- The model and End semester practical examination were conducted virtually and their outputs were viewed on their screen. Marks were allotted based on students performance in viva, execution of scripts and report verification.

Example:
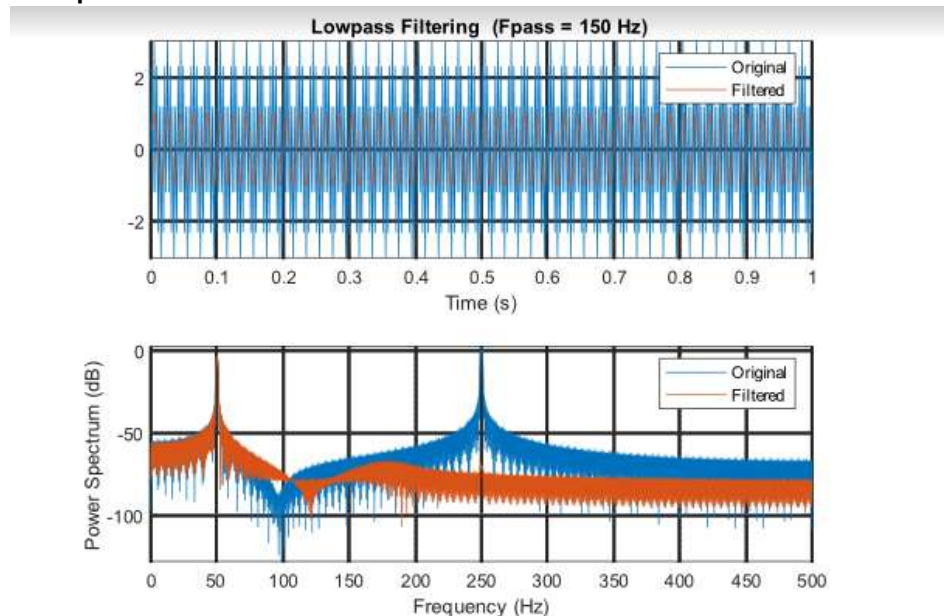

```
fs= 1000;
x= randn(2000,1);

[y1,d1]= lowpass(x,200,fs);
[y2,d2]= lowpass(x,200,fs);
[y3,d3]= lowpass(x,200,fs);
pspectrum([y1 y2 y3],fs)
```

❖ **Semester: II Semester PG**

Subject Code & Name: Data Acquisition and Processing Laboratory
Lab Incharge : Dr. S. Pravin Kumar

a) **Methodology**

- Video explanation of the theory, procedure and conduct of lab and lab manual in PDF format on the LMS.
- Explanation of the lab experiment in PANOPTO/PPT through ZOOM
- Video presentation of doing the experiment in the college laboratory setup.
- Demonstration of simulation experiments through ZOOM

Assessment Method:

- Online submission of record on LMS.
- Record with tabulated values for simulation has to be uploaded on the LMS page of DAQ lab within two days of the lab session.
- The model and End semester practical examination conducted by the following modalities
  ○ Quiz
  ○ Experiment execution
  ○ Viva voce
  ○ Report verification

Sample Screenshots

PHYSIOLOGICAL MODELLING OF CARDIAC OUTPUT AND ANALYSIS UNDER VARIOUS CONDITIONS OF HEART

AIM:

To study the physiological modelling of cardiac output and analyse the model under various conditions of heart.

MATERIALS REQUIRED:

JAVA and CV SIM software.

ABOUT CVSIM:

CV SIM is a lumped – parameter model of the human cardiovascular system that has been developed and used for research and for teaching quantitative physiological sources.

Cardiovascular system model was developed based on electrical circuit components, beginning with the ventricles, then adding a pulmonary circuit and finally a systemic circuit to obtain a closed loop model with fourteen parameters. In a simplified 6-compartment circulation model in which each component was a capacitor connected to ground , and also to adjacent nodes by impedances; current(flow) through the ventricular compartments was regulated by diodes representing valves.

CVSIM WINDOW COMPONENTS:

- Simulation Control Toolbar

- Simulation Parameters Pane

- Graphics Pane

- Strip Chart

- Plot

SIMULATION CONTROL TOOL BAR:

The Simulation Control Toolbar includes 6 controls to stop and start the stimulation and turn the control systems on and off:

GRAPHIC PANEL

CIRCUIT PANEL

PLOT AND CHART

CONGESTIVE HEART FAILURE

VIRTUAL HOSPITAL TRAINING

During the first wave of the Pandemic, it was not possible for the students of BE biomedical Engineering to attend Hospital Training physically in the Hospitals. Dr. Pavan Jadhav who is the Director of Panacea Multispecialty Hospital, Aurangabad, Maharashtra agreed to give a virtual tour to the students for Hospital Training. He moved through the Hospital Building and showed every department of his hospital. The students were shown the following departments:

1. Hopsital Reception
2. Causalty Department
3. X ray room
4. Wards
5. Orthopedics Operation Theatre
6. General and Gynaec Operation Theatre with laparoscope
7. ICU
8. Sterilization Unit
9. Central Oxygen Unit
10. Pharmacy

A short account of the training session is shown in the video link given below.

https://www.youtube.com/watch?v=9PpwKP7BpTQ&t=6s

ONE CREDIT COURSE DETAILS

Title of the Course: Pediatric Biomechanics – Deformities, Treatment, Injury Prevention and Computational Modeling

Faculty: Dr. Sriram Balasubramniam, Associate Professor, Drexel University, Philadelphia, USA.

Course Coordinators: Dr. A. Kavitha, HOD/BME and Dr. S. Pravin Kumar, Associate Professor/BME.

Teaching Assistant: Christian D'Andrea, MS; Ausilah Alfraihat, MS; Virginia Orozco, MS; Girish Viraraghavan, BS

Period: 16.11.20 – 26.11.20

Schedule: 8:30-10:30 AM on 16.11.20, 18.11.20, 19.11.20, 21.11.20, 23.11.20, 24.11.20, 25.11.20 and 26.11.20

Target Audience: III Year BME students

Course Description:
Pediatric trauma and orthopedic conditions significantly affect the quality of life in children. While motor vehicle crashes are the leading cause of death for children ages four years and older, with more than 5000 deaths per year for ages 21 years and younger in the US; pediatric skeletal deformities causes significant chronic problems associated with growth restriction, breathing difficulties, degenerative spine disease and pain.

This course will provide a comprehensive overview critical for automotive safety considerations and deformity treatment: Pediatric injury tolerance and biomechanics,

occupant protection, testing and federal regulation, as well as pediatric anatomy, skeletal deformities, pediatric medical device development and surgical treatment.

Additionally, two hands-on labs are integrated in this course, and focuses on developing modeling tools in MATLAB and finite element modeling software for pediatric biomechanics applications.

The knowledge gained from this course enables students to be more aware of the pediatric anatomy, deformities and injury tolerances, as well as challenges associated with pediatric medical device development and injury prevention. Course format includes lectures, lab sessions and student lab report submissions.

Goals for the Course:

- Familiarity with bony landmarks, anatomical terminology and structures of the different body regions.
- Gain knowledge about the etiology, diagnosis and treatment of pediatric spine and rib cage deformities.
- Understand the paediatric medical device development process, testing and regulatory pathway.
- An understanding of the paediatric biomechanics of the different body regions, associated injury mechanisms and tolerance.
    1. Recognize the significance of various injuries, how to rank order and quantitatively compare their severity, and how to assess overall severity of multiple injuries
    2. Identify the biomechanical and legal basis of automotive safety regulations.
    3. Describe the different measuring capabilities of various paediatric crash test dummies including Hybrid III and Q-series crash test dummies.
    4. Become familiar with computational modeling tools, and understand the steps involved in creating custom models for biomechanics applications

Syllabus

Total hours: 15

- Pediatric Injury Biomechanics
- Kelvin-Voight model-based assessment of CPR manikin chest compression – Lab
- Pediatric Orthopedic Biomechanics
- Spine and Rib cage deformities and Treatments,
- Finite Element Modeling of functional spinal unit -Lab

Lecture Schedule

Lecture Schedule: (M – Monday, T – Tuesday, W – Wednesday, R – Thursday, F – Friday, Sa – Saturday)
*All lecture PowerPoints will be made available on OneDrive by 8AM on the day of lecture.

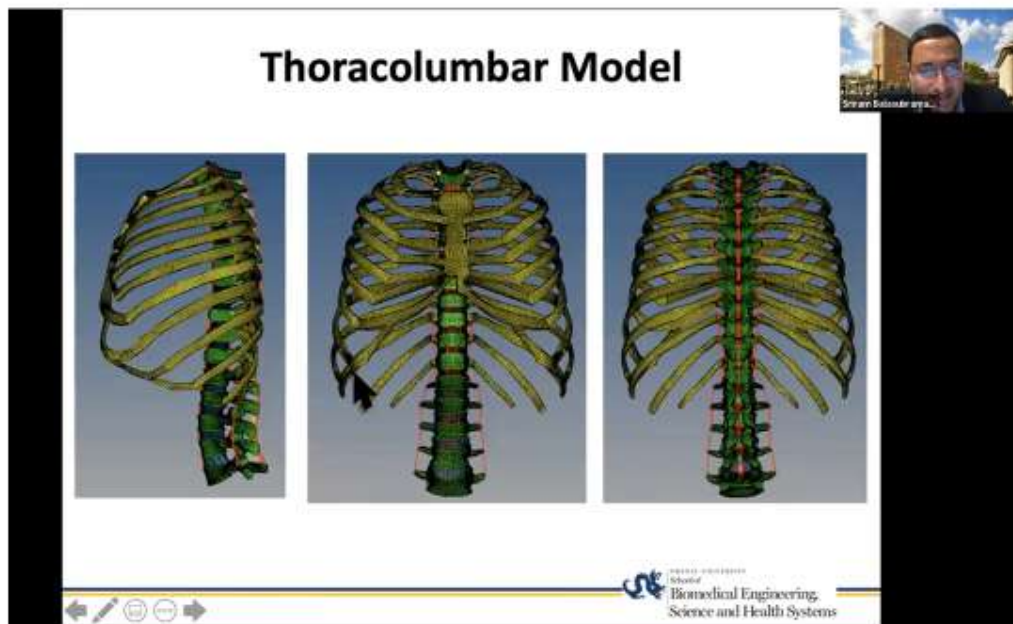| Week	Lecture Topic	Instructor
Week 1M (Nov 16)	Pediatric Injury Biomechanics - Part 1/2	SB
Week 1W (Nov 18)	Pediatric Injury Biomechanics - Part 2/2	SB
Week 1R (Nov 19)	Kelvin-Voight model-based assessment of CPR manikin chest compression - Lab 1/2	SB
Week 1Sa (Nov 21)	Kelvin-Voight model-based assessment of CPR manikin chest compression - Lab 2/2	SB
Week 2M (Nov 23)	Pediatric Orthopedic Biomechanics - Spine and Rib cage deformities and Treatments - Part 1/2	SB
Week 2T (Nov 24)	Pediatric Orthopedic Biomechanics - Spine and Rib cage deformities and Treatments - Part 2/2	SB
Week 2W (Nov 25)	Finite Element Modeling of functional spinal unit - Lab 1/2	SB, CD
Week 2R (Nov 26)	Finite Element Modeling of functional spinal unit - Lab 2/2	SB, CD

Grading: Grades to be based upon Class Participation – 40%, Lab Report – 60% Late submissions will not be graded.

Communication: All communications with the instructor / TA must use their email as they are listed at the top of the syllabus. The TA must be copied on every email.

Lab Final Report: A template for the lab final report will be available on OneDrive. Final reports must be submitted with the following sections: Background/Introduction, Methods & Materials, Results, Discussion and Conclusion. Reports should be single-spaced, Times New Roman font 12 and all figures must have captions. Additionally, any sources used (including lab manuals and lecture slides) must be cited. Submissions that are lacking any of the above sections or formatting will have points deducted.

Screenshots

Students Feedback

A great appreciation for the Management and the BME staffs who gave us an opportunity to participate in this Course. This course was very informative and everything was based upon the research on modern basis on date. Dr. Sriram gave us an insight of a new field that we were not aware and it was interesting.

The sessions were very lively and the instructor was very enthusiastic despite the classes being on a virtual setup, which made us interested in learning and also to pursue the research work in the same field like Dr. Sriram. It was a new content for us and we have some knowledge about new software to use also. The professor was very enthusiastic in teaching his classes so that we get all the content in this course properly. It was a new learning experience.

It gave us information about a very new field which we earlier didn't know much about. The teaching was very clear and supported by informative presentations and other materials. All the content was based on the latest research which made it more practical. The involvement of different statistics and previous projects done enhanced the importance of the topic as well as enhanced our understanding of it. There were question sessions after every topic which prompted us to think out of the box and also to understand the topic better.

The grading of the course was based on our understanding, analysis and presentation rather than tedious tests based on memory. We appreciate that there was a lab component in the course as it gave us a headstart in learning many valuable skills like finite element modelling using Hyperworks. The hands on session gave us an experience to learn how modelling of different body parts can be done and how they can be analyzed.

The course opened up new interests for us, and helped us to think practically. Dr. Sriram was very helpful and patient and his PhD students were very friendly and helpful too. Overall this was a wonderful course and we had a very good learning experience.

OPEN BOOK TEST

1.Open Book testing lecture

Date	Title	Speaker	Affiliation
Jul 29, 2020	Open Book Assessment and Digital Bloom's Taxonomy	Dr Raja Murugadoss	Vice Principal GMR Institute of Technology Andhra Pradesh
August 06, 2020,	Open Book Assessment Practices	Dr Dinesh Bhatia	Associate Professor Department of Biomedical Engineering North Eastern Hill University, Shillong, Meghalaya.

2.a) List of subjects in which open book testing has been attempted, in BME (1st July 2020- 30th June 2021).

Semester	Course code	Course Title
UG		
VII	EC8093	Digital Image Processing
PG		
II	PMD1201	Applied Medical Image Processing

II	PMD1202	Medical Imaging and Radiotherapy
II	PMD1203	Biomechanics
II	PMD1224	Machine Learning Techniques
II	PMD1231	Brain Computer Interface and its application

b) General feedback from students

The students have been informed from which books the questions may be asked. Because of this approach they were able to complete the task within the given timeframe.

- The students have taken it up well and found this concept interesting.
- Due to the increased difficulty levels, they were not able to score much compared to the regular tests.

ONLINE COURSES

Approximate number of courses done by a) students and b) faculty in Coursera courses (1st July 2020- 30th June 2021)..

Number of students	Number of courses		Number of faculty	Number of courses
100	88		7	19

Note: The number of courses in the column refers to the number of unique courses attended and if more students had attended the same course, the course count was considered to be 1.

INTERNSHIPS

Number of internships (1st July 2020- 30th June 2021)

Year	Internships done physically	Internships done remotely
II	0	5
III	4	39
IV	0	10