1. Conditions for Admission

Candidates for admission to the first year of the four-semester M.E./M.Tech. Degree programme in Engineering shall be required to have passed B.E./B.Tech. degree of Annamalai University or any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time. The admission for M.E. Part-Time programme is restricted to those working or residing within a radius of 90 km from Annamalainagar. The application should be sent through their employers.


<table>
<thead>
<tr>
<th>Department</th>
<th>Programme (Full Time &amp; Part time)</th>
<th>Eligible B.E./B.Tech Programme</th>
</tr>
</thead>
</table>

3. Courses of study

The courses of study along with the respective syllabi and the scheme of Examinations for each of the M.E / M. Tech programmes offered by the different Departments of study in the Faculty of Engineering and Technology are given separately.

4. Choice Based Credit System (CBCS)

The curriculum includes three components namely Program Core, Program Electives and Open Electives, Mandatory Learning Courses and Audit Courses in addition to Thesis. Each semester curriculum shall normally have a blend of theory and practical courses.

5. Assignment of Credits for Courses

Each course is normally assigned one credit per hour of lecture / tutorial per week and 0.5 credit for one hour of laboratory or project or industrial training or seminar per week. The total credits for the programme will be 68.

6. Duration of the programme

A student of M.E / M.Tech programme is normally expected to complete in four semesters for full-time / six semesters for part-time but in any case not more than four years for full-time / six years for part-time from the date of admission.
7. Registration for Courses
A newly admitted student will automatically be registered for all the courses prescribed for the first semester, without any option. Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day. Registration for the Thesis Phase - I and Phase-II shall be done at the appropriate semesters.

8. Electives
8.1 Program Electives
The student has to select two electives in first semester, another two electives in the second semester and one more in the third semester from the list of Program Electives.

8.2 Open Electives
The student has to select two electives in third semester from the list of Open Electives offered by the Department and / or other departments in the Faculty of Engineering and Technology.

8.3 MOOC (SWAYAM) Courses
Further, the student can be permitted to earn credits by studying the Massive Open Online Courses offered through the SWAYAM Portal of UGC with the approval of the Head of the Department concerned. These courses will be considered as equivalent to open elective courses. Thus the credit earned through MOOC courses can be transferred and considered for awarding Degree to the student concerned.

8.4 Value Added Courses (Inter Faculty Electives)
Of the two open elective courses, a student must study one value added course that is offered by other Faculties in our University either in second or third semester of the M.E programme.

9. Industrial Project
A student may be allowed to take up the one program elective and two open elective courses of third semester (Full Time program) in the first and second semester, to enable him/her to carry out Project Phase-I and Phase-II in an industry during the entire second year of study. The condition is that the student must register those courses in the first semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

10. Assessment
10.1 Theory Courses
The break-up of continuous assessment and examination marks for theory courses is as follows:

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<tr>
<th>Assessment Type</th>
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<tr>
<td>First assessment (Mid-Semester Test-I)</td>
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<td>Second assessment (Mid-Semester Test-II)</td>
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<td>Third Assessment</td>
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<tr>
<td>End Semester Examination</td>
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</table>
10.2 Practical Courses

The break-up of continuous assessment and examination marks for Practical courses is as follows:

First assessment (Test-I) : 15 marks
Second assessment (Test-II) : 15 marks
Maintenance of record book : 10 marks
End Semester Examination : 60 marks

10.3 Thesis work

The thesis Phase I will be assessed for 40 marks by a committee consisting of the Head of the Department, the guide and a minimum of two members nominated by the Head of the Department. The Head of the Department will be the chairman. The number of reviews must be a minimum of three per semester. 60 marks are allotted for the thesis work and viva voce examination at the end of the third semester. The same procedure will be adopted for thesis Phase II in the fourth semester.

10.4 Seminar / Industrial Training

The continuous assessment marks for the seminar / industrial training will be 40 and to be assessed by a seminar committee consisting of the Seminar Coordinator and a minimum of two members nominated by the Head of the Department. The continuous assessment marks will be awarded at the end of the seminar session. 60 marks are allotted for the seminar / industrial training and viva voce examination conducted based on the seminar / industrial training report at the end of the semester.

11. Student Counselors (Mentors)

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counselor (mentor) for those students throughout their period of study. Such student counselors shall advise the students in selecting open elective courses from, give preliminary approval for the courses to be taken by the students during each semester, and obtain the final approval of the Head of the Department monitor their progress in SWAYAM courses / open elective courses.

12. Class Committee

For each of the semesters of M.E / M.Tech programmes, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from first to fourth semesters for Full time and first to sixth semesters for Part-time will be as follows:

- Teachers of the individual courses.
- A Thesis coordinator (for Thesis Phase I and II) shall be appointed by the Head of the Department from among the Thesis supervisors.
- A thesis review committee chairman shall be appointed by the Head of the Department
• One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.

• The Head of the Department may opt to be a member or the Chairman.

• All counselors of the class and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.

The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory courses / 40 marks for practical courses, for Industrial Training and for Thesis work (Phase-I and Phase-II) will be finalized for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of Examinations.

13. Temporary Break Of Study

A student can take a one-time temporary break of study covering the current semester and / or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire programme within the maximum period of four years for Full time / six years for Part time.

14. Substitute Assessments

A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end of semester examination may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

15. Attendance Requirements

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register and repeat the same semester in the subsequent academic years.
16. Passing and declaration of Examination Results

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average (GPA) and cumulative grade point average (CGPA) and prepare the mark sheets.

- 90 to 100 marks Grade ‘S’
- 80 to 89 marks Grade ‘A’
- 70 to 79 marks Grade ‘B’
- 60 to 69 marks Grade ‘C’
- 55 to 59 marks Grade ‘D’
- 50 to 54 marks Grade ‘E’
- Less than 50 marks Grade ‘RA’
- Withdrawn from the Examination Grade ‘W’

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

- S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; RA - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.
CGPA is similarly calculated considering all the courses taken from the time of admission.

17. Awarding Degree

After successful completion of the programme, the degree will be awarded with the following classifications based on CGPA.

For First Class with Distinction the student must earn a minimum of 68 credits within four semesters for full-time / six semesters for Part time from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must earn a minimum of 68 credits within two years and six months for full-time / three years and six months for Part time from the time of admission and obtain a CGPA of 6.75 or above.

For Second class, the student must earn a minimum of 68 credits within four years for full-time / six years for Part time from the time of admission.

18. Ranking of Candidates

The candidates who are eligible to get the M.E / M.Tech degree in First Class with Distinction will be ranked on the basis of CGPA for all the courses of study from I to IV semester for M.E / M.Tech full-time / I to VI semester for M.E / M.Tech part-time.

The candidates passing with First Class and without failing in any subject from the time of admission will be ranked next to those with distinction on the basis of CGPA for all the courses of study from I to IV semester for full-time / I to VI semester for M.E / M.Tech part-time.

19. Transitory Regulations

If a candidate studying under the old regulations M.E. / M.Tech could not attend any of the courses in his/her courses, shall be permitted to attend equal number of courses, under the new regulation and will be examined on those subjects. The choice of courses will be decided by the concerned Head of the department. However he/she will be permitted to submit the thesis as per the old regulations. The results of such candidates will be passed as per old regulations.

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

M.E. REHABILITATIVE INSTRUMENTATION

VISION

To nurture higher echelons of technology through participative education, innovative and collaborative research with a view to bring out employable graduates of International standard.

MISSION

To establish state of art facilities related to diverse dimension in the field of Instrumentation Engineering, Biomedical Engineering and Microelectronics and MEMS.
To foster higher quality of education with equivocal focus in theory and practical areas of Electronics, Control and Instrumentation Engineering, Biomedical Engineering and Microelectronics and MEMS.

To ensure that the dissemination of knowledge reaches the stakeholders and forge the opening of a fresh flair of human resources.

To create opportunities for advancements in different facets of this discipline and offer avenues to reach the citadels of one’s career.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The major objectives of the M.E (Rehabilitative Instrumentation) programme are to implement Science and Engineering principles in the broad area of medical instrumentation to improve healthcare delivery to human in association with physicians and surgeons and prepare them for:

- Comprehend the fundamental concepts in Bio Medical Engineering.
- Apply knowledge of Engineering, biology, and Biomechanical principles to the design, development, and evaluation of various medical devices for cost effective diagnosis and treatment of various ailments.
- To help the society and specifically the physically challenged person for their comfortable life style.

PROGRAMME OUTCOMES (PO)

A student who has undergone the M.E (Rehabilitative Instrumentation) program would have acquired abilities to

1. Possess a good knowledge of basic science (including medicine), mathematics & Engineering required for specific topics in Rehabilitation Engineering.
2. Have skill to use of different types of sensors and measurement of various physiological parameters.
3. Possess ability to provide effective solutions through data interpretation, design & implementation (as applicable to a given topic/scenario).
4. Able to identify the latest tools (hardware &/or software/program &/or materials) available, towards an effective biomedical solution to a given problem.
5. Understand the current healthcare necessities & the associated multidisciplinary environment and sustainability, and an ability to provide appropriate engineering-solutions especially for Physically Challenged persons.
6. Able to take leadership in investigating complex healthcare problems by putting together, a cohesive multidisciplinary team.
7. Able to understand about various imaging modalities used in the Hospitals.
8. Learn some of the latest techniques that can be applied to research.
9. Focus the experience through Hospital training and projects in one or more areas of advanced research.
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## M.E. REHABILITATIVE INSTRUMENTATION (FULL-TIME)

### COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION – 2019)

#### SEMESTER I

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Total 40 60 100 15

Note: * - Four weeks during the summer vacation at the end of II\(^{nd}\) Semester.

**L:** Lecture, **P:** Practical, **T:** Tutorial, **CA:** Continuous Assessment, **FE:** Final Examination, **Tr:** Training, **S:** Seminar, **Pr:** Project work

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| RI | M.E Specialization Code |

## M.E. REHABILITATIVE INSTRUMENTATION (PART-TIME)

**COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION – 2019)**

### SEMESTER I

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<tr>
<th>Course Code</th>
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# LIST OF AUDIT COURSES FOR M.E. (FULL-TIME)

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SYLLABUS

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COURSE OBJECTIVES

To understand basics of Human Anatomy and Physiology.

To understand different physiological processes taking place inside human body.

To impart knowledge on cell divisions, blood vascular system, ductless/endocrine glands, digestive system and nervous system and familiarize medical physiology to the students.

To apply this knowledge into biomedical engineering field.


**REFERENCES**

**COURSE OUTCOMES**
By successfully completing this course, students will be able to:

1. Describe and explain specific parts and key terms applied in anatomy and physiology.
2. Describe important physiological mechanisms involved in cell, tissue, and organ.
3. Understand organisation and functions of each organs and systems in human body.
4. Correlate the knowledge of medicine and engineering for the development of various instruments.
5. Understand the diseases associated with various parts of the body.

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**COURSE OBJECTIVES**
- To impart knowledge on impairment, sensory and auditory rehabilitation, orthopaedic prosthetics and orthotics in rehabilitation.
- To study basics of Rehabilitation Engineering.
- To study various orthotic & prosthetic devices.
- To understand various assistive technology for vision & hearing.

Anthropometry: Static and dynamic Measurements – Area – movement, measurement of Muscular Strength and Capabilities.


REFERENCES

COURSE OUTCOMES
By the end of this course the student will be able
1. To design rehabilitation aid and apply them with confidence, to help the challenged people.
2. To build foundation for learners enabling the learners to pursue higher studies with specialization in Rehabilitation Engineering.
3. To design rehabilitation aids and its understanding.
4. To have a thorough understanding of aids which can be useful with the societal needs.
5. To apply and test the developed products and automate it.
COURSE OBJECTIVES

- To understand the research problem formulation and analyze research related information.


**Effective literature studies**: Approaches, analysis Plagiarism, Research ethics.

**Effective technical writing**: How to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.


**New Developments in IPR**: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

**References**


**Course Outcomes:** At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

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**LIST OF EXPERIMENTS**

1. Representation of basic signals.
2. Linear convolution.
3. Autocorrelation and cross correlation.
5. Difference equation Representation of systems using Matlab.
6. Digital IIR Butterworth filter – LPF & HPF.
7. Digital IIR chebychev filter – LPF & HPF.
8. Design of FIR filter using windowing technique.
9. Upsampling and downsampling of Biosignals.
10. Analysis of ECG.
11. Analysis of EEG.
12. Analysis of PCG.

### LIST OF EXPERIMENTS

1. Temperature measurement using AD590 IC sensor
2. Displacement measurement by using a capacitive transducer
3. Study of the characteristics of a LDR
4. Pressure and displacement measurement by using LVDT
5. Study of a load cell with tensile and compressive load
6. Torque measurement Strain gauge transducer
7. Study & characterization of Biotransducers – Pressure, Temperature, Humidity
8. Study & characterization of Bioelectrodes – ECG, EMG, EEG
9. Study & characterization of Biotransducers – Tactile, Respiration, eyeball movement
10. Study of Gait Analysis

### COURSE OBJECTIVES

- To gain basic knowledge about the concepts of control systems and study its application in physiological modeling.
- To understand the system concepts and different mathematical modeling techniques applied in analyzing any given system.
- To understand basic concepts of modeling for designing biological model.
- To train and motivate students for pursuing higher education and research for developing cutting edge technologies.


**Biological control system:** Introduction – dynamical systems – modeling – similarities between biological and engineering control system – biological receptors and receptor characteristics. The pupil control systems: General structure – dynamic response characteristics – open and closed loop instability – automatic aperture control.

**Human thermal system:** Basic concepts – modelling – thermo regulation – cold and warm bloodedness – lumped and partial differential equations. Case Study: Heat transfer example. Modeling the body as compartment: behavior in simple
compartmental system – pharmaco kinetic model – urea distribution model. Multi compartmental system: Dissolution of drugs in solid form – distribution and accessibility of body water and tissue compartments – basis for zero and first order chemical kinetic behavior in the biological system.

**Modeling of human thermal regulatory system:** Parameters involved – control system model – biochemistry of digestion – types of heat loss from body – heat transfer models – subsystems of human body like skin, core.

**Case Study Applications:** Cardiac rate – blood pressure – respiratory rate – mass balancing of lungs – oxygen uptake by RBC and pulmonary capillaries – oxygen and carbon dioxide transport in blood and tissues.

**REFERENCES**

**COURSE OUTCOMES**
Students will be able to
1. Understand the concepts of modeling.
2. Design control strategies for various organ functioning.
3. Analyse the causes for malfunctioning of organs.
4. Analyse and do research in the micro level for diagnosing the diseases.
5. Theoritically diagnose the kind of diseases for their understanding from the case studies.

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COURSE OBJECTIVES

To understand the principles and biology underlying the design of implants and artificial organs.

To understand the fundamentals of materials used for manufacturing implants, prosthesis and orthoses that has wide application in healthcare industry.

**Bio materials:** Definition of biomaterials – Requirements of biomaterials – classification of biomaterials – Comparison of properties of some common biomaterials – Effects of physiological fluid on the properties of biomaterials – Biological responses (extra and intra – vascular system). Surface properties of materials – physical properties of materials – mechanical properties – Biomaterial outlook for organ transplant, design considerations.

**Introduction to artificial organs:** Biomaterials used in artificial organs and prostheses – inflammation, rejection, correction. Rheological properties of blood – blood viscosity variation – effect of shear rate – hematocrit – temperature and protein contents – Casson equation – flow properties of blood through the blood vessels – problems associated with extracorporeal blood flow.


REFERENCES


**COURSE OUTCOMES**

Student will be able to

1. Understand the concept of biocompatibility and the methods of biomaterial testing.
2. Awareness about the testing of the biomaterials done biologically before implantation in the human body.
3. Gain knowledge in the existing designs of artificial organs.
4. Understanding the applications of the organs implants.
5. Develop additional features in the existing instruments.

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**LIST OF EXPERIMENTS**

1. Respiratory system analysis using Spirometer.
2. ECG wave analysis using simulator.
3. Real time patient monitoring system.
4. 12 – lead ECG measurement System.
5. EMG Biofeedback with NCV.
6. EMG Measurement system.
7. Auditory system check up using Audiometer.
8. ECG heart rate system with HRV.
9. Heart sound measurement using PCG.
12. Design of Medical Amplifier.

**COURSE OBJECTIVES**

- To train the students in the field work related to Rehabilitative Instrumentation and to have a practical knowledge in carrying out Rehabilitative Instrumentation field related works.
To train and develop skills in solving problems during execution of certain works related to Rehabilitative Instrumentation.

The students individually undergo a training program in reputed concerns in the field of Rehabilitative Instrumentation during the summer vacation (at the end of second semester for full-time/fourth semester for part-time) for a minimum stipulated period of four weeks. At the end of the training, the student has to submit a detailed report on the training they had, within ten days from the commencement of the third semester for Full-time/fifth semester for part-time. The students will be evaluated by a team of staff members nominated by head of the department through a viva-voce examination.

COURSE OUTCOMES
1. The students can face the challenges in the practice with confidence.
2. The student will be benefited by the training with managing the situation arises during the execution of works related to Rehabilitative Instrumentation.

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COURSE OBJECTIVES
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.

COURSE OUTCOMES
Upon completion of this course, the students will be able to:
1. Take up any challenging practical problems and find solution.

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COURSE OBJECTIVES
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.

COURSE OUTCOMES
Upon completion of this course, the students will be able to:
1. Take up any challenging practical problems and find solution.

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**COURSE OBJECTIVES**

- To study the production of X-rays and its application to different medical imaging techniques.
- To study the different types of Radio diagnostic techniques.
- To study the special imaging techniques used for visualizing the cross sections of the body.
- To study the imaging of soft tissues using ultrasound technique

**Introduction to Driving problems in biomedical imaging:** Signal input – image matrix, digital image quality – digital image processing – picture archiving and communication system (PACS) – sources of imaging data acquisition and noise – elementary image processing – Grenander’s Pattern Theory.


generator production. Rectilinear scanners – Linear scanners – SPECT – PET – Gamma Camera – Comparison of other tomographic techniques.


**REFERENCES**


**COURSE OUTCOMES**

Student will

1. Get the clear domain knowledge about the various Medical Imaging techniques.
2. To understand the various diagnostic applications of the medical imaging techniques.
3. To apply the imaging modalities in the medical hospitals.
4. To use the advanced techniques to diagnose the health problems.
5. Use their knowledge to use advanced Instruments for imaging.

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**COURSE OBJECTIVES**

- To understand the basic principle, working and design of various automated diagnostic equipments.
- To develop skills enabling Biomedical Engineers to serve Hospitals, National and International Industries and Government Agencies.
- To develop core competency in the field of Biomedical Engineering to gain technical expertise in biology and medicine for effective contribution in the development and improvement of health care solutions.
• To study various medical instrumentation systems, drug delivery systems and health management systems.


**Diagnosis:** Basic principles of echo technique – display techniques A, B and M mode – ultrasound as diagnostic tool – echocardiogram – abdomen – obstetrics – gynaecology – ophthalmology.


**REFERENCES**

**COURSE OUTCOMES**
Student will be able to
1. Demonstrate the principles of electronics used in designing various diagnostic equipment.
2. Have in-depth knowledge about different streams in Biomedical Engineering with greater emphasis on health care equipments and the advanced technologies such as Telemedicine, Telemetry, Medical Imaging, etc.
3. Provide a better technical support with exposure to the hospitals and health care industry.
4. Understand the various techniques and applying for the betterment of the patients.

5. Understand critical care units and its importance

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### COURSE OBJECTIVES

- Neural engineering and rehabilitation research applies neuroscience and engineering methods to analyze central and peripheral nervous system function and to design clinical solutions to neurological disorders or injury.
- To study the basics of Nervous system.
- To understand the development and arrangement of neural tissue.
- To study the neuronal disorders and injuries.
- To study the repairing and reconstruction mechanism of nervous system.


**Equivalent circuit model:** Electromotive, resistive and capacitive properties of cell membrane, change in membrane potential with distance, voltage clamp experiment and Hodgkin and Huxley’s model of action potential.


of learning – variations for the Hebbian rule. Long term synaptic potentiation and depression. Synaptic plasticity on different time scales.


**REFERENCES**

**COURSE OUTCOMES**
Through this course of study students will be able to
1. Understand the application of basic science and engineering techniques.
2. Develop methods to record from and exert control over the nervous system.
3. Understand and develop the models of associated organ systems.
4. Can carryout research in the analysis of memory of physiological systems.
5. Apply clinically for validation through research

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**COURSE OBJECTIVES**
- Cancer Modelling is to analyze the origin of cancer and basics of Molecular Biology.
- To study the cause for Cancer.
- To understand the depth understanding of development of Cancer.
• To study the various types of cancer and its treatment methods.
• To study and design the mathematical models of various cancer.

**Cancer:** Definition, Benign Tumors Vs. Malignant Tumors, Types of Cancer, Common Symptoms, Molecular Hallmarks of Cancer – Growth Signal Autonomy, Evasion of Growth Inhibitory Signals, Evasion of Apoptosis (Programmed Cell Death), Unlimited Replicative Potential, Angiogenesis (Formation of New Blood Vessels), Invasion and Metastasis, Molecular Basis of Cancer – Cancer Genes (Oncogenes and Tumor Suppressor Genes), Carcinogenesis – A Multistep Process, Evidences for Multistage Models of Carcinogenesis

**Global Cancer Incidence and Mortality:** Data Source and Measurements, Overall Cancer Risk, Incidence and Mortality Patterns for Common Cancers, Issues in Interpreting Temporal Trends, Analytical Methods for Epidemiological Studies – Ecological Studies, Cross – Sectional Studies, Cohort Studies, Case – Control Studies, Interpretation of Epidemiology Findings, Molecular Epidemiology


**REFERENCES**

COURSE OUTCOMES

Through this course of study students can able to

1. Understand the basics of molecular biology and cancer.
2. Analyse how Cancer develops and progresses.
3. Design the mathematical modelling and the causes of cancer can be analysed.
4. Understand various treatments methods and Imaging of cancer and the research problems can be solved to the extent.
5. Do research in the area of cancer modeling

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COURSE OBJECTIVES

- To build a strong base for developing algorithms for signal processing systems and Imaging systems.
- To develop competency in terms of logical thinking, programming and application skills.
- To train and motivate students for pursuing higher education and research for developing cutting edge technologies.


Adaptive filters: Principle noise canceller model – 50 Hz adaptive cancelling using a sine wave model – maternal ECG cancellation in fetal electrocardiography –


**REFERENCES**

**COURSE OUTCOMES**
Student will be able to
1. Understand the fundamental techniques and applications of digital signal processing with emphasis on biomedical signals.
2. Implement algorithms based on discrete time signals.
3. Understand Circular and linear convolution and their implementation using DFT analyse signals using discrete Fourier transform.
4. Understand efficient computation techniques such as DIT and DIF FFT algorithms.
5. Analyse the biological signals for the scope of diagnosis

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**COURSE OBJECTIVES**
- To familiarize the student with various transportation mechanism in living systems.
• To understand the concepts of organs.
• To study about the internal organs.

Introduction

Organization of the human body – cells – tissues – different organs.

**Heat transport:** Body temperature regulation based on thermostat principle and its operation – transportation in tissues – muscle, skin and other organs in different environmental temperatures.

**Transportation of fluids:** Blood transport through internal organs – urogenitary – cardio pulmonary and central nervous system.

**Gastro intestine system:** Diffusion – osmosis – electro osmosis – ultra filtration – reverse osmosis through natural membrane and artificial synthetic membranes.

**Lymph:** Transportation through internal organs, urogenitary, cardio pulmonary, central nervous and gastro intestine systems. Problems on lymph transfer in human body.

**Mass transfer:** Constituents of blood, urine, mass transfer in kidney, skeletal, nervous, gastro intestine and cardio pulmonary systems. Comparison with artificial organs.

REFERENCES


COURSE OUTCOMES

Student will be able to

1. Understand the internal organs.
2. Understand the organs functioning in detail.
3. Know the Physics involved in the body fluids.
4. Understand in depth knowledge of human systems.
5. Know about the minarels and liquids present in the body.

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COURSE OBJECTIVES

To familiarize the student with cancer and Molecular biology.


REFERENCES


COURSE OUTCOMES

Student will be able to

1. Have clear understanding of basics of cancer and its types.
2. Understand the causes of Cancer.
3. Analyse the modalities for the detection of Cancer.
4. Develop cancer detecting modules.
5. Help the society by the developed products.

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**COURSE OBJECTIVES**

To study about the Mathematical Modelling.
- To have knowledge on the Anatomy and physiology of Bones.
- To know how Cancer develops in Bones and affects its function.


**Abstract Models:** phase model – rate model – McCulloch – Pitts neuron – integrate and fire neuron model. Synapses and synaptic plasticity – simplified and phenomenological models of synaptic functions. Synaptic transmission: electrical
and chemical. Gated transmission at the nerve muscle synapse and central synapses – neurotransmitters.

REFERENCES

COURSE OUTCOMES
Student will be able to
1. Understand the types of bone tissues and its structures.
2. Analyse the causes of Bone Cancer.
3. Model the different types of bones and Cancer affected Bones.
4. Do research on the theraptics on Bone Cancer.
5. Design new modalities for diagnosis with study analysis.

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COURSE OBJECTIVES
- To acquire knowledge about the various medical imaging techniques.
- To understand the fundamental principle and working of the medical imaging systems involved in the diagnosis of health care.


Tomography: Principle, Plane of Movement, Multisection Radiography, Computerised Axial Tomography, Type of Detection, image reconstruction, Spiral CT, Transverse Tomography, 3D Imaging.

Emission Imaging: Alpha, Beta, Gamma Emission, different types of Radiation Detectors, G.M. & Proportional Counters, Pulse Height Analysers, Isotopic, Scanners, Isotopic Diagnosis of RBC Destruction Rate, GI Bleedings Iron
Concentration, Liver Functions, Functions of Gamma Camera, PET, SPECT, PET/CT.

**Magnetic Resonance Imaging:** Principle of MRI, MRI instrumentation, Imaging Different Sections of the Body, Tissue Characterization, MR Spectroscopy, Functional MRI.

Therapy Using X–Rays and Isotopes 9 Direct and Indirect effects of high energy radiation, Units for radiation Exposure, Depth Dose curves, Linear Accelerator Betatron, Cobalt and Cesium Therapy, Computation of Absorbed Dose Level, Automatic Treatment Planning, Hazardous Effects of Radiation, Radiation measuring units, Allowed Levels, ICRP regulation Protection Methods.

**REFERENCES**


**COURSE OUTCOMES**

Student will be able to

1. Understand the different methods and modalities used for medical imaging.
2. Learn the preferred medical imaging methods for routine clinical applications.
3. Understand the engineering models used to describe and analyze medical images.
4. Apply these tools to different problems in medical imaging.
5. Develop drugs with the research Analysis

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**19EIRIPEXX / 19PEIRIPEXX**

**WAVELET TRANSFORMS AND ITS APPLICATIONS**

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COURSE OBJECTIVES

To learn the fundamental concepts of wavelet
To apply the wavelet techniques for various biomedical signals.
To do analysis with the signals and processing

Introduction to Wavelets: Introduction to Multirate signal processing – Decimation and Interpolation, Quadrature Mirror Filters, Subband coding, Limitations of Fourier transform, Short time Fourier transform and its drawbacks, Continuous Wavelet transform, Time frequency representation, Wavelet System and its characteristics, Orthogonal and Orthonormal functions and function spaces.

Multiresolution Concept and Discrete Wavelet Transform: Multiresolution formulation of wavelet systems – signal spaces, scaling function, wavelet function and its properties, Multiresolution analysis, Haar scaling and wavelet function, Filter banks – Analysis and Synthesis, 1D and 2D Discrete wavelet transform, Wavelet Packets, Tree structured filter bank, Multichannel filter bank, Undecimated wavelet transform.


Wavelet Applications: Denoising of Signals and Images, Image enhancement, Edge detection, Image Fusion, Image compression, Wavelet based feature extraction, Analysis of phonocardiogram signals, Analysis of EEG signals, Speech enhancement for hearing aids.

REFERENCES


COURSE OUTCOMES

Student will be able to

1. Understand an in-depth knowledge about the basic concepts of wavelet and speech analysis
2. Apply wavelet for various physiological signals
3. Analyse the signal features and its functions
4. Do mathematical analysis on various types of Bio signals
5. Develop new algorithms for early diagnosis

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COURSE OBJECTIVES

To impart knowledge on various aspects of bioinformatics.

To study in detail about DNA and its formation.

**Basic Concepts of Molecular Biology:** Cells – Chromosomes, DNA, RNA, Proteins, Central dogma of molecular biology, Genomes and Genes – Genetic code, Transcription, Translation and Protein synthesis. Web based genomic and proteomic data bases: NCBI, Gen Bank.


**Gene structure in Prokaryotes and Eukaryotes:** Molecular Structure Prediction – Basic concepts and terminologies related to molecular structures – Basic molecular Visualization – RNA secondary structure prediction – Protein folding problem – Protein Threading – Protein Visualization – Introduction to Drug Discovery.

**Software Tools:** Use of Tools for basic and specialized sequence processing such as: BLAST, FASTA, RasMol, Phylip, Clustal W.

**REFERENCES**


COURSE OUTCOMES
Student will be able to
1. Understand the concept of Gene structures.
2. Acquire awareness about the computational biology.
3. Work with various software tools.
4. Understands the various aspects of informatics applied in health industry so that quality of health care is improved.
5. Analyse the gene formations and diseases.

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COURSE OBJECTIVES
Achieve familiarity with some basic ethical framework & understand how these ethical frame works can help us to think through contemporary questions in medical ethics.

Students will be able to know about the legal and ethical principles and application of these principles in health care settings & gain knowledge about the medical standards that to be followed in hospitals.

**Introduction to Medical Ethics:** Definition of Medical ethics, Scope of ethics in medicine, American medical Association code of ethics, CMA code of ethics – Fundamental Responsibilities, The Doctor and The Patient, The Doctor and The Profession, Professional Independence, The Doctor And Society.


**Hospital Accreditation Standards:** Accrediation – JCI Accreditation & its Policies. Patient centered standards, Healthcare Organization management standards.

**Medical Equipment Safety Standards:** General requirements for basic safety & essential performance of medical equipments. IEC 60601 standards – Base Standard – general requirement of electrical medical devices, Collateral Standards EMC radiation protection & programmable medical device system, Particular Standards – type of medical device.

**REFERENCES**


**COURSE OUTCOMES**

Upon completion of this course the student should be able to demonstrate a measurable increase in their knowledge, skills and abilities related to:

1. Legal and professional guidelines for the health professions.
2. Public duties and consent.
3. Guidelines to obtain medical standards in hospitals.
4. Medical ethics, legal ethics and the differences associated with the medical society.
5. Standards for the devices.

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19EIRIOEXX/ 19PEIRIOEXX

COMPUTERS IN MEDICINE

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COURSE OBJECTIVES

To familiarize the student with use of computers in medicine
To use computers for bio signal analysis
To automate the hospitals with the help of computers


Computer aids for the handicapped: basic discussion with examples – introduction to computer assisted instruction in medicine – ISDN in medicine.

REFERENCE


COURSE OUTCOMES

Student will be able to
1. Exposed to PC hardware as well as various microprocessor family.
2. Hardware behind data acquisition.
4. Develop insight knowledge about the biometrics and network security.
5. Automate the existing systems with computers.

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COURSE OBJECTIVES

To understand basics of Tissue Engineering.

To understand fundamentals of cell mechanisms.

To teach the Physical & biological principles that serve as the scientific basis for understanding the interactions of biological molecules and cells with biomaterials employed for the fabrication of permanent implantable prostheses and as matrices for tissue engineering.

To understand application of Tissue Engineering.

**Tissue:** Definition – structure – organization and types. Vascularity and angiogenesis – basic wound healing – cell migration – therapeutic and in vitro testing.


**Case study:** cell transplantation for liver – musculoskeletal – cardiovascular and neural systems. Ethical – FDA and regulatory issues of tissue engineering.


REFERENCES


COURSE OUTCOMES

By successfully completing this course, students will be able to:

1. Understand the importance of tissue engineering in the field of biomedical engineering.
2. Understand the mechanisms involved in interaction of different materials with cells and tissues.
3. Explain different methods involved in characterization and preparation of biomaterials in tissue engineering.
4. Apply the knowledge in creating new models in drug delivery systems using synthetic and basic knowledge on stem cells and its various functional applications and therapy.
5. Design an implant for tissue replacement.

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COURSE OBJECTIVES

To understand the generation of X-ray and its uses in imaging
To know the techniques used for visualizing various sections of the body.
To learn the principles of different radio diagnostic equipment in Imaging
To discuss the radiation therapy techniques and radiation safety.


**REFERENCES**


**COURSE OUTCOMES**

The student is exposed to the

2. Various imaging modalities and current techniques.
3. Radiation safety and precautions to be followed in the Hospitals.
5. Knowledge of radiation and its effects.

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**COURSE OBJECTIVES**

- To teach the key principles of sports medicine education.
- To enable the students with the knowledge of Biomechanics for the muscles and bones.
- To elaborate about the classification of sports injuries and physiological exercises.


**Sports Injuries:** Terminology and classification of common sports soft tissue injuries, Pathological changes in sprains, strain and contusion and their
management. Regional injuries and their management—injuries of head, ears, eyes, nose, back, shoulders, elbows, hand, abdomen, thighs, knee, leg and ankle.

Rehabilitation procedures of sports injuries, Principles of rehabilitation of injuries, Therapeutic modalities i.e cryotherapy, hydrotherapy, electrotherapy and lesser therapy. Massage and its techniques.

Physiology of exercise, short and long term effects of exercise on muscular tissues, Physiological principles of development of strength, endurance, speed and flexibility.

Heart role and exercise. Threshold for training effects on heart, Cardiac reserve capacity, blood pressure and exercise. Lungs ventilation during rest and exercise, change in lungs diffusions during muscular activities.

REFERENCES

COURSE OUTCOMES
The student is exposed to the
1. Awareness in sport Medicine.
2. Techniques to be applied for sports injuries.
3. Applications of Medical techniques for athlete.
4. Physiological exercises for various human systems and developmental strength.
5. New ideas for design projects.

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COURSE OBJECTIVES
- Neural engineering and rehabilitation research applies neuroscience and engineering methods to analyze central and peripheral nervous system function and to design clinical solutions to neurological disorders or injury.
- To study the basics of Nervous system
- To understand the development and arrangement of neural tissue
- To study the neuronal disorders and injuries
- To study the repairing and reconstruction mechanism of nervous system.


**Equivalent circuit model:** Electromotive, resistive and capacitive properties of cell membrane, change in membrane potential with distance, voltage clamp experiment and Hodgkin and Huxley’s model of action potential.


**REFERENCES**


**COURSE OUTCOMES**

Through this course of study students will be able to
1. Understand the application of basic science and engineering techniques,
2. Develop methods to record from and exert control over the nervous system
3. Understand and develop the models of associated organ systems.
4. Can carry out research in the analysis of memory of physiological systems
5. Apply neural networks for detection and analysis of diseases.

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**COURSE OBJECTIVES**
- To make the student understand health care sector
- To give awareness about hospital set up in a larger perspective with an emphasis on the systems.


**Introduction to Health Care:** A Conceptual Approach to Understanding the Health Care Systems: Evolution – Institutional Settings – Out Patient services – Medical Services – Surgical Services – Operating department – Pediatric services – Dental services – Psychiatric services – Casualty & Emergency services – Hospital Laboratory services – Anesthesia services – Obstetrics and Gynecology services – Neuro – Surgery service – Neurology services.

**Overview of Health Care Sector in India:** Primary care – Secondary care – Tertiary care – Rural Medical care – urban medical care – curative care – Preventive care – General & special Hospitals-Understanding the Hospital Management – Role of Medical, Nursing Staff, Paramedical and Supporting Staff - Health Policy - Population Policy - Drug Policy – Medical Education Policy

**Health Care Regulation:** WHO, International Health regulations, IMA, MCI, State Medical Council Bodies, Health universities and Teaching Hospitals and other Health care Delivery Systems

**Epidemiology Issues:** Epidemiology -Aims – Principles – Descriptive, Analytical and Experimental Epidemiology - Methods - Uses

**REFERENCES**

**COURSE OUTCOMES**

The student is exposed to the

1. Hospital administration.
2. Various environmental challenges in Health care domain
3. History and overview of healthcare system in the country.
4. Understands the regulation and standards.
5. Epidemiology Principles

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**COURSE OBJECTIVES**

To teach the key principles for telemedicine and health.

To enable the students with the knowledge of telemedical standards, mobile telemedicine and its applications.

**Telemedicine, telehealth and telecare:** History of telemedicine – Main phases of telemedicine – Pre electronic telemedicine. Electronic telemedicine Technical Requirements – Type of information and standards, audio, data, Fax, Video Types of communications and networking – networking architecture. POTS, ISDN, ATM Other Fixed networks – Air/airless communications, RF, Microwaves, Satellite, GSM, CDPD (Cellular Digital Packet Data) Acquisition/ displays – Acquisition systems Cameras, Scanners, Other medical specialized acquisition system.

**Display systems:** Analogue devices, LCD, Laser displays, Holographic representations, Virtual screen devices Computation / storage systems: Magnetic, Mixed, Optical (laser) devices (only brief description required).


**Constraints for the wide spread use of telemedicine:** constraints linked to economy, social acceptance Strategic planning for telemedicine implementation. Analysis of the present situation and the demand Objectives and strategies – Plan of implementation, Forces affecting technology transfer scenarios for telemedicine.

**REFERENCES**

**COURSE OUTCOMES**
The student is exposed to the

1. Technologies applied in multimedia using telemedicine.
2. Protocols behind encryption techniques for secure transmission of data.
3. Applications of telehealth in healthcare.
4. Concept of the fundamental concepts necessary to for any telemedicine and telehealth activity.
5. Telemedicine and ways of connecting nodal hospitals

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COURSE OBJECTIVES
To understand the fundamental engineering aspects of modelling Physiological systems.

To utilize concepts derived from biomedical research to aid in the design of engineering systems.

To apply system techniques and methods to biomedical problems.


**Case studies on modeling of physiological system:** Modeling of nerve action potential: Hodgkin – Huxley model.

**Modeling of skeletal muscle contraction:** Huxley Cross Bridge model. Modeling of myoelectrical activity.

**Modeling of cardiovascular system:** Block diagram representation of cardiovascular system.

REFERENCES

**COURSE OUTCOMES**

Student will be able to
1. Acquire an insight into and understanding of the utilization of models, system analysis and analog simulation in the field of bioengineering.
2. Understand basic concepts of modeling for designing biological model.
3. Model and simulate physiological processes for better understanding.
4. Use various simulation softwares for modeling biological systems.
5. Understand micro level analysis of cell signaling.

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**COURSE OBJECTIVES**

- To provide the knowledge of mechanical concepts as applied to human movement.
- To study about the bone structure and cartilage.
- To study the structure, movements, and loads applied to spine, shoulder and hip.
- To study about the fluid mechanic system applied to human body


**REFERENCES**


**COURSE OUTCOMES**

Student will be able to

1. Understand the definition of biomechanics, prostheses orthoses and its classification and design principles.
2. Develop a better understanding of how mechanical principles influence human motion during everyday life.
3. Analyze the forces at joints for various static and dynamic human activities; analyze the stresses and strains in biological tissues.
4. Understand the principles of mechanics that is used to analyze human movement.
5. Analyze the mechanism of joints and bones.
COURSE OBJECTIVES

- To provide knowledge to students to enable them to troubleshoot the various equipments used in hospitals.


Testing of passive components and semiconductor devices:

Testing of passive components & semiconductor devices: resistors, capacitors & inductors, causes of failure for electronic components, testing procedure for semiconductor devices: special diodes, bipolar transistors, field effect transistor (FET), and thyristor.


REFERENCES


COURSE OUTCOMES

Students will be able to
1. Understand the concepts of Medical Equipments.
2. Understand the functioning of equipments and usage in Hospitals.
3. Techniques about various electronic circuits in medical equipments.
4. Troubleshoot the medical devices
5. Applying the service concepts in developing new features

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COURSE OBJECTIVES

- To equip students with basics of design, construction and development process of devices which are used in medical, clinical or laboratory practice

**Introduction to Medical Equipments**: Define medical device, Classification of medical device, Medical devices medical instrumentation, Origin of bio-potential, Physiological signal, Human machine interface, Input output and control signal, Data acquisition, Sensor, Amplification, Medical electrical stimulator.


**Diagnostic Equipment Design**: System description of diagnostic equipment: Patient monitoring system, ECG, EEG, Blood pressure monitor, Digital stethoscope, Thermometer, System description and diagram of pulse oximeter, optical fiber optics for circulatory and respiratory system measurement.

**Therapeutic Equipment Design**: System description of therapeutic equipment: Pacemaker, External cardio vector defibrillator, Implantable cardio vector defibrillator, Deep brain stimulation, Functional electrical stimulator (FES), Hemodialysis delivery system, Mechanical ventilator.

**Implant and Prosthesis**: System description of various implant and prosthesis: Total hip prosthesis, Joint replacement, Design of artificial pancreas, Drug eluting stent and its engineering design - Intraocular lens implant, Cochlear implants, Heart valves.

REFERENCES


**COURSE OUTCOMES**

Students will be able to

1. Understand the basic design of medical devices.
2. Learn various acquisition modules in Medical devices.
3. Learn various therapeutic equipments.
4. Understand the design of implants.
5. Understand more about joint replacements.

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**AUDIT COURSES**

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**COURSE OBJECTIVES**

Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title, Ensure the good quality of paper at very first-time submission syllabus.

Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness


Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the conclusion.

Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.

REFERENCES

COURSE OBJECTIVES

Students will be able to:
- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming.

Introduction Disaster
Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Repercussions Of Disasters And Hazards
Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Disaster Prone Areas In India
Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Disaster Preparedness And Management
Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.
Risk Assessment


Disaster Mitigation Meaning

Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

REFERENCES


COURSE OBJECTIVES

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects
- Enhancing the memory power
- The engineering Scholars equipped with the Sanskrit will be able to explode the huge knowledge from ancient literature.


REFERENCES

1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathamama Deeksha-VempatiKutumbashtra, Rashtriya Sanskrit Sansthanam, New Delhi Publication

COURSE OUTCOMES

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood.
3. Being a global language, will help to develop logic in students.
COURSE OBJECTIVES

- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character


Importance of cultivation of values, Sense of duty, Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.


Character and Competence – Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

REFERENCES

COURSE OUTCOMES

Students will be able to

2. Learn the importance of Human values
3. Developing the overall personality

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COURSE OBJECTIVES:

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**History of Making of the Indian Constitution:**
History, Drafting Committee, (Composition & Working)

**Philosophy of the Indian Constitution:**
Preamble, Salient Features

**Contours of Constitutional Rights & Duties:**

**Organs of Governance:**
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

**Local Administration:**
District’s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments),

Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

**Election Commission**
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**References**
1. The Constitution of India, 1950 (Bare Act), Government Publication.

**COURSE OUTCOMES**
Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.


### COURSE OBJECTIVES

Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

### Introduction and Methodology


### Thematic overview

Pedagogical practices are being used by teachers, in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices

**Methodology for the in depth stage:** quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers’ attitudes and beliefs and Pedagogic strategies.

**Professional development:** alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes.

### Research gaps and future directions

Research design, Contexts, Pedagogy Teacher education, Curriculum and assessment, Dissemination and research impact.

### REFERENCES


**COURSE OUTCOMES**

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.

2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners.

3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

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**COURSE OBJECTIVES**

- To achieve overall health of body and mind
- To overcome stress

**Definitions of Eight parts of yog. (Ashtanga)**

Yam and Niyam

Do`s and Don’ts in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Asan and Pranayam

i) Various yog poses and their benefits for mind & body

ii) Regularization of breathing techniques and its effects-Types of pranayam

**REFERENCES**

1. 'Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur

2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata.

**COURSE OUTCOMES**

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also

2. Improve efficiency

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**COURSE OBJECTIVES**

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

**Neetisatakam-Holistic development of personality**

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

**Approach to day to day work and duties**

- Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

**Statements of basic knowledge.**

- Shrimad Bhagwad Geeta:
  - Chapter2-Verses 56, 62, 68
  - Chapter 12 -Verses 13, 14, 15, 16,17, 18

**Personality of Role model. Shrimad Bhagwad Geeta:**

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63
REFERENCES
1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P. Gopinath,
3. Rashtriya Sanskrit Sansthanam, New Delhi.

COURSE OUTCOMES
Students will be able to:
1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.