

SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.Tech-Biomedical Engineering

CURRICULUM and SYLLABI

[For students admitted in 2020-2021]

B.E / B.Tech Regulation 2019

Approved by BOS and Academic Council meetings

SONA COLLEGE OF TECHNOLOGY, SALEM
(An Autonomous Institution)

Courses of Study for B.E./B.Tech. Semester I under Regulations 2019 (CBCS)

Branch: Biomedical Engineering

| S.No | Course Code | Course Title | L | T | P | C | Category |
|------------------------------------|-------------|---|---|---|---|-----------|----------|
| Theory | | | | | | | |
| 1 | U19ENG101B | English For Engineers - I | 1 | 0 | 2 | 2 | HS |
| 2 | U19MAT102B | Linear Algebra and Multivariable Calculus | 3 | 1 | 0 | 4 | BS |
| 3 | U19PHY103E | Engineering Physics | 4 | 0 | 0 | 4 | BS |
| 4 | U19CHE104G | Engineering Chemistry | 3 | 0 | 0 | 3 | BS |
| 5 | U19PPR105 | Problem Solving using Python Programming | 3 | 0 | 0 | 3 | ES |
| 6 | U19BEE106B | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | PC |
| Practical | | | | | | | |
| 7 | U19PPL111 | Python Programming Laboratory | 0 | 0 | 2 | 1 | ES |
| 8 | U19BEEL113B | Basic Electrical and Electronics Engineering Laboratory | 0 | 0 | 2 | 1 | PC |
| 9 | U19GE101 | Basic Aptitude - I | 0 | 0 | 2 | 0 | EEC |
| Total Credits | | | | | | 21 | |
| Optional Language Elective* | | | | | | | |
| 10 | U19OLE1101 | French | 0 | 0 | 2 | 1 | HS |
| 11 | U19OLE1102 | German | | | | | |
| 12 | U19OLE1103 | Japanese | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson,
Science and
Humanities BoS
Dr.M.Renuga

Chairperson,
Biomedical
Engineering BoS
Dr.R.S.Sabeenian

Member Secretary,
Academic Council
Dr.R.Shivakumar

Chairperson,
Academic Council
& Principal
**Dr.S.R.R.Senthil
Kumar**

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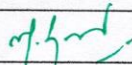
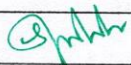
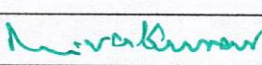

HOD/ Biomedical Engineering, First Semester BE BME Students and Staff, COE

Sona College of Technology, Salem – 636 005
(An Autonomous Institution)
Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | L | T | P | C | Category | Total Contact Hours |
|------------------------------------|-------------|---------------------------------------|---|---|---|-----------|----------|---------------------|
| Theory | | | | | | | | |
| 1 | U19ENG201B | English for Engineers -II | 2 | 0 | 0 | 2 | HSMC | 30 |
| 2 | U19MAT202C | Transforms and Differential Equations | 3 | 1 | 0 | 4 | BSC | 60 |
| 3 | U19CHE204D | Biochemistry | 2 | 0 | 0 | 2 | BSC | 30 |
| 4 | U19EGR206A | Engineering Graphics | 2 | 0 | 2 | 3 | ESC | 60 (30L+30P) |
| 5 | U19BME201 | Biology for Engineers | 3 | 0 | 0 | 3 | PCC | 45 |
| 6 | U19EC202 | Circuit Theory | 3 | 0 | 0 | 3 | PCC | 45 |
| Practical | | | | | | | | |
| 7 | U19WPL212 | Workshop Practice | 0 | 0 | 2 | 1 | ESC | 30 |
| 8 | U19PCL208B | Physics and Chemistry Laboratory | 0 | 0 | 4 | 2 | BSC | 60 |
| 9 | U19GE201 | Basic Aptitude – II | 0 | 0 | 2 | 0 | EEC | 30 |
| Total Credits | | | | | | 20 | | |
| Optional Language Elective* | | | | | | | | |
| 10 | U19OLE1201 | French | 0 | 0 | 2 | 1 | HSMC | 30 |
| 11 | U19OLE1202 | German | | | | | | |
| 12 | U19OLE1203 | Japanese | | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved by

| | | | |
|---|---|--|---|
|  |  |  |  |
| Chairperson, Science and Humanities BoS | Chairperson, Biomedical Engineering BoS | Member Secretary, Academic Council | Chairperson, Academic Council & Principal |
| Dr. M. Renuga | Dr. S. Prabakar | Dr. R. Shivakumar | Dr. S. R. R. Senthil Kumar |

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Sona College of Technology, Salem
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Courses of Study for B.E/B.Tech. Semester III Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|---|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19MAT301B | Probability and Statistics | 3 | 1 | 0 | 4 | 60 |
| 2 | U19BM301 | Electronic Devices and Circuits | 3 | 0 | 0 | 3 | 45 |
| 3 | U19EC301 | Signals and Systems | 3 | 1 | 0 | 4 | 60 |
| 4 | U19BM302 | Anatomy and Human Physiology | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CS307 | Programming in C | 3 | 0 | 0 | 3 | 45 |
| 6 | U19GE303 | Mandatory Course : Essence of Indian Traditional Knowledge | 2 | 0 | 0 | 0 | 30 |
| Practical | | | | | | | |
| 7 | U19BM303 | Electronic Devices and Circuits Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM304 | Anatomy and Human Physiology Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19CS308 | C Programming Laboratory | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE301 | Soft Skills and Aptitude – I | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 21 | |

Approved By

Chairperson, Biomedical Engineering BoS
Dr.S.Prabakar

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

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HOD/ Biomedical Engineering, Third Semester BE BME Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|--|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM401 | Analog and Digital Integrated Circuits | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM402 | Biomedical Instrumentation | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM403 | Control System for Biomedical Engineering | 3 | 0 | 0 | 3 | 45 |
| 4 | U19BM404 | Biomaterials | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CS406 | Data Structures | 3 | 0 | 0 | 3 | 45 |
| 6 | U19GE402 | Mandatory Course: Environment and Climate Science | 2 | 0 | 0 | 0 | 30 |
| Practical | | | | | | | |
| 7 | U19BM405 | Analog and Digital Integrated Circuits Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM406 | Biomedical Instrumentation Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19CS407 | Data Structures Laboratory | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE401 | Soft Skills and Aptitude-II | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 19 | |

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Dr.S.Prabakar

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

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HOD/ Biomedical Engineering, Fourth Semester BE BME Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V under Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|---|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM501 | Diagnostic and Therapeutic Equipments I | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM502 | Pathology and Microbiology | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM503 | Biomechanics | 3 | 0 | 0 | 3 | 45 |
| 4 | U19EC510 | Digital Signal Processing | 3 | 0 | 0 | 3 | 45 |
| 5 | U19EC511 | Microprocessors and Embedded System Design | 3 | 0 | 0 | 3 | 45 |
| 6 | noc22_mg104 | NPTEL - Principles of Management | 3 | 0 | 0 | 3 | 45 |
| Practical | | | | | | | |
| 7 | U19EC512 | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19EC513 | Microprocessors and Embedded System Design Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19BM504 | Pathology and Microbiology Laboratory | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE501 | Soft Skills and Aptitude – III | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 22 | 390 |

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Chairperson, Academic Council & Principal
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HOD/ Biomedical Engineering, Fifth Semester BE BME Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|---|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM601 | Diagnostic and Therapeutic Equipment II | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM602 | Radiological Equipment | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM603 | Biosensors and Transducers | 3 | 0 | 0 | 3 | 45 |
| 4 | U19BM910 | Professional Elective – Medical Device Design | 3 | 0 | 0 | 3 | 45 |
| 5 | U19BM911 | Professional Elective – Hospital Planning and Management | 3 | 0 | 0 | 3 | 45 |
| Open Elective | | | | | | | |
| 6 | U19CE1002 | Municipal Solid Waste Management | 3 | 0 | 0 | 3 | 45 |
| | U19EC1002 | Embedded and Real Time Systems | | | | | |
| | U19EE1003 | Innovation, IPR and Entrepreneurship Development | | | | | |
| | U19EE1004 | Renewable Energy Systems | | | | | |
| | U19FT1001 | Fundamentals of Fashion Design | | | | | |
| | U19MC1003 | Smart Automation | | | | | |
| | U19ME1004 | Renewable Energy Sources | | | | | |
| Practical | | | | | | | |
| 7 | U19BM604 | Diagnostic and Therapeutic Equipment Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM605 | Biosensors and Transducers Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19BM606 | Summer Internship / Summer Project | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE601 | Soft Skills and Aptitude – IV | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 22 | |

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Chairperson, Academic Council & Principal
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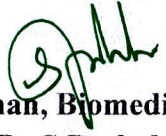
HOD/ Biomedical Engineering, Sixth Semester BE BME Students and Staff, COE

BME
VI

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VII Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|--|---|---------|----------|-----------|-------------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM701 ✓ | Medical Image Processing | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM702 ✓ | AI in Health and Medicine | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM907 ✓ | Professional Elective – Biomedical waste Management | 3 | 0 | 0 | 3 | 45 |
| 4 | U19BM909 ✓ | Professional Elective – Rehabilitation Engineering | 3 | 0 | 0 | 3 | 45 |
| 5 | U19BM2003 ✓ | Professional Elective- Basic Life Support and first Aid | 3 | 0 | 0 | 3 | 45 |
| 6 | U19CE1004 ✓ | Open Elective – Disaster Management ✓ | 3 | 0 | 0 | 3 | 45 |
| | U19CS1001 ✓ | Open Elective - Big Data Analytics | | | | | |
| | U19CS1002 ✓ | Open Elective - Cloud Computing | | | | | |
| | U19EC1007 ✓ | Open Elective - CMOS VLSI Design | | | | | |
| | U19EE1002 ✓ | Open Elective - Energy Conservation and Management | | | | | |
| | U19EE1003 ✓ | Open Elective - Innovation, IPR and Entrepreneurship Development | | | | | |
| | U19FT1001 ✓ | Open Elective - Fundamentals of Fashion Design | | | | | |
| | U19ME1002 ✓ | Open Elective - Industrial Safety | | | | | |
| | U19ME1004 ✓ | Open Elective - Renewable Energy Sources | | | | | |
| U19IT1001 ✓ | Open Elective - Problem Solving Techniques using Java Programming | | | | | | |
| Practical | | | | | | | |
| 7 | U19BM703 ✓ | Medical Image Processing Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM704 ✓ | AI in Medicine Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19BM705 ✓ | Hospital Training | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 21 ✓ | |

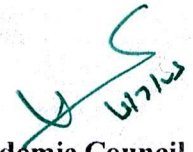
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**Chairperson, Academic Council & Principal
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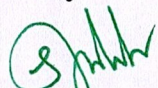
HOD/ Biomedical Engineering, Seventh Semester BE BME Students and Staff, COE

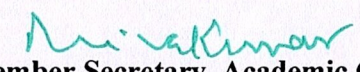
BME
VIII

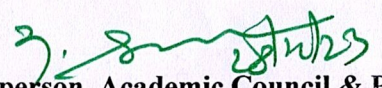
Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|--------------|---------|----------|-----------|-----------|---------------------|
| Practical | | | | | | | |
| 1 | U19BM801 | Project Work | 0 | 0 | 24 | 12 | 360 |
| Total Credits | | | | | | 12 | |

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Chairman, Biomedical Engineering BoS
Dr.S.Prabakar


Member Secretary, Academic Council
Dr.R.Shivakumar 6/12/23


Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

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HOD/ Biomedical Engineering, Eighth Semester BE BME Students and Staff, COE

SONA COLLEGE OF TECHNOLOGY, SALEM
(An Autonomous Institution)

Courses of Study for B.E./B.Tech. Semester I under Regulations 2019 (CBCS)

Branch: Biomedical Engineering

| S.No | Course Code | Course Title | L | T | P | C | Category |
|------------------------------------|-------------|---|---|---|---|-----------|----------|
| Theory | | | | | | | |
| 1 | U19ENG101B | English For Engineers - I | 1 | 0 | 2 | 2 | HS |
| 2 | U19MAT102B | Linear Algebra and Multivariable Calculus | 3 | 1 | 0 | 4 | BS |
| 3 | U19PHY103E | Engineering Physics | 4 | 0 | 0 | 4 | BS |
| 4 | U19CHE104G | Engineering Chemistry | 3 | 0 | 0 | 3 | BS |
| 5 | U19PPR105 | Problem Solving using Python Programming | 3 | 0 | 0 | 3 | ES |
| 6 | U19BEE106B | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | PC |
| Practical | | | | | | | |
| 7 | U19PPL111 | Python Programming Laboratory | 0 | 0 | 2 | 1 | ES |
| 8 | U19BEEL113B | Basic Electrical and Electronics Engineering Laboratory | 0 | 0 | 2 | 1 | PC |
| 9 | U19GE101 | Basic Aptitude - I | 0 | 0 | 2 | 0 | EEC |
| Total Credits | | | | | | 21 | |
| Optional Language Elective* | | | | | | | |
| 10 | U19OLE1101 | French | 0 | 0 | 2 | 1 | HS |
| 11 | U19OLE1102 | German | | | | | |
| 12 | U19OLE1103 | Japanese | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

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& Principal
**Dr.S.R.R.Senthil
Kumar**

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**U19ENG101B - ENGLISH FOR ENGINEERS – I
COMMON TO CSE, ECE, EEE, MCT, BME**

| | | | |
|----------|----------|----------|----------|
| L | T | P | C |
| 1 | 0 | 2 | 2 |

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

1. Use grammatical components effectively in both written and spoken communication
2. Develop speaking skills for self-introduction, delivering speeches and technical presentation.
3. Speak effectively in real time and business situations
4. Write email, formal letters and descriptions of graphics
5. Develop skills for writing reports and proposals, and for general purpose and technical writing.

UNIT I

- General Vocabulary, Parts of speech
- Self-introduction - personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
- Instructions, Email - fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – Describing – defining – providing examples or evidences

UNIT II

- Tenses, active and passive voice
- Welcome address, vote of thanks, special address on specific topic.
- Checklists, letter writing - business communication, quotations, placing orders, complaints, replies to queries from business customers, inviting dignitaries, accepting and declining invitations

UNIT III

- Prefixes and Suffixes
- Mini presentation in small groups of two or three on office arrangements, facilities, office functions, sales, purchases, training recruitment, advertising,

applying for financial assistance, applying for a job, team work, discussion, presentation.

- Job application letter and resume, recommendations,

UNIT IV

- Modal verbs and probability, concord
- Situational Role Play - between examiner and candidate, teacher and student, customer and sales manager, hotel manager and organiser, team leader and team member, bank manager and candidate, interviewer and applicant, car driver and client, industrialist and candidate, receptionist and appointment seeker, new employee and manager, employee and employee, p.a. and manager, schedule for training
- Note making, Proposal

UNIT V

- If conditionals
- Situational Role Play - Asking for directions, seeking help with office equipment, clarifying an error in the bill, job details, buying a product, selling a product, designing a website, cancelling and fixing appointments, hotel accommodation, training facilities, dress code, conference facilities.
- Memo, technical report writing - feasibility reports, accident report, survey report

TOTAL: 45 hours

Speaking test will be conducted for 20 marks externally and evaluated along with English for Engineers – I in the End Semester Valuation.

TEXT BOOK

- Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

EXTENSIVE READING

- The Story of Amazon.com- Sara Gilbert, published by Jaico
- The Story of Google – Sara Gilbert, published by Jaico

REFERENCE

- Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
- A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

U19MAT102B - LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS

Common to ECE and BME

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

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

1. apply the concepts of vector spaces and linear transformations in real world applications
2. apply the concepts of eigen values and eigen vectors of a real matrix and their properties in diagonalization and the reduction of a real symmetric matrix from quadratic form to canonical form
3. find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
4. apply appropriate techniques of multiple integrals to find the area and volume
5. apply the concepts of vector differentiation and integration to determine the line, surface and volume integrals.

UNIT I - VECTOR SPACES

12

Vector Space – Linear independence and dependence of vectors – Basis – Dimension – Linear transformations (maps) – Matrix associated with a linear map – Range and kernel of a linear map – Rank-nullity theorem (without proof).

UNIT II - EIGEN VALUES AND EIGEN VECTORS

12

Eigen values and eigen vectors of real matrices – Properties of eigen values and eigen vectors – Cayley-Hamilton theorem – Diagonalization of real symmetric matrices – Reduction of quadratic form to canonical form.

UNIT III - FUNCTIONS OF SEVERAL VARIABLES

12

Functions of several variables – Partial differentiation – Total derivative – Jacobians – Taylor's theorem for function of two variables – Maxima and minima of function of two variables without constraints – Constrained maxima and minima by Lagrange's method of undetermined multipliers.

UNIT IV - MULTIPLE INTEGRALS

12

Double integrals – Change of order of integration – Change of variables from Cartesian to polar coordinates – Area as double integrals in Cartesian coordinates – Triple integrals – Volume as triple integrals in Cartesian coordinates.

UNIT V - VECTOR CALCULUS

12

Vector differentiation: Scalar and vector valued functions – Gradient, directional derivative, divergence and curl – Scalar potential.

Vector integration: Line, surface and volume integrals – Statement of Green's, Stoke's and Gauss divergence theorems – Simple applications involving squares, rectangles, cubes and rectangular parallelepiped.

Theory: 45 Hours; Tutorial: 15 hours

TOTAL: 60 hours

TEXT BOOKS

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCE BOOKS

1. S. Lipschutz and M. L. Lipson, "Linear Algebra", McGraw Hill Publishers, 6th Edition, 2018.
2. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
3. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
5. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

U19PHY103E - ENGINEERING PHYSICS
(For Biomedical Engineering)

L LT P C
4 0 0 4

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

1. Discuss the dual nature of matter and radiation and the application of wave nature of particles.
2. Describe the basic components of lasers.
3. Analyse the relation between arrangement of atoms and material properties.
4. Explain the ultrasonic inspection technique in the field of medicine.
5. Elucidate the applications of X rays and radioactivity in the field of medicine.

UNIT I - QUANTUM PHYSICS

12

Origin of quantum mechanics – Limitations of classical theory - Dual nature of matter and radiation

Particle nature of radiation - Compton effect - Explanation based on quantum theory - Expression for Compton shift (no derivation).

Wave nature of matter - de Broglie waves - Schrödinger's time independent and time dependent wave equations - Physical significance of wave function - Energy and wave function of an electron trapped in one dimensional box.

Application of wave nature of particles - Electron microscope - Comparison of optical and electron microscope –Transmission electron microscope - Scanning electron microscope - Limitations of electron microscope.

UNIT II - LASERS

12

Basic terms - Energy level - normal population - induced absorption (pumping) - population inversion - meta stable state - spontaneous emission - stimulated emission.

Basic components of a laser - Active medium - pumping technique - optical resonator
Einstein's theory - Stimulated absorption - spontaneous emission and stimulated emission.

Types of lasers - Solid lasers (Nd:YAG) - Gas lasers (CO₂ laser) - Semiconductor laser (homojunction and hetero junction laser)

Applications - Holography - Construction and reconstruction of hologram - Applications of lasers in science and Engineering.

UNIT III - CRYSTAL PHYSICS

12

Importance of crystals - Types of crystals - Basic definitions in crystallography (Lattice – space lattice - unit cell - lattice parameters – basis - crystallographic formula) - Seven crystal systems and fourteen Bravais lattices – Lattice planes and Miller indices – Interplanar distance - d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number and Atomic Packing factor for SC, BCC, FCC and HCP Structures - Polymorphism and allotropy.

Crystal imperfections - Point, line and surface defects – Burger vector.

Crystal Structure – Graphite Structure and Diamond Structure.

UNIT IV - ULTRASONICS

12

Introduction – Ultrasonic waves - Properties of ultrasonic waves.

Production of ultrasonic waves – Magnetostriction method – Magnetostriction oscillator - Piezo electric method – Piezo electric oscillator.

Ultrasonic imaging systems – Block diagram of ultrasonic imaging system – A scan, B scan and T-M mode display - Ultrasound pictures of human body – Ultrasonic technique to measure blood flow and heart beat – Physiological effects of ultrasound therapy – Phonocardiography.

UNIT V - MEDICAL PHYSICS

12

X – rays - Electromagnetic spectrum - Introduction to x- rays – Production of x- ray images – Producing live x- ray images – Radiation given to patients – Nuclear medicine – Sources of radioactivity – Radioisotopes for nuclear medicine – Statistical aspects of radioactivity decay in radioisotopes – Nuclear imaging techniques – Basic instrumentation for nuclear imaging – Gamma ray camera – Positron emission tomography.

TOTAL: 60 hours

TEXT BOOK

- M.N.Avadhanulu, ‘Engineering Physics’ S.Chand & Company Ltd, New Delhi (2015)
- B. K. Pandey and S. Chaturvedi, Engineering Physics , Cengage Learning India Pvt. Ltd., Delhi, 2019

REFERENCES

- Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised Edition 2019).
- Rajendran, V, and Marikani A, ‘Materials science’ TMH Publications, (2004) New Delhi.
- Palanisamy P.K, ‘Materials science’, SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)
- Cameran. R, Medical Physics, John Wiley and Sons.
- D. K. Bhattacharya, Poonam Tandon “Engineering Physics” Oxford University Press 2017.
- M.Arumugam, “Applied Physics” Anuradha agencies, kumbakonam 2001

U19CHE104G - ENGINEERING CHEMISTRY
(For Mechatronics and Biomedical Engineering)

L T P C
3 0 0 3

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

1. Analyze the impurities of water, their removal methods and explain the conditioning methods for industrial uses.
2. Outline the principles and applications of electrochemistry to engineering and technology.
3. Analyze the types of corrosion and describe the methods of corrosion control.
4. Discuss the principle and applications of surface chemistry and catalysis in engineering and technology.
5. Describe the basics of nano chemistry, synthesis, properties and applications of nano materials in engineering and technology.

UNIT I - WATER TECHNOLOGY

9

Introduction - Characteristics – hardness – estimation of hardness by EDTA method, alkalinity and its estimation - Boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (colloidal, phosphate, calgon and carbonate conditioning methods) – external conditioning – zeolite process, demineralization process, desalination of brackish water by reverse osmosis.

UNIT II - ELECTROCHEMISTRY

9

Electrode potential - Nernst Equation - derivation and problems based on single electrode potential calculation - reference electrodes - standard hydrogen electrode - calomel electrode – Ion selective electrode - glass electrode - measurement of pH – electrochemical series – significance – electrolytic and electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – potentiometric titrations (redox – Fe^{2+} vs dichromate) – conductometric titrations (acid-base – HCl vs NaOH).

UNIT III - CORROSION AND CORROSION CONTROL

9

Chemical corrosion - Pilling-Bedworth rule – electrochemical corrosion – mechanism - galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – preliminary treatment - Paints constituents and their functions – surface conversion coatings – Galvanizing and Tinning.

UNIT IV - SURFACE CHEMISTRY AND CATALYSIS

9

Adsorption-types-physical and chemical adsorption – adsorption of gases on solids-adsorption isotherms-Freundlich and Langmuir isotherms-adsorption of solutes from solution – applications of adsorption-role of adsorption in catalytic reactions – basic principles in adsorption chromatography – adsorption in pollution abatement (granular activated carbon and powdered activated carbon) – catalysis-types - characteristics of catalysts - autocatalysis - definition and examples.

UNIT V - NANOCHEMISTRY

9

Basics - distinction between molecules, nanoparticles and bulk materials – size-dependent properties – nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire – Synthesis: precipitation – thermolysis – hydrothermal – solvothermal – electrodeposition - chemical vapour deposition - sol-gel technique – properties and applications of nano materials.

TOTAL: 45 hours

TEXT BOOKS

- P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi, 2010 (15th Edition).
- T. Maruthavanan *et al.*, “Engineering Chemistry”, Sonaversity, Sona College of Technology, Salem, Revised Edition 2018.

REFERENCE BOOKS

- H.K. Chopra, A. Parmer, “Chemistry for Engineers”, Narosa Publishing House, New Delhi, 110 002, 2016.
- Kannan P., Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd., Chennai, 2009.
- B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2008.
- Ozin G. A. and Arsenault A. C., “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.

U19PPR105 - PROBLEM SOLVING USING PYTHON PROGRAMMING

(Common to BME, CSE, ECE, EEE, IT and MCT)

L T P C

3 0 0 3

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

1. Develop algorithmic solutions to simple computational problems
2. Write simple Python programs
3. Write programs with the various control statements and handling strings in Python
4. Develop Python programs using functions and files
5. Analyze a problem and use appropriate data structures to solve it.

UNIT I - ALGORITHMIC PROBLEM SOLVING 9

Need for computer languages, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT II - BASICS OF PYTHON PROGRAMMING 9

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

UNIT III - CONTROL STATEMENTS AND STRINGS 9

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

UNIT IV - FUNCTIONS AND FILES 9

Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local scope, global scope and recursion. Files -Text files, reading and writing files.

UNIT V - DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES 9

Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries.

TOTAL: 45 Hours

TEXT BOOKS

- Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 2018.
- Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)

REFERENCES

- Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 2018.
- Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
- Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013.

U19BEE106B - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to ECE and BME)

L T P C
3 0 0 3

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

1. Realize the basic concepts of electrical quantities and components.
2. Understand the working of electrical machines.
3. Analyze the construction and characteristics of semiconductor devices.
4. Examine the BJT formation and its characteristics.
5. Enhance the knowledge on Special Devices

UNIT I – BASICS OF ELECTRICAL PERCEPTIONS 9

Definition of Electric Voltage, Current, Power, Power factor & Energy, Ohms law, Kirchoff's Laws and its applications-Frequency-AC and DC Signals-types of sources-single phase-three phase- Resistance- Inductance-capacitance-Series and parallel combinations.

UNIT II - ELECTRICAL MACHINES 9

DC Generator: construction of DC Machine – working principle of DC Generator – EMF equation – Types of DC Generator. DC Motor: Working principle of DC Motor – Types of DC Motor. Transformer: Working principle of Transformer – EMF equation – Transformation ratio.

UNIT III - PN JUNCTION DIODE 9

Energy band theory-Conductor-Insulator-Semiconductor-Doping-formation of N-type and P-type materials-PN junction Diode – V-I Characteristics- Zener diode- VI characteristics of Zener-Avalanche break down. - Zener effect-Zener diode as voltage regulator.

UNIT IV – BJT 9

Bipolar Junction Transistor – construction-Working principle-Regions of transistor-CB, CE, CC Configurations and Characteristics – Transistor as a switch – Applications of transistor.

UNIT V - SPECIAL DEVICES 9

Construction and Characteristics of - Tunnel Diode-Varactor diode-Photo diode- Photo transistor- SCR-TRIAC-DIAC

Total: 45 hours

TEXT BOOKS

1. D P Kothari and I J Nagrath, “Basic Electrical and Electronics Engineering”, Mc Graw Hills (India) Private Limited, 2014.
- 2.

REFERENCE BOOKS

1. D. Devaraj, S. K. Bhattacharya, “Basic Electrical and Electronics Engineering”, Pearson India, 2016
2. AbhiChakrabarti, Sudipta Debnath, Soumitra Kumar Mandal, “Basic Electrical & Electronics Book “,Mc Graw Hill Education; Fifth Edition, 2016.
3. Ravish Singh, “ Basic Electrical & Electronics Engineering”, McGraw Hill Education, 2014

U19PPL111 - PYTHON PROGRAMMING LABORATORY

(Common to BME, CSE, ECE, EEE, IT and MCT)

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

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

1. Implement the algorithms using basic control structures in Python
2. Develop Python programs to use functions, strings and data structures to solve different types of problems
3. Implement persistent storing information through file operations

LIST OF EXPERIMENTS

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Develop python programs to perform operations on list and tuples
9. Implement dictionary and set in python
10. Implement python program to perform file operations.

TOTAL: 30 hours

U19BEEL113B - BASIC ELECTRICAL AND ELECTRONICS LABORATORY

(Common to ECE and BME)

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

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

1. Identify the active, passive components and measuring instruments.
2. Analyse the electrical quantity at any point of circuit.
3. Design the circuit based on PN junction diode and BJT.

LIST OF EXPERIMENTS

1. Identification of active and passive electronic components.
2. Study on CRO, Ammeter, Voltmeter, Multi-meter, Function Generator, and DSO.
3. Measurement of DC and AC power supply using measuring instruments.
4. Realization and design problems on ohms law.
5. Realization and design problems on KCL, KVL.
6. Mesh and node analysis of circuit.
7. VI characteristics analysis of PN junction diode.
8. Biasing and characteristics analysis of BJT.
9. CB, CC and CE analysis of BJT.
10. Realization of transistor as switch.

TOTAL: 30 hours

U19GE101 - BASIC APTITUDE – I
(Common to All Departments)

| L | T | P | C |
|----------|----------|----------|----------|
| 0 | 0 | 2 | 0 |

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

1. Solve fundamental problems in specific areas of quantitative aptitude
2. Solve basic problems in stated areas of logical reasoning
3. Demonstrate rudimentary verbal aptitude skills in English with regard to specific topics

1. Quantitative Aptitude and Logical Reasoning

Solving simple problems with reference to the following topics:

- a. Numbers – HCF & LCM
- b. Decimal fractions
- c. Square roots & cube roots
- d. Surds & Indices
- e. Logarithms
- f. Percentage
- g. Averages
- h. Coding and Decoding & Visual language

2. Verbal Aptitude

Demonstrating plain English language skills with reference to the following topics:

- a. Synonyms
- b. Antonyms
- c. Verbal analogy
- d. Editing passages
- e. Sentence filler words

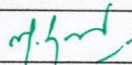
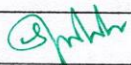
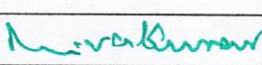

TOTAL: 30 hours

Sona College of Technology, Salem – 636 005
(An Autonomous Institution)
Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | L | T | P | C | Category | Total Contact Hours |
|------------------------------------|-------------|---------------------------------------|---|---|---|-----------|----------|---------------------|
| Theory | | | | | | | | |
| 1 | U19ENG201B | English for Engineers -II | 2 | 0 | 0 | 2 | HSMC | 30 |
| 2 | U19MAT202C | Transforms and Differential Equations | 3 | 1 | 0 | 4 | BSC | 60 |
| 3 | U19CHE204D | Biochemistry | 2 | 0 | 0 | 2 | BSC | 30 |
| 4 | U19EGR206A | Engineering Graphics | 2 | 0 | 2 | 3 | ESC | 60 (30L+30P) |
| 5 | U19BME201 | Biology for Engineers | 3 | 0 | 0 | 3 | PCC | 45 |
| 6 | U19EC202 | Circuit Theory | 3 | 0 | 0 | 3 | PCC | 45 |
| Practical | | | | | | | | |
| 7 | U19WPL212 | Workshop Practice | 0 | 0 | 2 | 1 | ESC | 30 |
| 8 | U19PCL208B | Physics and Chemistry Laboratory | 0 | 0 | 4 | 2 | BSC | 60 |
| 9 | U19GE201 | Basic Aptitude – II | 0 | 0 | 2 | 0 | EEC | 30 |
| Total Credits | | | | | | 20 | | |
| Optional Language Elective* | | | | | | | | |
| 10 | U19OLE1201 | French | 0 | 0 | 2 | 1 | HSMC | 30 |
| 11 | U19OLE1202 | German | | | | | | |
| 12 | U19OLE1203 | Japanese | | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved by

| | | | |
|---|---|--|---|
|  |  |  |  |
| Chairperson, Science and Humanities BoS | Chairperson, Biomedical Engineering BoS | Member Secretary, Academic Council | Chairperson, Academic Council & Principal |
| Dr. M. Renuga | Dr. S. Prabakar | Dr. R. Shivakumar | Dr. S. R. R. Senthil Kumar |

Copy to:-HOD/ Biomedical Engineering, Second Semester BE BME Students and Staff, COE

U19ENG201B- English for Engineers – II

First year II semester

BME

Course Outcome: At the end of course, the students will be able to

1. Frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.
2. Develop and demonstrate listening skills for academic and professional purposes.
3. Draw conclusions on explicit and implicit oral information.
4. Develop effective reading skills and reinforce language skills required for using grammar and building vocabulary.
5. Read for gathering and understanding information, following directions and giving responses.

| | COURSE OUTCOMES | PROGRAMME OUTCOMES | | | | | | | | | | | | Pso 1 | Pso 2 |
|---|---|--------------------|---|---|---|---|---|---|---|---|----|----|----|-------|-------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | |
| 1 | Frame sentences correctly, both in written and spoken forms of language with accuracy and fluency | 2 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2 | Develop and demonstrate listening skills for academic and professional purposes | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | Draw conclusions on explicit and implicit oral information | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | Develop effective reading skills and reinforce language skills required for using grammar and building vocabulary | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 5 | Read for gathering and understanding information, following directions and giving responses. | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

UNIT –I

- Cause and effect expressions, adjectives, comparative adjectives
- Listening to conversations, welcome speeches, lectures and description of equipment

- Listening to different kinds of interviews (face-to-face, radio, TV and telephone interviews)
- Understanding notices, messages, timetables, advertisements, graphs, etc.
- Reading passages for specific information transfer

UNIT – II

- Prepositions and dependent prepositions
- Understanding short conversations or monologues
- Taking down phone messages, orders, notes etc
- Listening for gist, identifying topic, context or function
- Reading documents for business and general contexts and interpreting graphical representations

UNIT – III

- Collocations
- Listening comprehension, entering information in tabular form
- Error correction, editing mistakes in grammar, vocabulary, spelling, etc.
- Reading passage with multiple choice questions, reading for gist and reading for specific information, skimming for comprehending the general idea and meaning and contents of the whole text

UNIT – IV

- Articles, adverbs
- Intensive listening exercises and completing the steps of a process.
- Listening exercises to categorise data in tables.
- Short reading passage: gap-filling exercise related to grammar, testing the understanding of prepositions, articles, auxiliary verbs, modal verbs, pronouns, relative pronouns and adverbs, short reading passage with multiple choice questions.

UNIT – V

- Pronouns
- Listening to extended speech for detail and inference
- Listening and developing hints
- gap-filling exercise testing the knowledge of vocabulary, collocations, dependent prepositions, grammatical structures
- Short reading passages for sentence matching exercises, picking out specific information in a short text

TOTAL: 30 hours

B. E. / BIOMEDICAL ENGINEERING

| | | | | | |
|---------------|---------------------------------------|---|---|---|---|
| SEMESTER – II | TRANSFORMS AND DIFFERENTIAL EQUATIONS | L | T | P | C |
| UI9MAT202C | | 3 | 1 | 0 | 4 |

COURSE OUTCOMES

At the end of the course, the students will be able to

1. apply the classical method to solve linear ordinary differential equations with constant coefficients.
2. apply the Laplace transforms technique and its properties to solve an ordinary differential equation.
3. express a periodic signal as an infinite sum of sine and cosine wave components using Fourier series.
4. apply the Fourier transform techniques to convert the signal in terms of the frequencies of the waves.
5. find the general and singular solutions of linear and nonlinear partial differential equations.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO2 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO3 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO4 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO5 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |

UNIT – I ORDINARY DIFFERENTIAL EQUATIONS

12

Linear higher order ordinary differential equations with constant coefficients – Cauchy's and Legendre's homogeneous linear ordinary differential equations – Method of variation of parameters.

UNIT – II LAPLACE TRANSFORMS

12

Laplace transform: Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse function – Initial and final value theorems – Transform of periodic functions.

Inverse Laplace transform: Standard results – Statement of convolution theorem and its applications – Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform.

UNIT – III FOURIER SERIES

12

General Fourier series – Dirichlet's conditions – Change of intervals – Odd and even functions – Half range sine and cosine series – Root mean square – Parseval's identity – Harmonic analysis.

UNIT – IV FOURIER TRANSFORMS

12

Fourier transform pair – Properties – Fourier sine and cosine transforms pair – Properties – Transforms of simple functions – Parseval's identity.

UNIT – V PARTIAL DIFFERENTIAL EQUATIONS

12

Formation of partial differential equations – Lagrange's partial differential equation – Clairaut's form of partial differential equations – Higher order linear partial differential equation with constant coefficients.

Theory: **45 Hours**

Tutorial: **15 Hours**

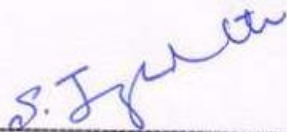
Total: **60 Hours**

TEXT BOOKS:

1. T. Veerarajan, "Transforms and Partial Differential Equations", McGraw Hill Publishers, 3rd Edition, 2016.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCE BOOKS:

1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
2. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.



Prof. S. JAYABHARATHI
Head / Department of Mathematics
Sona College of Technology
Salem – 636 005



Dr. M. RENUGA
BoS - Chairperson
Science and Humanities
Sona College of Technology
Salem – 636 005

COURSE CODE U19CHE204D
COURSE NAME BIOCHEMISTRY

L T P C
 2 0 0 2

Course outcome:

At the end of the course the students will be able to

- CO1** Outline the fundamentals of biochemistry.
- CO2** Analyze the classification of carbohydrates and their properties and applications.
- CO3** Discuss the classification of lipids and their biological importance.
- CO4** Demonstrate the structure and properties of nucleic acid and protein.
- CO5** Describe the classification and the biological clinical applications of enzymes.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| COs, POs PSOs Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO - 1 | 3 | 2 | | | | | | | | | | | | 3 |
| CO - 2 | 3 | 2 | | | | | | | | | | | | 3 |
| CO - 3 | 3 | 2 | | | | | | | | | | | | 3 |
| CO - 4 | 3 | 2 | | | | | | | | | | | | 3 |
| CO - 5 | 3 | 2 | | | | | | | | | | | | 3 |

UNIT I INTRODUCTION TO BIOCHEMISTRY 6

Introduction to Biochemistry - water as a biological solvent - weak acid and bases, pH, buffers, Handerson Hasselbalch equation, physiological buffers in living systems, Energy in living organism - Properties of water and their applications in biological systems - Introduction to Biomolecules, Biological membrane, Clinical application of Electrolytes and radioisotopes.

UNIT II CARBOHYDRATES 6

Classification of carbohydrates - mono, di, oligo and polysaccharides - Structure, physical and chemical properties of carbohydrates - Isomerism, racemisation and mutarotation - Digestion and absorption of carbohydrates - Metabolic pathways and bioenergetics – Glycolysis, glycogenesis, glycogenolysis and its hormonal regulation - TCA cycle and electron transport chain - Oxidative phosphorylation - Biochemical aspect of Diabetes mellitus and Glycogen storage Disease.

UNIT III LIPIDS**6**

Classification of lipids- simple, compound and derived lipids - Nomenclature of fatty acid, physical and chemical properties of fat - Metabolic pathways: synthesis and degradation of fatty acid (beta oxidation), hormonal regulation of fatty acid metabolism, ketogenesis, Biosynthesis of Cholesterol - Disorders of lipid metabolism.

UNIT IV NUCLEIC ACID and PROTEIN**6**

Structure of purines and pyrimidines, nucleoside, nucleotide, DNA act as a genetic material, Chargoff's rule - Watson and Crick model of DNA - Structure of RNA and its type - Metabolism and Disorder of purines and pyrimidines nucleotide - Classification, structure and properties of proteins, structural organization of proteins - classification and properties of amino acids - Separation of protein, Inborn Metabolic error of amino acid metabolism.

UNIT V ENZYME AND ITS CLINICAL APPLICATION**6**

Classification of enzymes, apoenzyme, coenzyme, holoenzyme and cofactors - Kinetics of enzymes - Michaelis-Menten equation - Factors affecting enzymatic activity: temperature, pH, substrate concentration and enzyme concentration - Inhibitors of enzyme action: Competitive, non-competitive, irreversible - Enzyme: Mode of action, allosteric and covalent regulation - Clinical enzymology - Measurement of enzyme activity and interpretation of units.

TOTAL: 30 HOURS**TEXT BOOKS:**

1. Rafi MD —Text book of biochemistry for Medical Students, Second Edition, University Press, 2014.
2. David W. Martin, Peter A. Mayes, Victor W. Rodwell, - Harper's Review of Biochemistry, LANGE Medical Publications, 1981.

REFERENCES:

1. Keith Wilson and John Walker, —Practical Biochemistry - Principles & Techniques, Oxford University Press, 2009.
2. Pamela C. Champe and Richard A. Harvey, — Lippincott Biochemistry Lippincott's Illustrated Reviews, Raven publishers, 1994.

U19EGR206A – ENGINEERING GRAPHICS

L T P C
2 0 2 3

Course Outcomes: Upon completion of this course the students will be able to

- CO1** Predict the construction of various curves in civil elevation, plan and machine components.
- CO2** Analyze the principles of projection of various planes by different angle to project points, lines and planes.
- CO3** Draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method.
- CO4** Understand the interior details of complex components, machineries by sectioning the solid body. Study the development of surfaces for prisms and pyramids.
- CO5** Draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

| CO / PO, PSO Mapping | | | | | | | | | | | | | | |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <i>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</i> | | | | | | | | | | | | | | |
| Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| COs, POs PSOs Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO 1 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |
| CO 2 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |
| CO 3 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |
| CO 4 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |
| CO 5 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |

UNIT I – PLANE CURVES (Manual drafting) 06

Curves used in engineering practices Conics – Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II – PROJECTION OF POINTS, LINES AND PLANE SURFACES (CAD software) 12

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

UNIT III – PROJECTION OF SOLIDS (CAD software) 12

Creation of 3D CAD models of pyramids, prisms and solids of revolutions-Sectional views - **(Not for Examination)**

Projection of simple solids like prisms – pyramids – cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV – SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES (CAD software) 12

Sectioning of simple solids like prisms – pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids – Prisms – pyramids – cylinders and cones.

UNIT V – Conversion of Isometric Views to Orthographic Views (Manual drafting)

12

Representation of three dimensional objects – General Principles of Orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

TOTAL: 60 Hours

TEXT BOOKS

1. P. Suresh et al., “Engineering Graphics and Drawing”, Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.
2. K.V. Natarajan Engineering Graphics by, Chennai, 17th edition 2003.

REFERENCES

1. Dhananjay A. JoIhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.
2. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. K. R. Gopalakrishnana, Engineering Drawing (Vol. I & II), Subhas Publications, 1998.
4. Bertoline & Wiebe fundamentals of graphics communication III edition McGrawhill 2002

**U19BME201 – BIOLOGY FOR ENGINEERS
BME**

**L T P C
3 0 0 3**

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

1. Analyze the cell growth and structure.
2. Classify various nomenclatures of Enzymes.
3. Compare different cycles of Metabolism.
4. Analyze the human activity with the Genetic nature.
5. Design the various industrial applications.

| | | CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | |
|-----|--|--|-----|-----|-----|-----|-----|-----|-----|-------|-------|-------|------|-------|-------|
| Cos | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO 2 | PSO 3 |
| CO1 | 3 | 3 | 1 | | | | | | | | | 2 | 1 | 1 | |
| CO2 | 3 | 3 | 1 | | | | | | | | | 2 | 1 | 1 | |
| CO3 | 3 | 3 | 1 | | | | | | | | | 2 | 1 | 1 | |
| CO4 | 3 | 3 | 1 | | | | | | | | | 2 | 1 | 1 | |
| CO5 | 3 | 3 | 1 | | | | | | | | | 2 | 1 | 1 | |

UNIT I - CELL: THE BASIC UNIT OF LIFE 9

Cell- Basic Properties of Cells- Prokaryotic Cells- Eukaryotic Cells- Cell Cycle and Cell Division- M Phase- Meiosis- Cell Differentiation.

UNIT II - MOLECULAR ANALYSIS AND ENZYMES 9

Carbohydrates- Amino acids and Proteins- Nucleic Acids- Lipids- Nature of Bonding and Qualitative Tests- Classification and Nomenclature of Enzymes- Co-Factors- Importance of Enzymes..

UNIT III - METABOLISM 9

Metabolism and Its Concepts- Metabolic Basis for Living - Anabolic and Catabolic Pathways - Concept of Non- Equilibrium and Steady State- Photosynthesis- Photorespiration (C2 Cycle) - C4 Pathways- CAM Cycle (In Succulent Plant) - Factors Affecting Photosynthesis-Respiration- Glycolysis- Fermentation- Aerobic Respiration.

UNIT IV - GENETICS

9

Mendel's Laws of Inheritance- Gene Interaction- Multiple Alleles- Chromosomal Theory of Inheritance- Linkage- Recombination (Crossing Over) - Chromosome Mapping- Genetic Disorders.

UNIT V - MICROBIOLOGY AND ITS INDUSTRIAL APPLICATIONS 9

Microorganisms- Growth Kinetics- Culture Media- Sterilization- Microscopy- applications of Microbiology- Immunology and Immunity- Cancer Biology- Stem Cell.

Total: 45 hours

TEXT BOOKS

1. Wiley, "Biology for Engineers", John Wiley & Sons, I Edition, 2018.
2. S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, "Biology for Engineers," Tata McGraw-Hill, New Delhi, 2012.

REFERENCE BOOKS

1. Robert Weaver, "Molecular Biology," McGraw-Hill, 5th Edition, 2012.
2. Kenneth Murphy, "Janeway's Immunobiology," Garland Science; 8th edition, 2011.

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

1. apply basic laws to calculate the voltage, current and power for ac and dc electric circuit.
2. identify the network topologies of circuits.
3. analyze the dc circuits using network theorems.
4. analyze the resonant circuits and coupled circuits.
5. analyze the two port networks for various parameters.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
| CO 1 | 3 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | - | - | 1 | 1 | 2 | 2 |
| CO 2 | 3 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | - | - | 1 | 1 | 2 | 2 |
| CO 3 | 3 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | - | - | 1 | 1 | 2 | 2 |
| CO 4 | 3 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | - | - | 1 | 1 | 2 | 2 |
| CO 5 | 3 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | - | - | 1 | 1 | 2 | 2 |

UNIT I - BASICS OF CIRCUIT ANALYSIS 9

Review on mesh and nodal analysis – Star Delta Transformation Techniques – Phase Relationship For R, L And C – Impedance, Admittance for R, L And C Elements – Concept of Duality – Dual Network – Graphs of A Network – Trees, Twig, Link and Branches – Incidence Matrix – Tie-Set Matrix Formation and Cut-Set Matrix Formation of a Graph.

UNIT II - CIRCUIT THEOREMS 9

DC analysis : Superposition Theorem – Thevenin's Theorem – Norton's Theorem – Reciprocity Theorem – Maximum Power Transfer Theorem – Tellegen's Theorem – Millman's Theorem.

UNIT III - SERIES RESONANT CIRCUITS AND COUPLED CIRCUITS 9

Resonances: Natural Frequency and Damping Ratio – Series Resonance – Impedance and Phase Angle of a Series Resonance Circuit – Voltages and Currents in a Series Circuit – Quality Factor. Coupled Circuits: Self-Inductance – Mutual Inductance – Dot Conversion – Coupling Coefficient – Ideal Transformer.

UNIT IV - TRANSIENTS 9

Steady State and Transient Response – DC Response of an R-L Circuit – DC Response of an R-C Circuit – DC Response of an R-L-C Circuit – Sinusoidal Response of R-L Circuit – Sinusoidal Response of R-C Circuit – Sinusoidal Response of R-L-C Circuit.

UNIT V - TWO PORT NETWORKS 9

Two port Network – Open Circuit Impedance (Z) Parameters – Short Circuit Admittance (Y) Parameters – Transmission (ABCD) Parameters – Hybrid (h) Parameters – Inter Relationship of Different Parameters.

TOTAL: 45 Hours

TEXT BOOK

1. A Sudhakar, Shyammmohan S Palli, "*Circuits and Networks Analysis and Synthesis*", Mc-Graw Hill, 2019.

REFERENCES

1. Ravish R Singh, "Networks Analysis and Synthesis", Mc-Graw Hill Education, 2019.
2. M.L. Soni and J.C. Gupta, A Course in "*Electrical Circuits Analysis*", Dhanpat Rai & Co.(P), 2015.
3. G.K. Mithal and Ravi Mittal, "*Network Analysis*", Khanna Khanna Pub, 2017.
4. Umesh Sinha, L.P.Singh, "Circuit and Field Theory", Tech India Publication Series, 2016.
5. Abhijit Chakrabarti, "Circuit Theory Analysis and Synthesis", Dhanpat Rai & CO. (Pvt).Ltd, Educational and technical publishers.

U19WPL212 – WORKSHOP PRACTICE

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

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

CO1 familiarize with the basic of tools and equipment's used in fitting, carpentry, welding and sheet metal.

CO2 fabricate the different simple products in above trades.

CO3 produce different joining of metals.

List of Experiments

SECTION 1: FITTING

Tools and Equipment's- Practice in filling. Making of Vee joint and square (T-fitting) joint.

SECTION 2: SHEET METAL

Tools and Equipment's- Practice Making of Dust Pan and Funnel.

SECTION 3: WELDING

Tools and Equipment's – Practice
Arc welding of Butt joint and Lap Joint.

SECTION 4: CARPENTRY

Tools and Equipment's- Planning Practice Making of Half Lap joint and Dovetail Joint.

TOTAL: 30 Hours

| | | | | | | | | | | | | | | | |
|---|--|---|-------------|-------------|-------------|----------------------------------|-------------|-------------|-------------|--------------|--------------|-------------------|--------------|--------------|----------|
| U19PCL208B | | PHYSICS AND CHEMISTRY LABORATORY | | | | | | | | | | L | T | P | C |
| | | | | | | | | | | | | 0 | 0 | 4 | 2 |
| Course Outcomes | | | | | | | | | | | | | | | |
| After successful completion of this course, the students should be able to | | | | | | | | | | | | | | | |
| CO1: | Apply the principles of Optics, Electricity and Elasticity to determine the Engineering properties of materials. | | | | | | | | | | | | | | |
| CO2: | Identify hardness and suggest the quality of water suitable for domestic purpose and analyze the concentration of carbonate, bicarbonate and hydroxide present in the given sample of water. | | | | | | | | | | | | | | |
| CO3: | Determine the thickness and resistivity of the given copper turn used for house hold applications and determine the amount of pH of house hold water sample and suggest the remedial measures. | | | | | | | | | | | | | | |
| Pre-requisite: Capable of using Screw gauge, Vernier calliper, Travelling microscope, Spectrometer, able to handle burette and pipette | | | | | | | | | | | | | | | |
| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | |
| CO1 | 3 | | | 1 | | 1 | | | | | 1 | | | 2 | |
| CO2 | 3 | | | 1 | | 1 | | | | | 1 | | | 2 | |
| CO3 | 3 | | | 1 | | 1 | | | | | 1 | | | 2 | |
| Course Assessment methods | | | | | | | | | | | | | | | |
| Direct | | | | | | | | | | | | Indirect | | | |
| Mean of 1 st half of Experiment (10) | | | | | | Quiz on 2 nd half (5) | | | | | | Course end survey | | | |
| Quiz on 1 st half (5) | | | | | | Internal test II (10) | | | | | | | | | |
| Internal test I (10) | | | | | | RTPS (10) | | | | | | | | | |
| Mean of 2 nd half of Experiment (10) | | | | | | End semester Examination (40) | | | | | | | | | |
| List of Experiments (Physics part) | | | | | | | | | | | | | | | |
| 1 | Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus. | | | | | | | | | | | | | | |
| 2 | Determination of dispersive power of the prism for various pairs of colors in the mercury spectrum using a spectrometer. | | | | | | | | | | | | | | |
| 3 | Determination of laser wavelength, particle size of lycopodium powder, acceptance angle and | | | | | | | | | | | | | | |

| | |
|---|--|
| | numerical aperture of an optical fibre using diode laser. |
| 4 | Determination of specific resistance of a given wire using Carey Foster's bridge. |
| 5 | Determination of band gap of the given semiconductor diode. |
| 6 | Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer. |
| 7 | Determination of wavelength of the prominent colors in the mercury spectrum using a spectrometer. |
| 8 | Determination of the Young's modulus of the given material by non-uniform bending method. |
| 9 | Determination of coefficient of viscosity of the given liquid by Poiseuille's method. |
| 10 | Determination of rigidity modulus of the material using torsion pendulum. |
| List of Experiments (Chemistry part) | |
| 11 | Estimation of hardness of water sample by EDTA method. |
| 12 | Estimation of alkalinity of water sample by indicator method. |
| 13 | Estimation of copper in brass by EDTA method. |
| 14 | Estimation of HCl by pH metry. |
| 15 | Determination of iron content in water by spectrophotometric method. |
| 16 | Estimation of HCl by conductometry. (HCl vs NaOH) |
| 17 | Estimation of mixture of acids by conductometry. (HCl + CH ₃ COOH vs NaOH) |
| 18 | Estimation of ferrous ion by potentiometric titration. |
| 19 | Determination of Molecular weight of a polymer by viscosity measurements. |
| 20 | Estimation of chromium in waste water. |
| | Total Hours: 60 Hrs. |

U19GE201 - BASIC APTITUDE - II

| | | | |
|----------|----------|----------|----------|
| L | T | P | C |
| 0 | 0 | 2 | 0 |

Course Outcomes: At the end of the course, the students will be able to CO1

solve more elaborate problems than those in BA-I in specific areas of

quantitative aptitude.

CO2 solve problems of greater intricacy than those in BA-I in stated areas of logical reasoning.

CO3 demonstrate higher than BA-I level verbal aptitude skills in English with regard to specific topics.

List of Experiments

1. QUANTITATIVE APTITUDE AND LOGICAL REASONING

Solving quantitative aptitude and logical reasoning problems with reference to the following topics:

- a. Ratio and proportion
- b. Partnership
- c. Chain rule
- d. Ages
- e. Profit, loss and discount
- f. Geometry
- g. Area and volume
- h. Data arrangement

2. VERBAL APTITUDE

Demonstrating verbal aptitude skills in English with reference to the following topics:

- a. Jumbled sentences
- b. Reconstructions of sentences (PQRS)
- c. Sentence fillers two words
- d. Idioms and phrases
- e. Spotting errors
- f. Writing captions for given pictures

TOTAL : 24 Hours

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|---|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19MAT301B | Probability and Statistics | 3 | 1 | 0 | 4 | 60 |
| 2 | U19BM301 | Electronic Devices and Circuits | 3 | 0 | 0 | 3 | 45 |
| 3 | U19EC301 | Signals and Systems | 3 | 1 | 0 | 4 | 60 |
| 4 | U19BM302 | Anatomy and Human Physiology | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CS307 | Programming in C | 3 | 0 | 0 | 3 | 45 |
| 6 | U19GE303 | Mandatory Course : Essence of Indian Traditional Knowledge | 2 | 0 | 0 | 0 | 30 |
| Practical | | | | | | | |
| 7 | U19BM303 | Electronic Devices and Circuits Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM304 | Anatomy and Human Physiology Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19CS308 | C Programming Laboratory | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE301 | Soft Skills and Aptitude – I | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 21 | |

Approved By

Chairperson, Biomedical Engineering BoS
Dr.S.Prabakar

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Biomedical Engineering, Third Semester BE BME Students and Staff, COE

B. E / BIOMEDICAL ENGINEERING

| | | | | | |
|----------------|-----------------------------------|---|---|---|---|
| SEMESTER – III | PROBABILITY AND STATISTICS | L | T | P | C |
| UI9MAT301B | | 3 | 1 | 0 | 4 |

COURSE OUTCOMES

At the end of the course, the students will be able to

1. apply the concepts of measures of central tendency, dispersion, correlation to the given data and analyze the results.
2. apply the concepts of random variables and their properties to generate the moments.
3. fit the suitable distribution and its properties to the real world problems and interpret the results.
4. apply the concepts of joint probability distribution and its properties to find the covariance.
5. test the hypothesis of the population using sample information.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | PSO1 | PSO2 |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | | |
| CO1 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO2 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO3 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO4 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |
| CO5 | 3 | 3 | | 3 | | | | | | | | 2 | 3 | |

UNIT – I BASIC STATISTICS

12

Measures of central tendency (simple arithmetic mean, median, mode) – Quartiles – Measures of dispersion (range, inter-quartile range, quartile deviation, mean deviation, standard deviation, coefficient of variation) – Simple correlation – Curve fitting (straight line and parabola).

UNIT – II RANDOM VARIABLES

12

Discrete and continuous random variables – Probability mass function, probability density function, moments, moment generating function and their properties.

UNIT – III THEORETICAL DISTRIBUTIONS

12

Binomial, Poisson, geometric, uniform, exponential and normal distributions and their properties - Applications.

UNIT – IV TWO DIMENSIONAL RANDOM VARIABLES

12

Joint distributions, marginal and conditional distributions – Covariance – Correlation – Central limit theorem.

20. 05. 2020

B. E. / B. Tech. Regulations 2019

UNIT – V TESTING OF SIGNIFICANCE

12

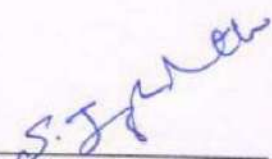
Sampling distributions - Testing of hypothesis for mean, standard deviation, variance, proportion and differences using normal and t distributions - χ^2 - tests for independence of attributes and goodness of fit and F distribution.

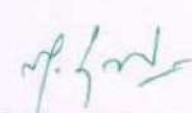
Theory: **45 Hours**Tutorial: **15 Hours**Total: **60 Hours****TEXT BOOKS:**

1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.
2. T. Veerarajan, "Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", McGraw Hill Publishers, 4th Edition, 7th Reprint, 2018.

REFERENCE BOOKS:

1. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
2. S. Ross, "A First Course in Probability", Pearson Publishers, 9th Edition, 2019.
3. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.
4. W. Feller, "An Introduction to Probability Theory and its Applications – Volume I", Wiley Publishers, 3rd Edition, 2008.
5. S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 15th Edition, 2012.


Prof. S. JAYABHARATHI
Head / Department of Mathematics
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Dr. M. RENUGA
BoS - Chairperson
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20. 05. 2020

B. E. / B. Tech. Regulations 2019

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Describe the basic concepts of anatomy and physiology.
2. Recognize the ways the body undergoes change throughout the life span related to cell and organ development.
3. Analyze how the development and progression of structural systems contributes to the body's overall function.
4. Identify basic characteristics of each body system and how they work together as a whole.
5. Differentiate between organ systems of the body and their various functions.

| CO/ PO, PSO Mapping | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes(POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| CO2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| CO3 | 1 | 2 | - | 1 | - | - | - | - | - | - | - | - | 1 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 1 | 1 |
| CO5 | 1 | 1 | - | 1 | - | - | - | - | - | - | - | - | 1 | 1 |

UNIT I ORGANIZATION OF HUMAN BODY**9**

Structure of Cell – levels of structural organization - Polarization and Depolarization of Cell, Tissue: Types – Homeostasis -Specialized tissues – functions – Positive and Negative Feedback Mechanism - Muscle Physiology: Muscle physiology and aspects of Skin Resistance.

UNIT II RESPIRATORY SYSTEM AND URINARY SYSTEM**9**

Respiratory System: Physiological aspects of respiratory system – Trachea and Lungs - Exchange of gases - Respiratory Mechanism. Types of respiration - Oxygen and carbon dioxide transport and acid base regulation. Urinary system: Structure of Kidney and Nephron - Mechanism of Urine formation – Urinary reflex – urethra - internal/external sphincters - Homeostasis and blood pressure regulation by urinary system – Storage and elimination.

UNIT III BLOOD AND CARDIOVASCULAR SYSTEM

9

Blood composition - functions of blood – functions of RBC.WBC types and their functions Blood groups – importance of blood groups – identification of blood groups. Blood vessels – Electrical simulation – blood clotting -Wound healing - Anatomy of heart – Properties of Cardiac muscle –Conducting system of heart – Cardiac cycle – Heart sound- Volume and pressure changes and regulation of heart rate– Coronary Circulation.Factors regulating Blood flow– ECG–Einthoven’s Triangle.

UNIT IV SKELETAL AND SPECIAL SENSORY SYSTEM

9

Skeletal system: Bone types and functions – Axial Skeleton and Appendicular Skeleton. Joint - Types of Joint – Cartilage structure, types and functions. Special Sensory system- Optics of vision – receptor and neural function of the retina – photochemistry of vision – central neurophysiology of vision – EOG – Physiology of hearing mechanism – hearing loss – audiograms – hearing tests – taste and smell sensors.

UNIT V NERVOUS SYSTEM

9

Structure of a Neuron – Neuroglial Cells - Synapses - Reflex actions of sympathetic and parasympathetic nervous system – Nerve conduction and action potentials - Brain – Electroencephalograph (EEG) - Divisions of brain lobes - Cross Sectional Anatomy of Brain - Cortical localizations and functions. Spinal cord – Tracts of spinal cord – Spinal Nerve - Reflex mechanism – Types of reflex. Autonomic nervous system and its functions.

TOTAL:45 HOURS

TEXTBOOK

1. Elaine.N. Marieb, "Essential of Human Anatomy and Physiology", Pearson Education New Delhi, 8th Edition, 2016.
2. Ramzi SCotran, Vinay Kumar and Stanley L Robbins, Pathologic Basis of Diseases, 7th Edition, W.B.Saunders Co., 2005.
3. Gillian Pocock, Christopher D. Richards, "The Human Body An introduction for Biomedical and Health Sciences", Oxford University Press, USA, 2013.

REFERENCES

1. William F. Ganong, "Review of Medical Physiology", Mc Graw Hill, New Delhi, 25th Edition, 2015.
2. Eldra Pearl Solomon. "Introduction to Human Anatomy and Physiology", W.B.Saunders Company, 2003.
3. Arthur C. Guyton, "Text book of Medical Physiology", Elsevier Saunders, 11th Edition, 2006.

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Bias the transistors for amplification purpose
2. Analysis the mid-frequency operation of BJT amplifier circuits
3. Calculate cut-off frequencies and bandwidth of BJT amplifier circuit
4. Analysis the Working principle of FETs
5. Design different types of power supplies.

| CO/ PO, PSO Mapping | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes(POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 1 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |
| CO2 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |
| CO3 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |
| CO5 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |

UNIT I TRANSISTOR BIAS STABILITY**9**

BJT – Need for biasing – Stability factor - Fixed bias circuit, Load line and quiescent point. Variation of quiescent point due to h_{FE} variation within manufacturers tolerance - Stability factors - Different types of biasing circuits - Method of stabilizing the Q point - Advantage of Self bias (voltage divider bias) over other types of biasing- self bias as a constant current circuit

UNIT II MID-BAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS**9**

CE, CB and CC amplifiers - Method of drawing small-signal equivalent circuit - Miller's theorem - Comparison of CB, CE and CC amplifiers and their uses - Methods of increasing input impedance using Darlington connection and bootstrapping – Differential amplifier, Basic BJT differential pair – CMRR.

UNITIII FREQUENCY RESPONSE OF AMPLIFIERS

9

General shape of frequency response of amplifiers - Definition of cut-off frequencies and bandwidth - Low frequency analysis of amplifiers to obtain lower cut-off frequency Hybrid equivalent circuit of BJTs - High frequency analysis of BJT amplifiers to obtain upper cut-off frequency – Gain Bandwidth Product.

UNITIV FIELD EFFECT TRANSISTORS

9

JFETs – Drain and Transfer characteristics - Current equations - Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, Characteristics – Comparison of MOSFET with JFET.

UNITV RECTIFIERS AND POWER SUPPLIES

9

Classification of power supplies, Rectifiers - Half-wave, full-wave and bridge rectifiers with resistive load. Analysis for V_{dc} and ripple voltage with C, L, LC and CLC filters

TOTAL:45 HOURS

TEXTBOOK

1. Millman and Halkias, "Integrated Electronics", 2nd Edition, Tata Mc Graw Hill, 2010.
2. Anil K. Maini and Varsha Agrawal, "Electronics Devices and Circuits", First Edition, Wiley Publications, 2009.

REFERENCES

1. Y.N. Bapat, "Electronic devices and circuits, Discrete and Integrated", 3rd Edition, Tata Mc Graw Hill, 2011

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Estimation and quantification of bio molecules.
2. Separation of macromolecules.
3. Interpreting the metabolic changes in pathological conditions.

| CO/ PO, PSO Mapping | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| CO2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 |
| CO3 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 |

LIST OF EXPERIMENTS:

1. Preparation of serum and plasma from blood using Neubaur's Chamber.
2. Measure the amount of blood using blood glucose estimation.
3. Measure the level of creatinine in the blood to check kidney function.
4. Determination of urea in blood and urine by Urease method.
5. Estimation of cholesterol in serum.
6. Separation of proteins by SDS electrophoresis.
7. Separation of amino acids by thin layer chromatography.
8. Separation of DNA by agarose gel electrophoresis.
9. ESR, PCV, MCH, MCV, MCHC, total count of RBCs and hemoglobin estimation.
10. Differential count of different WBCs and blood group identification.
11. Measurement of Ph of solutions using pH meter.
12. Ishihara chart for color blindness and Snellen's chart for myopia and hyperopia - by letters reading and ophthalmoscope to view retina.
13. Determination of percentage Transmittance, Absorbance and concentration of given solution using spectrophotometer.

TOTAL: 30Hrs

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Operate electronic test equipment and hardware tools to use and the same for conducting experiments
2. Plot the characteristics of given bipolar BJT, Diodes and special diodes to understand their behavior
3. Design, construct, and test amplifier circuits and interpret the results

| CO/ PO, PSO Mapping | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes(POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 1 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |
| CO2 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |
| CO3 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 |

LIST OF EXPERIMENTS:

1. V-I Characteristics of given Si and Ge Diodes
2. V-I Characteristics of Zener Diode and Prove that the output voltage gets regulated after the breakdown voltage for variable input voltage in the range of 0.5V to 8V of a given Zener Diode
3. Design Power Supply circuit using Half wave and Full wave rectifier with simple capacitor filter.
4. Analyse Characteristics of the following Special Diodes
 - Photodiode
 - Light emitting diode
5. Analyse the Input and Output Characteristics of BJT(NPN)
6. Analyse Frequency Response of BJT(CE) using Fixed Bias Amplifier Circuit
7. Analyse Frequency Response of BJT (CE) using Voltage Divider Bias (self-bias) with and without bypassed Emitter Resistor (CE)
8. Analyse the frequency response of the Common Collector BJT Amplifier.
9. Design a Differential amplifier using BJT and Measurement of CMRR.

TOTAL: 30Hrs

COURSE OUTCOMES:

After successful completion the course, the student will be able to

1. Write simple C programs using console input and output functions
2. Write C programs using arrays, decision making and looping statements
3. Design and develop simple application using functions and pointers.
4. Design and develop real-time applications using structures and unions
5. Design and develop real-time applications using file operation

| CO/ PO, PSO Mapping | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes(POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | 2 | 3 | | | 2 | 1 | 1 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 3 | | | 2 | 1 | 1 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 3 | | | 2 | 1 | 1 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | | | 2 | 1 | 1 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | | | 2 | 1 | 1 | 2 | 3 | 3 |

UNIT I BASICS OF C PROGRAMMING**9**

Introduction to programming paradigms - Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity -Expressions – Input / Output statements, Assignment statements – Decision making statements – Switch statement- Looping statements–Pre-processor directives –Compilation process

UNIT II ARRAYS AND STRINGS**9**

Introduction to Arrays: Declaration, Initialization –Onedimensionalarray–Twodimensionalarrays–multi-dimensionalarray- String– string built-in functions – Sorting-Searching

UNIT III FUNCTIONS AND POINTERS**9**

Introduction to functions: Function prototype, function definition, function call-Call by Value-Call by reference – Recursion – user defined functions versus built-in functions- Pointers – Pointer operators – Pointer arithmetic–Arrays and pointers–pointers to an array– function pointer-indirect pointer.

UNITIVSTRUCTURES**9**

Structure – Structure definition-Nested structures – Pointer and Structures – Array of structures – Self-referential structures–bit fields-Union-Dynamic memory allocation-Singly linked list–type def.

UNITV FILE PROCESSING**9**

Files – Types of file- File Primitives- File access mode- Sequential file access - Random file access – Command line arguments-introduction to TSR programs

TOTAL: 45 HRS**TEXT BOOKS:**

1. BenClemens“21stCenturyC”, Second Edition,OreillyMediaInc,2014
2. Deiteland Deitel,“C Howto Program”,Pearson Education,NewDelhi,2011.

REFERENCE BOOKS:

1. Kernighan,B.WandRitchie,D.M,“TheCProgramminglanguage”,SecondEdition,PearsonEducation, 2006.
2. YashavantP.Kanetkar.“LetUsC”,BPBPublications,14thedition,2016.
3. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill,2006.
4. AnitaGoel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India)Pvt.Ltd., Pearson Educationin South Asia,2011.
5. E.Balagurusamy,“ProgramminginANSIC”,seventhedition,TataMcGrawHill,2016.

COURSE OUTCOMES:

After successful completion the course, the student will be able to

1. Design and develop simple programs using branching, looping statements
2. Develop programs using functions arrays, structures and string handling
3. Write programs using pointers and dynamic memory allocation and file handling

| CO/ PO, PSO Mapping | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes(POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 3 | 1 | 2 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 3 | 1 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 3 | 1 | 2 | 2 | 3 | 3 |

LIST OF EXPERIMENTS:

1. Programs using Input, Output and assignment statements.
2. Programs using Branching statements.
3. Programs using Looping statements.
4. Programs using Functions.
5. Programs using Arrays.
6. Programs using Structures.
7. Programs using Strings.
8. Programs using Pointers (both data pointers and function pointers).
9. Programs using dynamic memory allocation.
10. Programs using Recursion.
11. Programs using Files.

TOTAL: 30Hrs

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Classify the signals as continuous time and discrete time signals and classify systems based on their properties
2. Determine the response of LTI system using convolution sum for DT system and
3. Convolution Integral for CT system
4. Apply Fourier series and Fourier Transform for periodic Signals
5. Analyze system using Laplace transform and realize the structure for CT system
6. Analyze system using Z transform and realize the structure for DT system

| CO/ PO, PSO Mapping | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 2 | 1 | 2 | 1 | | | | 1 | 2 | 1 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 1 | | 1 | | 2 | | 1 | 2 | 1 | 3 | 3 |
| CO3 | 3 | 3 | 1 | | 2 | 1 | 2 | 2 | | 1 | 2 | 1 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 2 | | 1 | | 2 | | 1 | 2 | 1 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 1 | 2 | 1 | 2 | 2 | | 1 | 2 | 1 | 3 | 3 |

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS**12**

Continuous-Time and Discrete-Time signals–The Unit Impulse Unit Step, Unit Ramp Signals and other Basic Signals – Operation of Signals -Time Shifting – Time Reversal– Amplitude Scaling – Time Scaling – Signal Addition – Multiplications – Classification of signals- Continuous-Time and Discrete-Time Systems– Basic System Properties - Systems with and Without Memory – Causality – Stability – Time Invariance – Linearity.

UNIT II LINEAR TIME- INVARIANT SYSTEMS**12**

Continuous-Time LTI Systems: The Convolution Integral - graphical and analytical approach – Properties of Linear Time-Invariant Systems – Solution of Differential Equations. Discrete-Time LTI system: The Convolution sum-tabulation method-matrix multiplication method-graphical and analytical approach – Solution of Difference Equations.

UNIT III ANALYSIS OF CT SIGNALS USING FOURIER SERIES &FOURIER TRANSFORM 12

Fourier Series Representation (Trigonometric and Exponential) of Continuous-Time Periodic Signals – Properties of Continuous-Time Fourier Series – Representation of Aperiodic Signals: The Continuous-Time Fourier Transform – The Fourier Transform for Periodic Signals – Properties of the Continuous-Time Fourier Transform.

UNIT IV ANALYSIS OF SIGNALS AND SYSTEMS USING LAPLACE TRANSFORM 12

The Laplace Transform – The Region of Convergence for Laplace Transform– The Inverse Laplace Transform using Partial fraction– Properties of the Laplace Transform–System Function and Block Diagram Representations-Direct Form I and Direct Form II.

UNIT V: ANALYSIS OF SIGNALS AND SYSTEMS USING Z-TRANSFORM 12

The Z-Transform – The Region of Convergence for the Z-Transform –The Inverse Z-Transform using Partial fraction and Long division method– Properties of the Z-Transform – System Function and Block Diagram Representations-Direct Form I and Direct Form II.

TOTAL: 60 Hrs

TEXT BOOKS

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, “Signals and Systems”, 2nd E, Prentice Hall India, 2010
2. A.Anand Kumar, “Signals and Systems”, 3rd Edition, Prentice Hall India,2013

REFERENCES

1. M .J. Roberts, “Signals & Systems Analysis using Transform Methods & MATLAB”, Tata McGraw Hill, 2007
2. Haykin, Simon, and Barry Van Veen. “Signals and systems”, John Wiley & Sons, 2007. 3. A. NagoorKani, “Signals & Systems”, Tata McGraw Hill, 2010
3. John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing, Principles, Algorithms, and Applications”, 4th E, PHI, 2007
4. Robert A. Gable, Richard A. Roberts, “Signals & Linear Systems”, 3rd E, John Wiley, 1995
5. Edward W Kamen& Bonnie’s Heck, “Fundamentals of Signals and Systems”, Pearson Education, 2007

| Semester-III | U19 GE301- SOFT SKILLS AND APTITUDE – I | L | T | P | C | Marks |
|---|---|---|---|---|---|-------|
| | | 0 | 0 | 2 | 1 | 100 |
| Course Outcomes | | | | | | |
| At the end of the course the student will be able to: | | | | | | |
| 1. Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches | | | | | | |
| 2. Solve problems of greater intricacy in stated areas of quantitative aptitude and logical reasoning | | | | | | |
| 3. Demonstrate higher levels of verbal aptitude skills in English with regard to specific topics | | | | | | |
| 1.Soft Skills | Demonstrating soft-skill capabilities with reference to the following topics: | | | | | |
| | <ul style="list-style-type: none"> a. Attitude building b. Dealing with criticism c. Innovation and creativity d. Problem solving and decision making e. Public speaking f. Group discussions | | | | | |
| 2. Quantitative Aptitude and Logical Reasoning | Solving problems with reference to the following topics: | | | | | |
| | <ul style="list-style-type: none"> a. Vedic Maths: Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification. b. Numbers: Types, Power cycle, Divisibility, Prime factors & multiples, HCF & LCM, Remainder theorem, Unit digit, highest power. c. Averages: Basics of averages and weighted average. d. Percentages: Basics of percentage and Successive percentages. e. Ratio and proportion: Basics of R & P, Alligations, Mixture and Partnership. f. Profit ,Loss and Discount: Basic & Advanced PLD g. Data Interpretation: Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation. h. Syllogism: Six set syllogism using Venn diagram and tick and cross method | | | | | |
| 3. Verbal Aptitude | Demonstrating English language skills with reference to the following topics: | | | | | |
| | <ul style="list-style-type: none"> a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures g. Error spotting | | | | | |

S. Aust

Department of Placement Training
Sona College of Technology.
Salem-636 005.

SEMESTER – III

MANDATORY COURSE

U19GE303 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

(Common for IT, ECE and BME)

| | | | |
|---|---|---|---|
| L | T | P | C |
| 2 | 0 | 0 | 0 |

Course Outcomes

At the end of the course, the students will be able to,

1. understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
2. show an ability to comment critically on curriculum proposals that aim to promote science citizenship/scientific literacy
3. communicate using common medical and psychological terminology, including the skill to discuss commonly used medications, supplements, and surgical procedures
4. use effective oral and written language skills to communicate scientific data and ideas
5. describe the fundamentals of yoga and its importance

Unit I

- Introduction to Vedas
- Traditional methodology of Veda – Sat Angas
- Types of Vedas and their application
- Sub Veda – Ayurveda - their modern day application

6

Unit II

- Basics of Applied Vedic Science
- Modern day application of Vedas and procedure
- Ancient Indian Scientific thoughts
- Introduction to the Vedic language “Sanskrit”

6

UNIT – III- Modern science

- Introduction – modern science
- Objectives – modern science
- Architecture in ancient India

6

UNIT – IV Technology

- India’s contribution to science and technology (from ancient to modern)
- Nobel laureates of Indian origin and their contribution
- India in space
- Latest achievement from Jan – 2017

6

20.05.2020

B.E. / B.Tech. Regulations 2019

UNIT – V- Yoga and Holistic Health Care

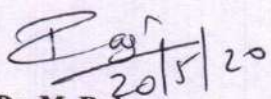
6

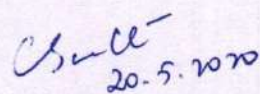
- Fundamentals of yoga and holistic health
- Human biology
- Diet and nutrition
- Life management
- Contemporary yogic models – case study

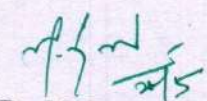
References

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
4. Roshan Dalal The Vedas: An Introduction to Hinduism's Sacred Texts, Penguin Books 2014. ISBN 13: 9780143066385
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN : 9781988207049

Total: 30 HOURS


Dr. M. Raja
Course Coordinator / Sciences


Dr. C. Shanthi
HOD / Sciences


Dr. M. Renuga
Chairperson BOS,
Science and Humanities

20.05.2020

B.E. / B.Tech. Regulations 2019

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|--|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM401 | Analog and Digital Integrated Circuits | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM402 | Biomedical Instrumentation | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM403 | Control System for Biomedical Engineering | 3 | 0 | 0 | 3 | 45 |
| 4 | U19BM404 | Biomaterials | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CS406 | Data Structures | 3 | 0 | 0 | 3 | 45 |
| 6 | U19GE402 | Mandatory Course: Environment and Climate Science | 2 | 0 | 0 | 0 | 30 |
| Practical | | | | | | | |
| 7 | U19BM405 | Analog and Digital Integrated Circuits Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM406 | Biomedical Instrumentation Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19CS407 | Data Structures Laboratory | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE401 | Soft Skills and Aptitude-II | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 19 | |

Approved By

Chairperson, Biomedical Engineering BoS
Dr.S.Prabakar

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Biomedical Engineering, Fourth Semester BE BME Students and Staff, COE

COURSE OUTCOMES:

At the end of each course, the students will be able to

1. Introduce the basic building blocks of linear integrated circuits and the linear and non-linear applications of operational amplifiers.
2. Learn the theory of active filter, ADC and DAC.
3. Introduce the concepts of waveform generation and introduce some special function ICs 555 and 565.
4. Present the Digital fundamentals, Boolean algebra and its applications in digital systems, and familiarize with the design of various combinational digital circuits using logic gates.
5. Introduce the analysis and design procedures for synchronous and asynchronous sequential circuits.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Po's) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | 3 | - | - | - | - | 3 | 1 | - | - | 3 | - | - |
| CO2 | 3 | 3 | 3 | 3 | - | - | - | - | 3 | 1 | - | - | 3 | - | - |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | - | 3 | 1 | - | - | 3 | - | - |
| CO4 | 3 | 3 | 3 | 3 | - | - | 3 | - | - | - | - | - | 3 | - | - |
| CO5 | 3 | 3 | 3 | 3 | - | - | 3 | - | - | - | - | - | 3 | - | - |

UNIT I OPERATIONAL AMPLIFIER 9

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Pin details -Linear applications - Inverting, Non-Inverting, summing, subtracting, averaging, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, I-V converter, V-I converters, Non linear applications -Comparators, Schmitt Trigger, Precision rectifier.

UNIT II ACTIVE FILTERS AND DATA CONVERTERS 9

Introduction to Active Filters, LPF, HPF, Band pass, Band reject and All Pass Filters, Basic DAC, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC, Single and Dual Slope ADC. Features and Pin details of DAC and ADC ICs -DAC0800 and ADC0808.

UNIT III OP-AMP, IC-555 & IC 565 APPLICATIONS 9

Oscillators - RC Phase shift and Wein-bridge. Waveform generators - Square, triangular and saw tooth, IC555 Timer - Functional Diagram, Monostable and Astable Operations, IC565 PLL - Block Schematic, Description of Individual Blocks and IC pins, Applications.

UNIT IV DIGITAL INTEGRATED CIRCUITS**9**

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Gray, Alphanumeric codes, Boolean theorems, Various Logic Families, Logic gates, Universal gates, Sum of products and product of sums, Karnaugh map Minimization, Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT V SEQUENTIAL LOGIC IC'S AND MEMORIES**9**

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, ICs details, Triggering of FF, – state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

TOTAL: 45 PERIODS**TEXT BOOK:**

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson, 5th Edition, 2014.
2. Ramakant A. Gayakwad, "OP - AMP and Linear IC's", Prentice Hall, 2012

REFERENCES BOOKS::

1. Taub and Schilling, "Digital Integrated Electronics", Mc Graw Hill, 2017.
2. John.F.Wakerly, "Digital design principles and practices", Pearson Education, 5th Edition, 2018.
3. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Mc Graw Hill Education, 3rd Edition, 2017.
4. S Salivahanan and V S Kanchana Bhaaskaran, Linear Integrated Circuits, McGraw Hill Education, 3rd Edition, 2018.

COURSE OUTCOMES:

At the end of each unit, the students will be able to

1. Summarize various aspects of bio potential recording systems for human anatomy.
2. Interpret the various measurement methods and translate flow of blood as metrics.
3. Outline the objectives and working principles of various radiological and ultrasound equipment's.
4. Explicit bio amplifiers for physiological recordings.
5. Examine the fundamentals of signal generators and analyzers.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |
| CO2 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |
| CO4 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |

UNIT I BASICS OF BIOPOTENTIALS**9**

Origin of Bio-potentials- Electro-Physiology, Bio-potential Electrodes-Bio-Potential Recording, Biological Amplifiers –ECG-EEG-EMG-PCG-EOG-Lead systems and recording methods-Typical waveforms and signal characteristics.

UNIT II HAEMOTOLOGICAL INSTRUMENTS AND ANALYSIS TECHNIQUE**9**

Step Measurement of blood flow-radiographic indicator dye dilution-Thermal convection-Magnetic blood flow rate-Ultrasonic blood flow meter-Sphygmomanometer-Blood gas analyzer-Oximeter-Auto analyzer-Electrophoresis-Colorimeter-Spectrophotometer-Flame photometer.

UNIT III MEDICAL IMAGING TECHNIQUES**9**

Introduction to medical imaging - X-Ray, Computer Tomography (CT),Magnetic Resonance imaging (MRI),Positron Emission Tomography (PET),SPECT,Mammography-Physics of ultrasound imaging-Modes of Scan-Advantages and Disadvantages of ultrasound Scanning-Thermography.

UNIT IV SIGNAL CONDITIONING CIRCUITS**9**

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier, Impedance matching circuit, Isolation amplifiers – Transformer and optical isolation - Isolated DC amplifier and AC carrier amplifier., Power line interference, Right leg driven ECG amplifier, Band pass filter circuits.

UNIT V: SIGNAL GENERATORS AND ANALYZERS**9**

Sine wave generator-Frequency synthesized sine wave generator-sweep frequency generator-Pulse and Square wave generator-Functional Generator-Wave Analyzer-Applications-Harmonic distortion analyzer-Spectrum analyzer-Applications.

Total Hours: 45**TEXT BOOKS:**

1. Leslie Cromwell, “Biomedical Instrumentation and Measurements”, Pearson India, 2015.
2. Albert D. Helfrick and William David Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Pearson Education India; 1st edition, January 2015.

REFERENCES BOOKS::

1. R S Khandpur, “Handbook of Biomedical Instrumentation”, McGraw Hill Education; Third edition, 2015.
2. Ananda Natarajan R, “Biomedical Instrumentation and Measurements”, Prentice Hall of India, New Delhi, 2015.
3. Oliver B.M and Cage J.M, “Electronic Measurements and Instrumentation”, McGraw Hill, revised edition 2017.
4. Joseph J Carr, “Elements of Electronic Instrumentation and Measurement”, Pearson Education India, 3rd edition, 2015.

COURSE OUTCOMES:

At the end of each unit, the students will be able to

1. Interpret the need for mathematical modeling of various systems, representation of systems in block diagrams and signal flow graphs and are introduced to biological control systems
2. Determine the time response of various systems and discuss the concept of system stability
3. Examine the frequency response characteristics of various systems using different charts
4. Appraise the concept of modeling basic physiological systems
5. Identify the application aspects of time and frequency response analysis in physiological control systems.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | 2 | 2 | 1 |
| CO2 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | 2 | 2 | 1 |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | 1 | - | - | 1 | 2 | 2 | 1 |
| CO4 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 2 | 1 |
| CO5 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 2 | 1 |

UNIT I INTRODUCTION 9

Open and Closed loop Systems, Modeling and Block Diagrams, Block diagram and signal flow graph representation of systems, reduction of block diagram and signal flow graph, Introduction to Physiological control systems- Illustration, Linear models of physiological systems, Difference between engineering and physiological control system.

UNIT II TIME RESPONSE ANALYSIS 9

Step and impulse responses of first order and second order systems, time domain specifications of first and second order systems, steady state error constants, Definition of stability, Routh- Hurwitz criteria of stability, root locus technique, construction of root locus and study of stability.

UNIT III FREQUENCY RESPONSE ANALYSIS 9

Frequency domain specifications - Polar plots, Bode plots, Nyquist plot, Nyquist stability criterion, closed loop stability, Constant M and N circles, Nichol’s chart.

UNIT IV BIOLOGICAL SYSTEM MODELS 9

Distributed parameter versus lumped parameter models, Model development of Cardiovascular system- Heart model-circulatory model, Pulmonary mechanics- Lung tissue viscoelastance-chest

wall- airways, Interaction of Pulmonary and Cardiovascular models, Static analysis of physiological systems – Regulation of cardiac output, Regulation of ventilation.

UNIT V BIOLOGICAL CONTROL SYSTEM ANALYSIS

9

Simple models of muscle stretch reflex action, Study of steady state analysis of muscle stretch reflex action, Study of transient response analysis of neuromuscular reflex model action, Study of frequency response of circulatory control model, Stability analysis of Pupillary light reflex.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. I.J. Nagarath and M. Gopal, Control Systems Engineering, 5th Edition, Anshan Publishers, 2009.
2. Michael C K Khoo, Physiological Control Systems, WILEY- IEEE Press, Prentice Hall of India, 2018.

REFERENCE BOOKS:

1. Benjamin C. Kuo, Automatic Control Systems, Prentice Hall of India, 2014.
2. John Enderle Susan Blanchard and Joseph Bronzino, Introduction to Biomedical Engineering, 2nd Edition, Academic Press, 2005.
3. Ogata, Katsuhiko and Yanjuan Yang, Modern control engineering, Vol 4, Prentice-Hall, 2010.
4. Bhattacharya and Sriman Kumar, Control systems engineering, Pearson Education India, 2nd Edition, 2012.
5. Richard C. Dorf and Robert H. Bishop, Modern control systems, Pearson, 2004.

COURSE OUTCOMES:

At the end of each unit, the students will be able to -

1. Describe the basic properties of Biomaterials.
2. Analyze the metallic implant materials.
3. Analyze the polymeric implant materials and Composite implant materials.
4. Identify basic characteristics of bio ceramics.
5. Measure the Biocompatibility and analyze the Toxicological Screening of Biomaterials

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | 1 | - | - | - | - | - | 1 | - | 1 | - | - | - | 2 | 1 |
| CO2 | 3 | 2 | 2 | - | 2 | - | - | - | - | 1 | - | - | 1 | 2 | 1 |
| CO3 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | 2 | 1 |
| CO4 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | 2 | 1 |
| CO5 | 3 | 2 | 2 | - | 2 | - | - | 1 | - | 1 | - | - | 1 | 2 | 1 |

UNIT I**PROPERTIES OF BIOMATERIALS****9**

Definition of biomaterials- requirements & 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.

UNIT II**METALLIC IMPLANT MATERIALS****9**

Stainless steel- Cobalt based alloys- Ti and Ti-based alloys. Importance of stress-corrosion cracking. Host tissue reaction with bio metal- corrosion behaviour and the importance of passive films for tissue adhesion. Hard tissue replacement implant: Orthopedic implants- Dental implants. Soft tissue replacement implants: Percutaneous and skin implants- Vascular implants- Heart valve implants-Tailor made composite in medium.

UNIT III**POLYMERIC IMPLANT MATERIALS****9**

Polyolefin's- polyamides- acrylic polymers- fluorocarbon polymers- silicon rubbers- acetyls. (Classification according to thermo sets- thermoplastics and elastomers). Viscoelastic behavior: creep-recovery- stress-relaxation- strain rate sensitivity. Importance of molecular structure- hydrophilic and hydrophobic surface properties- migration of additives (processing aids)- aging and environmental stress cracking.

Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes- Biopolymers in controlled release systems. Synthetic polymeric membranes and their biological applications.

UNIT IV

CERAMIC IMPLANT MATERIAL

9

Definition of bio ceramics. Common types of bio ceramics Aluminum oxides- Glass ceramics- Carbons. Bio resorbable and bioactive ceramics. Importance of wear resistance and low fracture toughness. Host tissue reactions: importance of interfacial tissue reaction (ceramic/bone tissue reaction). Composite implant materials - Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement (short and long fibers- fibers pull out). Polymers filled with osteogenic fillers (hydroxyapatite). Host tissue reactions.

UNIT V BIOCOMPATIBILITY AND TOXICOLOGICAL SCREENING OF BIOMATERIALS

9

Definition of biocompatibility, blood compatibility and tissue compatibility. Toxicity tests: acute and chronic toxicity studies (in situ implantation, tissue culture, haemolysis, thrombogenic potential test, systemic toxicity, intracutaneous irritation test), sensitization, carcinogenicity, mutagenicity and special tests.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Biomaterials- Basic Theory with Engineering Applications C.Mauli Agarwal, Joo L.Ong, Mark R. Appleford, Gopinath Mani. Cambridge University Press, New York- 2016.

REFERENCE BOOKS:

1. Biomaterials Science: An Introduction to Materials in Medicine- By Buddy D. Ratner, et. al. Academic Press, San Diego, 2015.
2. Sujata V. Bhat, Biomaterials, Narosa Publishing House, 2014.

COURSE OUTCOMES

At the end of the course, the students will be able to

1. Implement abstract data types for linear data structures
2. Solve real world problems using stack and queue linear data structures
3. Apply various non-linear tree data structures in real time applications
4. Design algorithms to solve common graph problems
5. Analyze various searching, sorting and hashing techniques

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 |

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation - Singly linked lists - Circularly linked lists - Doubly-linked lists – Applications of lists

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations– Evaluating arithmetic expressions - Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Double ended queue – Applications of Stacks and queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Trees – Traversals – Binary Trees – Expression trees – Applications of trees – Binary search trees - AVL Trees – B-Tree – Heap – Applications of heap -Tries.

UNIT IV NON LINEAR DATA STRUCTURES – GRAPHS 9

Graphs - Representation of graph – Graph traversals – Breadth-first traversal – Depth-first traversal – Minimum Spanning Trees: Prim’s algorithm, Kruskal’s algorithm – Shortest path algorithms: Dijkstra’s algorithm- Applications of Graphs: Topological Sort.

Searching - Linear Search – Binary Search, Sorting – Bubble sort– Insertion sort – Merge sort, Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Total Hours: 45

TEXT BOOK:

1. Mark Allen Weiss, “Data structures and Algorithm Analysis in C”, Pearson Education, New Delhi, Second Edition, 2012.

REFERENCES BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest , Clifford Stein, “Introduction to Algorithms” ,3rd Edition, MIT Press, 2010.
2. Jean Paul Tremblay and Sorenson, “An Introduction to Data Structures with Applications”, McGraw Hill Publishing Company, New Delhi, Second Edition, 2007.
3. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tanenbaum, “Data Structures using C and C++”, Prentice Hall of India/ Pearson Education, New Delhi, 2006.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Silicon Press, New Jersey, Second Edition, 2005

Course Outcomes:

At the end of the course, the student will be able to

1. State the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
2. Explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. Explain environmental based pollution their causes, effects and their remedial measures
4. Discuss their causes, effects and the control measures of Global Warming, Acid Rain, Ozone Layer Depletion
5. Describe the effect of climate change due to pollution

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | - | - | - | 2 | 2 | - | - | - | - | - | - | - | 3 |
| CO2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 |
| CO3 | 3 | 2 | - | - | - | 2 | 2 | - | - | - | - | - | - | 2 | 3 |
| CO4 | 3 | 2 | - | - | - | 2 | 2 | - | - | - | - | - | - | 2 | 3 |
| CO5 | 3 | 2 | - | - | - | 2 | 2 | - | - | - | - | - | - | 2 | 3 |

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES**6**

Definition, Scope and Importance Forest Resources:- Use and over - exploitation, deforestation, Case Studies, Water Resources:- Use and Over-Utilization of Surface and ground water , Floods, Drought, Food Resources- Effects of Modern Agriculture, Fertilizer- Pesticide Problems–Role of an Individual in Conservation of Natural Resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY**6**

Structure and Function of an Ecosystem– Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity –Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values –India as a Mega-Diversity Nation — Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

UNIT III ENVIRONMENTAL POLLUTION

6

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain,– Role of an Individual in Prevention of Pollution..

UNIT IV CLIMATE CHANGE ON THE ENVIRONMENT

6

Sustainable Development- - Climate Change- Causes and effects of Global Warming - Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy - Kyoto Protocol in reduction of greenhouse gases - Ozone Layer Depletion - mechanism, effects and control measures- Montreal Protocol to protect ozone layer depletion - Rain Water Harvesting - .Effect of climate change due to air pollution Case study - CNG vehicles in Delhi

UNIT V EFFECT OF CLIMATE CHANGE ON POLLUTION

6

Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings, consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.

Total Hours: 30

TEXT BOOKS:

1. Miller, T.G. Jr., “Environmental Science”, Wadsworth Pub. Co. 2018
2. Anubha Kaushik and Kaushik, “Environmental Science and Engineering” New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

REFERENCES BOOKS:

1. S. Radjarejesri et al., “Environmental Science” Sonaversity, Sona College of Technology, Salem, 2018.
2. Masters, G.M., “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., 2nd Edition, 2004.
3. Erach, B., “The Biodiversity of India”, Mapin Publishing P.Ltd.,Ahmedabad, India.
4. Erach Bharucha, “Textbook of Environmental Studies for Undergraduate Courses”, 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad – 500029.

COURSE OUTCOMES

At the end of course , the students will be able to

1. Perform mathematical operations and generate different types of waveforms using IC 741 Op-amp.
2. Design monostable and Astable multivibrators using IC 555.
3. Design and implement combinational and sequential circuits using logic gates and breadboards.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | 3 | | | | | 3 | 1 | | | 3 | 1 | |
| CO2 | 3 | 3 | 3 | 3 | | | | | 3 | 1 | | | 3 | 1 | |
| CO3 | 3 | 3 | 3 | 3 | | | | | 3 | 1 | | | 3 | 1 | |

List of Experiments:

1. Design of Inverting and Non-Inverting amplifier using Opamp (IC 741)
2. Design of Integrator and Differentiator using Opamp (IC 741)
3. Design of Differential amplifier to find CMRR using Opamp (IC 741).
4. Design of Astable and Monostable multivibrator using Opamp IC 741
5. Design of Schmitt trigger using Opamp (IC 741)
6. Design and implementation of
 - (a) Half Adder and Full Adder, Half Subtractor and Full Subtractor
 - (b) 4-bit Parallel Adder cum Subtractor
 - (c) Magnitude Comparator
7. Design and implementation of
 - (a) Code Converters – Binary to Gray and Gray to Binary
 - b) BCD to Excess 3 and Excess 3 to BCD

8. Design and implementation of
 - (a) Multiplexer and Demultiplexer
 - (b) Decoder
 - (c) Encoder
 - (d) Parity Generator and Checker
9. Design and implementation of
 - (a) Asynchronous Counter
 - (b) Synchronous Counter
10. Design and implementation of
 - (a) Shift Registers – SISO, SIPO and PIPO

Total Hours: 30

COURSE OUTCOMES

At the end of course , the students will be able to

1. Measure various non-electrical parameters Record the electrical impulses of heart, muscle and brain using ECG, EMG and EEG.
2. Measure various non-electrical parameters using suitable sensors/transducers and
3. Design instrumentation amplifier and filters using simulation tools.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |
| CO2 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | - | - | - | 3 | 2 | - | - | - | 2 | 2 | 2 | 3 | 3 | 3 |

List of Experiments

1. Measure the electrical activity of heart using ECG.
2. Measure the electrical activity of muscles using EMG.
3. Measure the electrical pattern of brains Using EEG.
4. Measure the velocity of blood flow using Blood flow measurement system using ultra sound transducer.
5. Measure the respiration rate using accessories.
6. Measure the rate/rhythm in heart beat using pacemakers.
7. Measure of hearing loss by air conduction and bone conduction using Audiometer.
8. Measure of blood pressure using sphygmomanometer and stethoscope.
9. Conduct Weber and Rinne test for auditory conduction.
10. Design instrumentation amplifier circuit and filter circuits using TINA simulation software.

Total Hours: 30

COURSE OUTCOMES

At the end of the course, students will be able to

1. Design and develop simple programs using data structures
2. Apply non-linear data structures for various real time applications
3. Design shortest path algorithm for various real life applications

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 |

LIST OF EXPERIMENTS

1. Implementation of Lists, Stacks and Queues
2. Implementation of Binary Tree and Traversal Techniques
3. Implementation of Binary Search Trees
4. Implementation of AVL Trees
5. Implementation of B-trees
6. Implementation of graphs using BFS and DFS.
7. Implementation of Prim's algorithm.
8. Implementation of Kruskal's algorithm
9. Implementation of Dijkstra's algorithm
10. Implementation of Hashing and Collision Resolution Technique.
11. Implementation of Heap
12. Implement of Sorting and searching Techniques

Total Hours: 30

| Semester – IV | U19GE401-SOFT SKILLS AND APTITUDE – II | L | T | P | C | Marks |
|--|--|---|---|---|---|-------|
| | | 0 | 0 | 2 | 1 | 100 |
| Course Outcomes | | | | | | |
| At the end of the course the student will be able to: | | | | | | |
| 1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches | | | | | | |
| 2. Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests | | | | | | |
| 3. Demonstrate greater than SSA-I level of verbal aptitude skills in English with regard to given topics and score 65-70% marks in company-specific internal tests | | | | | | |
| 1.Soft Skills | Demonstrating soft-skill capabilities with reference to the following topics: <ol style="list-style-type: none"> SWOT Goal setting Time management Stress management Interpersonal skills and Intrapersonal skills Presentation skills Group discussions | | | | | |
| 2. Quantitative Aptitude and Logical Reasoning | Solving problems with reference to the following topics: <ol style="list-style-type: none"> Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages. Logarithms, Inequalities and Modulus Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series. Time and Work: Pipes & Cistern and Work Equivalence. Time, Speed and Distance: Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks and Escalators. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection. Binary Number System.- Binary to decimal, Octal, Hexadecimal | | | | | |
| 3. Verbal Aptitude | Demonstrating English language skills with reference to the following topics: <ol style="list-style-type: none"> Critical reasoning Theme detection Verbal analogy Prepositions Articles Cloze test Company specific aptitude questions | | | | | |



Dr.S.Anita

Head/Training

MANDATORY COURSES

Sona College of Technology, Salem

Department of Sciences (Chemistry)

SEMESTER – IV

MANDATORY COURSE

U19GE402 - ENVIRONMENT AND CLIMATE SCIENCE

(Common for MCT, IT, FT, ECE and BME)

L T P C
2 0 0 0

Course Outcomes:

At the end of the course, the student will be able to

1. state the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
2. explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. explain environmental based pollution their causes, effects and their remedial measures
4. discuss their causes, effects and the control measures of Global Warming, Acid Rain, Ozone Layer Depletion
5. describe the effect of climate change due to pollution

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **6**

Definition, Scope and Importance Forest Resources:- Use and over - exploitation, deforestation, Case Studies, Water Resources:- Use and Over-Utilization of Surface and ground water , Floods, Drought, Food Resources- Effects of Modern Agriculture, Fertilizer- Pesticide Problems–Role of an Individual in Conservation of Natural Resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY **6**

Structure and Function of an Ecosystem– Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity –Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values –India as a Mega-Diversity Nation — Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

UNIT III ENVIRONMENTAL POLLUTION **6**

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain,– Role of an Individual in Prevention of Pollution..

23.01.2021

B.E. / B.Tech. Regulations 2019

UNIT IV CLIMATE CHANGE ON THE ENVIRONMENT

6

Sustainable Development- - Climate Change- Causes and effects of Global Warming - Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy - Kyoto Protocol in reduction of greenhouse gases - Ozone Layer Depletion - mechanism, effects and control measures- Montreal Protocol to protect ozone layer depletion - Rain Water Harvesting - .Effect of climate change due to air pollution Case study - CNG vehicles in Delhi

UNIT V EFFECT OF CLIMATE CHANGE ON POLLUTION

6

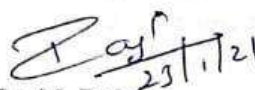
Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings. consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.

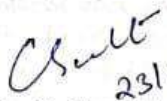
TOTAL: 30 HOURS**Text Books:**

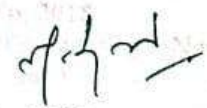
1. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co. 2018
2. Anubha Kaushik and Kaushik, "Environmental Science and Engineering" New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

References:

1. S. Radjarejesri et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2018.
2. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
3. Erach, B., "The Biodiversity of India", Mapin Publishing P.Ltd., Ahmedabad, India.
4. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad - 500029.


23/1/21
Dr. M. Raja
Course Coordinator / Sciences


23/1/2021
Dr. C. Shanthi
HOD / Sciences


Dr. M. Renuga
Chairperson BOS,
Science and Humanities

23.01.2021

B.E. / B.Tech. Regulations 2019

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V under Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|---|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM501 | Diagnostic and Therapeutic Equipments I | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM502 | Pathology and Microbiology | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM503 | Biomechanics | 3 | 0 | 0 | 3 | 45 |
| 4 | U19EC510 | Digital Signal Processing | 3 | 0 | 0 | 3 | 45 |
| 5 | U19EC511 | Microprocessors and Embedded System Design | 3 | 0 | 0 | 3 | 45 |
| 6 | noc22_mg104 | NPTEL - Principles of Management | 3 | 0 | 0 | 3 | 45 |
| Practical | | | | | | | |
| 7 | U19EC512 | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19EC513 | Microprocessors and Embedded System Design Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19BM504 | Pathology and Microbiology Laboratory | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE501 | Soft Skills and Aptitude – III | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 22 | 390 |

Approved By

Chairman, Biomedical Engineering BoS
Dr.S.Prabakar

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Biomedical Engineering, Fifth Semester BE BME Students and Staff, COE

COURSE OUTCOMES

At the end of the course, the student will be able to

- Elucidate the working and recording setup of all basic cardiac equipment.
- Explicate the working and recording of all basic neurological equipment.
- Interpret the recording of diagnostic and therapeutic equipment related to EMG.
- Explain about measurements of parameters related to respiratory system.
- Depict the measurement techniques of sensory responses.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | P09 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 1 | 2 | - | 1 | - | - | - | - | - | - | - | - | 2 | 2 | - |
| CO2 | 2 | 1 | - | 1 | - | - | - | - | - | - | - | - | 2 | 2 | - |
| CO3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | - |
| CO4 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | 2 | 2 | - |
| CO5 | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | 2 | 2 | - |

UNIT I CARDIAC DIAGNOSTIC EQUIPMENTS**9**

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Holter Monitor, Phonocardiography, ECG machine maintenance and troubleshooting, Cardiac Pacemaker- Internal and External Pacemaker- Batteries, AC and DC Defibrillator- Internal and External, Defibrillator Protection Circuit, Cardiac ablation catheter.

UNIT II NEUROLOGICAL DIAGNOSTIC EQUIPMENTS**9**

Clinical significance of EEG, Multi-channel EEG recording system, Epilepsy, Evoked Potential-Visual, Auditory and Somatosensory, MEG (Magneto Encephalograph). EEG Bio Feedback Instrumentation. EEG system maintenance and troubleshooting.

UNIT III MUSCULAR AND BIOMECHANICAL MEASUREMENTS**9**

Recording and analysis of EMG waveforms, fatigue characteristics, Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation. Static Measurement - Load Cell, Pedobarograph. Dynamic Measurement -Velocity, Acceleration, GAIT, Limb position.

UNIT IV RESPIRATORY MEASUREMENT SYSTEM**9**

Instrumentation for measuring the mechanics of breathing - Spirometer -Lung Volume and vital capacity, measurements of residual volume, Pneumotachometer -Airway resistance measurement, Whole body

Plethysmograph, Intra-Alveolar and Thoracic pressure measurements, Apnoea Monitor. Types of Ventilators - Pressure, Volume, and Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators.

UNIT V SENSORY MEASUREMENT

9

Psychophysiological Measurements - polygraph, basal skin resistance (BSR), galvanic skin resistance (GSR), Sensory responses - Audiometer-Pure tone, Speech, Eye Tonometer, Applanation Tonometer, slit lamp, auto refractometer.

TOTAL: 45 HOURS

TEXT BOOKS:

1. John G. Webster, —Medical Instrumentation Application and Design, 4th edition, Wiley India PvtLtd,New Delhi, 2015.
2. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson education, 2012.

REFERENCE BOOKS:

1. Myer Kutz, —Standard Handbook of Biomedical Engineering & Design, McGraw Hill, 2003.
2. L.A Geddes and L.E.Baker, —Principles of Applied Biomedical Instrumentation, 3rd Edition, 2008.
3. Leslie Cromwell, —Biomedical Instrumentation and Measurementl, Pearson Education, New Delhi, 2007.
4. Antony Y.K.Chan, Biomedical Device Technology, Principles and design, Charles Thomas Publisher Ltd, Illinois, USA, 2008.
5. B H Brown, R H Smallwood, D C Barber, P V Lawford and D R Hose, —Medical Physics and Biomedical Engineering, 2nd Edition, IOP Publishers. 2001.

COURSE OUTCOMES

At the end of the course, the student will be able to

- Describe DFT , FFT and to perform its computations
- Design FIR digital filters using various techniques
- Design IIR digital filters using different techniques.
- Analyse the finite word length effects in signal processing
- Describe the fundamentals of digital signal processors.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 2 | 3 | 2 | 1 | - | - | - | - | 2 | 2 | 3 | 3 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 1 | - | - | - | - | 2 | 2 | 3 | 3 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 1 | - | - | - | - | 2 | 2 | 3 | 3 | 1 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 1 | - | - | - | - | 2 | 2 | 3 | 3 | 1 |
| CO5 | 3 | 1 | 2 | 1 | 3 | 1 | - | - | - | - | 2 | 2 | 3 | 3 | 1 |

UNIT I DISCRETE FOURIER TRANSFORM AND FFT**9**

Introduction to DFT – Efficient computation of DFT- Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –Circular Convolution - Fast convolution- overlap save method and overlap add method.

UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS**9**

Review of design of Analog Butterworth and Chebychev Filters – Design of IIR digital filters using impulse invariance technique – Design of IIR digital filters using bilinear transformation – pre warping – Frequency transformation in digital domain – Realization cascade and parallel form

UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS**9**

Amplitude and phase responses of FIR filters – Linear phase filters – Windowing techniques for design of linear phase FIR filters: Rectangular- Hamming- Hanning- Kasier window- Gibbs phenomenon –Principle of frequency sampling technique. Realization of FIR filters- Linear and cascade form.

UNIT IV FINITE WORD LENGTH EFFECTS**9**

Quantization noise – derivation for quantization noise power- comparison – truncation and rounding error – input quantization error-coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling

Architectural Features – Von Neumann architecture- Harvard architecture- Bus Architecture and Memory-Multiplier- Shifter- MAC Unit- ALU- Addressing Modes – Address Generation Unit - pipelining- Overview of instruction set of TMS320C54XX. Introduction of TMS320C6748 Processor

TOTAL: 45 HOURS

TEXTBOOKS:

1. John G Proakis- Dimtris G Manolakis-“ Digital Signal Processing Principles-Algorithms and Application”- Pearson/PHI- 4th Edition- 2014
2. B.Venkataramani & M-Bhaskar- “Digital Signal Processor Architecture- Programming and Application”- TMH 2017

REFERENCE BOOKS:

1. Allan V.Openheim, Ronald W.Schafer & John R.Buck, “Discrete Time Signal Processing”- second edition Pearson/Prentice Hall, 2014.
2. P.Ramesh Babu, “Digital Signal Processing”-SCITECH-2017.
3. S.K.Mitra, “Digital Signal Processing- A Computer based approach”- Tata McGraw-Hill- 2006- New Delhi.
4. S.Salivahanan, A.Vallavaraj, Gnanapriya, “Digital Signal processing” - McGraw Hill / TMH,2019.

COURSE OUTCOMES

At the end of the course, the student will be able to

- Elucidate the basic nature of disease processes
- Classify diseases and apply knowledge of pathology's role in the diagnosis, staging and management of disease
- Depict theory and practical skills in microscopy and their handling techniques and staining procedures
- Distinguish common infectious agents and the diseases that they cause
- Illustrate the immunological reactions for the disease diagnosis.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | P09 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO3 | 1 | 2 | - | 1 | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO5 | 1 | 1 | - | 1 | - | - | - | - | - | - | - | - | 1 | 1 | 1 |

UNIT I CELL INJURY, CELL ADAPTATIONS AND NEOPLASIA**9**

Cell injury - Reversible and Irreversible cell injury, Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification- Dystrophic and Metastatic. cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, Grading, staging and laboratory diagnosis of cancer.

UNIT II FLUID AND HEMODYNAMIC DISORDERS**9**

Edema, thrombosis, embolism, Ischemia, disseminated intravascular coagulation, infarction, shock, chronic venous congestion. Haematological disorders-Bleeding disorders, Leukaemia's, Lymphomas, Haemorrhage

UNIT III MICROBIOLOGY TECHNIQUES**9**

Basics in Microbiology, morphology and classification of bacteria, growth pattern, nutritional requirements, identification of bacteria, culture media and its types, culture techniques and observation of culture, Structure and classification of virus and fungi, methods of sterilization of microbes

UNIT IV MICROSCOPY AND INFECTIOUS DISEASES**9**

Microscopy: basic principles of light microscopy - bright field, dark field, phase contrast, fluorescence, Electron microscopy- TEM & SEM. Preparation of samples for light and electron microscope. Staining methods -simple stain, gram stain, AFB stain, capsule and spore staining. Disease caused by bacteria, fungi, protozoal, virus and helminthes.

UNIT V IMMUNOPATHOLOGY**9**

Types of Immunity; Innate and acquired, cells involved in immune response, types of Hypersensitivity, Auto-immune disorders: Basic concepts and classification, SLE. Immunodeficiency syndrome including HIV infection. Antibodies and its types, antigen and antibody reactions, Immunological Assay: Immune diffusion, Immuno electrophoresis, RIA and ELISA, monoclonal antibodies.

TOTAL: 45 HOURS**TEXT BOOKS:**

1. Mohan and Harsh, Textbook of pathology, New Delhi, Jaypee brother's medical publishers, 2005.
2. Ramzi S Cotran, Vinay Kumar and Stanley L Robbins, Pathologic Basis of Diseases, 7thEdition, WB Saunders Co., 2005.
3. Ananthanarayanan and Panicker, Microbiology, 10th Edition, Orient blackswan, 2017

REFERENCE BOOKS:

1. Underwood JCE, General and Systematic Pathology, 3rd Edition, Churchill Livingstone, 2000.
2. Dubey RC and Maheswari DK., A Text Book of Microbiology, Chand and Company Ltd, 2007
3. Prescott, Harley and Klein, Microbiology, 10th Edition, McGraw Hill, 2017.

COURSE OUTCOMES

At the end of the course, the student will be able to

- Illustrate the principles of mechanics
- Infer the basics of bio fluid mechanics
- Utilize the mechanical properties of musculoskeletal elements
- Examine the biomechanics of joints and implants
- Design the application of biomechanics into modelling

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | 3 | 2 | 3 | 2 | 1 | - | - | - | - | - | - | 3 | 1 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | 3 | 2 | 1 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | 3 | 2 | 1 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 1 | - | - | - | - | - | - | 3 | 2 | 1 |

UNIT I INTRODUCTION TO BIOMECHANICS**9**

Introduction – Scalars and vectors, Statics –Resolution and composition of forces, Moments, couple, Resultant, equilibrium of coplanar forces, Dynamics – Linear motion, Newton’s laws of motion, Velocity and acceleration, Kinematics – Models, Transducers Constitutive equations – Non-viscous fluid, Newtonian Viscous fluid and Hookean Elastic solid

UNIT II BIOMECHANICS OF BIOFLUID**9**

Intrinsic fluid properties, Viscometers, Rheological properties of blood, Pressure-flow relationship for Non-Newtonian Fluids, Fluid mechanics in straight tube, Structure of blood vessels, Material properties and modelling of Blood vessels, Heart – Cardiac muscle characterization, Native heart valves, Prosthetic heart valve fluid dynamics.

UNIT III BIOMECHANICS OF MUSCULOSKELETAL SYSTEM**9**

Constitutive equation of viscoelasticity – Maxwell, Voight and Kelvin models, anisotropy, Hard Tissues – Structure, viscoelastic properties, functional adaptation, Soft Tissues – Structure, functions, material properties and modelling of Soft Tissues – Cartilage, Tendons and Ligaments Skeletal Muscle, Bone fracture mechanics, Implants for bone fractures.

UNIT IV BIOMECHANICS OF JOINTS AND IMPLANTS**9**

Skeletal joints, forces and stresses in human joints, Analysis of rigid bodies in equilibrium, Free body diagrams, Structure of joints, Types of joints, Biomechanical analysis of elbow, shoulder, spinal column, hip, knee and ankle, Lubrication of synovial joints, Gait analysis, Motion analysis using video

UNIT V MODELLING AND ERGONOMICS**9**

Introduction to Finite Element Analysis, finite element analysis of lumbar spine; Ergonomics – Musculoskeletal disorders, Ergonomic principles contributing to good workplace design, Design of a Computer work station, Whole body vibrations, Hand transmitted and whole-body vibrations

TOTAL: 45 HOURS**TEXT BOOKS:**

1. Subrata Pal, Textbook of Biomechanics, Viva Books Private Limited, 2009
2. Y.C. Fung, Bio-Mechanics- Mechanical Properties of Tissues, Springer-Verlag, 1998.

REFERENCE BOOKS:

1. Sheraz S. Malik and Shahbaz S. Malik, Orthopaedic Biomechanics Made Easy, Cambridge University Press, 2015.
2. Jay D. Humphrey, Sherry De Lange, An Introduction to Biomechanics: Solids and Fluids, Analysis and Design, Springer Science Business Media, 2004.
3. Shrawan Kumar, Biomechanics in Ergonomics, Second Edition, CRC Press 2007.
4. Neil J. Mansfield, Human Response to Vibration, CRC Press, 2005.
5. Carl J. Payton, Biomechanical Evaluation of movement in sports and Exercise, 2008.
6. Krishna B. Chandran, Ajit P. Yoganathan and Stanley E. Rittgers, Biofluid Mechanics: The Human Circulation, Taylor and Francis, 2007

COURSE OUTCOMES

At the end of the course, the student will be able to

- Develop assembly language program to solve mathematical problems using ALP programs.
- Understand the architecture and addressing modes, of Intel 8051 microcontroller.
- Design the embedded system application using 8051 microcontrollers.
- Analyze the hardware and software components of embedded system and its design process.
- Develop a real time application using embedded design process.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | 2 | 1 | 3 | 3 | 2 | - | - | 1 | 1 | 2 | 1 | 3 | 3 | - |
| CO2 | 1 | 2 | 2 | 3 | 2 | 1 | - | - | 1 | 1 | 2 | 1 | 3 | 2 | - |
| CO3 | 2 | 2 | 3 | 2 | 3 | 1 | - | - | 1 | 1 | 1 | 1 | 3 | 3 | - |
| CO4 | 2 | 2 | 2 | 3 | 2 | 3 | - | - | 1 | 1 | 2 | 1 | 3 | 2 | - |
| CO5 | 2 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 2 | - |

UNIT I MICROPROCESSOR**9**

8086 Microprocessor Architecture – Addressing Modes – Instruction Set – Assembly Language Programming

UNIT II MICROCONTROLLER**9**

Architecture of 8051 – Special Function Registers (SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes – Assembly language programming.

UNIT III INTERFACING MICROCONTROLLER**9**

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD & Key board interfacing – ADC, DAC & Sensor Interfacing – External Memory Interface – Stepper Motor and Waveform generation

UNIT IV EMBEDDED SYSTEM AND RTOS CONCEPTS**9**

Introduction – Application Areas – Categories of Embedded System – Specialties of Embedded system - Overview of Embedded System Architecture – Hardware Architecture – Software Architecture – Communication Software-Architecture of the Kernel – Task and Task Scheduler – Interrupt Service Routines – Semaphores – Mutex – Mailboxes – Message – Queues – Event Registers– Pipes – Signals – Timers

Case Study of an Automatic Mask vending machine using MUCOS RTOS – Case study of blood pressure meter – Case study of pulse Oximeter.

TOTAL: 45 HOURS

TEXT BOOKS:

1. Soumitra Kumar Mandal , “Microprocessors and Microcontrollers, Architecture, Programming and Interfacing using 8085, 8086 and 8051”, McGrawHill Companies,2018.
2. K.V.K.K. Prasad, “Embedded/Real – Time Systems: Concepts, Design & Programming”, Reprint Edition,Dreamtech,New Delhi,India,2013.

REFERENCE BOOKS:

1. Douglas V Hall, “Microprocessor and Interfacing : Programming and Interfacing”, Edition-3Tata McGrawHill Companies, 2019.
2. A.K. Ray and K.M.Burchandi, “Intel Microprocessors Architecture Programming and Interfacing”, McGraw Hill International Edition, 2006.
3. Kenneth J Ayala, “The 8051 Microcontroller Architecture Programming and Application”, Edition3,Penram International Publishers (India), New Delhi, 2007.
4. Ramesh S Gaonkar, “Microprocessor Architecture, Programming and application with 8085”, 4th Edition, Penram International Publishing, New Delhi, 2002.
5. M. Rafi Quazzaman, “Microprocessors Theory and Applications: Intel and Motorola”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

COURSE OUTCOMES

At the end of the course, the student will be able to

- Perform convolution, sampling and FFT operations on signals using MATLAB and DSP Processor
- Design FIR and IIR filters using MATLAB and DSP Processor
- Perform arithmetic operations and generate the signals using DSP Processor

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 1 | 1 | 1 | - | 2 | - | - | - | - | - | - | - | 1 | 1 | - |
| CO2 | 3 | 2 | 2 | - | 2 | 2 | 1 | - | - | 1 | 1 | - | 2 | 3 | - |
| CO3 | 3 | 2 | 1 | 1 | 3 | 1 | - | - | 1 | - | - | 2 | 2 | 3 | - |

LIST OF EXPERIMENTS:

1. Generation of Discrete time signals
2. Linear and Circular convolution
3. Auto and Cross Correlation
4. Sampling and effect of Aliasing
5. Design of FIR and notch type of Filters
6. Design of IIR Filters
7. Frequency analysis using DFT and FFT
8. Waveform generation of ECG,EEG signals
9. Up sampling and down sampling operations

Using TMS320C54 Processor

1. Arithmetic operations using DSP
2. Sampling of input signal
3. Implementation of FIR and IIR Filters
4. Linear convolution
5. Calculation of FFT
6. Study of TMS320C6748 Processor.

TOTAL: 30 HOURS

COURSE OUTCOMES

At the end of the course, the student will be able to

- Develop and implement the arithmetic and logical operations using assembly language for 8086 microprocessors
- Develop and implement the interfacing of peripheral with 8051 microcontroller using embedded ‘C’ programs
- Develop and implement the sensors interfacing with Arduino development board.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|--|---|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 2 | 2 | - | - | 2 | - | - | 3 | - | - | 3 | 3 | - |
| CO2 | 3 | 3 | 2 | 2 | 2 | - | 2 | - | - | 2 | - | - | 3 | 2 | - |
| CO3 | 3 | 3 | 2 | 2 | 3 | - | 2 | - | - | 3 | - | - | 3 | 2 | - |

LIST OF EXPERIMENTS:

1. Experiments based on 8086 microprocessor developed using assembly language
2. 8 bit / 16 bit addition, subtraction, multiplication, division using 8086
3. Logical operations, sorting of numbers, string manipulation using 8086
4. Experiments based on 89C5X microcontroller developed using Embedded ‘C’ environment
5. Timers, Serial port and Parallel I/O port access using 89C5X
6. Interfacing of LED, Key switches using 89C5X.
7. Interfacing of 7 Segment display using 89C5X.
8. Experiments based on Arduino board (UNO, Nano, Node MCU) interfacing
9. Serial data communication using Arduino.
10. Interfacing LED, Key switch, relay, and buzzer.
11. Interfacing Potentiometer, Thermistor, LDR.
12. Interfacing servo motors.
13. I2C devices.
14. IR sensors.
15. Measurement of Bio medical signals.
16. Interfacing WiFi and Blue tooth modules.
17. Data monitoring in cloud using IOT

TOTAL: 30 HOURS

COURSE OUTCOMES

At the end of the course, the student will be able to

- Illustrate the pathological state of different clinical conditions
- Describe the staining characteristics of bacteria and differentiate these bacteria according to microscopic morphologies
- Perform antigen antibody reactions

| CO / PO, PSO Mapping | | | | | | | | | | | | | | |
|---|---|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| CO2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 |
| CO3 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 |

List of Experiments:

1. Urine analysis (physical and chemical examination)
2. Determination of bleeding time and clotting time
3. Differential count of Blood cells using Leishman's stain
4. Abnormal forms of RBC
5. Haematology slides of anaemia and leukaemia
6. Study of bone marrow charts
7. Histopathological examination of benign and malignant tumours (demonstration)
8. Handling of Microscopes: calibration of Microscopes
9. Test for motility (Hanging drop method)
10. Simple stain test
11. Gram stain test
12. AFB stain test
13. Capsule stain test
14. Isolation of nucleic acids from bacteria (demonstration)
15. Immunodiffusion (antigen –antibody reactions)
16. Enumeration of microorganisms

TOTAL: 30 HOURS

noc22_mg104 - PRINCIPLES OF MANAGEMENT

COURSE LAYOUT:

Week 1:Management: Definition, nature, purpose and scope of management, Skills and roles of a Manager, functions, principles; Evolution of Management Thought, Scientific Management.

Week 2:Planning: Types of plans, planning process, Characteristics of planning, Traditional objective setting, Strategic Management, premising and forecasting

Week 3:Decision-Making: Process, Simon's model of decision making, creative problem solving, group decision making.

Week 4:Management by Objectives: Management by exception; Styles of management: (American, Japanese and Indian), McKinsey's 7-S Approach, Self Management

Week 5:Organizing: Organizational design and structure, Coordination, differentiation and integration.

Week 6:Span of management, centralization and de-centralization Delegation, Authority & power - concept & distinction, Line and staff organizations

Week 7:Staffing: Human Resource Management and Selection, Performance appraisal and Career strategy, Coordination- Concepts, issues and techniques

Week 8:Organizational Change: Introduction, Resistance to Change, Behavioural Reactions to Change, Approaches Or Models to Managing Organisational Change.

Week 9:Organizational Change: Introduction, Resistance to Change, Behavioural Reactions to Change, Approaches Or Models to Managing Organisational Change.

Week 10:Leading: Human Factors and Motivation, Leadership, Communication, Teams and Team Work

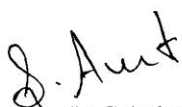
Week 11:Leading: Human Factors and Motivation, Leadership, Communication, Teams and Team Work

Week 12:Controlling: Concept, planning-control relationship, process of control, Types of Control, Control Techniques Characteristics of team

BOOKS AND REFERENCES

1. Principles of management : Stoner
2. Principles of management: Koontz O'donell

| Semester –V | U19GE501 : SOFT SKILLS AND APTITUDE - III | L | T | P | C | Marks |
|---|--|---|---|---|---|-------|
| | | 0 | 0 | 2 | 1 | 100 |
| Course Outcomes | | | | | | |
| At the end of the course the student will be able to: | | | | | | |
| 1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches | | | | | | |
| 2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests | | | | | | |
| 3. Display effective language knowledge to construct sentences with subject verb agreement and select the best alternative for the underlined parts of the sentences, and fill in the blanks in the given passages with suitable forms of words and their synonyms. | | | | | | |
| 1.SOFT SKILLS | Demonstrating soft-skill capabilities with reference to the following topics: <ol style="list-style-type: none"> Career planning Resume writing Group discussion Teamwork Leadership skills Interview skills Mock interviews Mock GDs | | | | | |
| 2.QUANTITATIVE APTITUDE AND LOGICAL REASONING | Solving problems with reference to the following topics : <ol style="list-style-type: none"> Geometry: 2D, 3D, Coordinate Geometry, and Height & Distance. Permutation&Combinations:Principles of counting, Circular Arrangements and Derangements. Probability: Addition & Multiplication Theorems, Conditional Probability and Bayes Theorem. Statistics : Mean Median, Mode, Range and Standard Deviation. Interest Calculation :Simple Interest and Compound Interest Crypto arithmetic: Addition and Multiplication based problem. Logical Reasoning :Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding & Decoding, Problems and Input – Output Reasoning. Statement & Assumptions, Statements & Arguments, Inference. Company Specific Pattern :Infosys and TCS company specific problems | | | | | |
| 3. VERBAL APTITUDE | Demonstrating English language skills with reference to the following topics: <ol style="list-style-type: none"> Subject verb agreement Selecting the best alternative for the stated parts of given sentences Reading comprehension Contextual synonyms Sentence fillers Writing a story for a given picture Company specific aptitude questions | | | | | |



Dr.S.Anita

Head/Training

**Department of Placement Training
Sona College of Technology,
Salem-636 005.**

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|---|---------|----------|-----------|-----------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM601 | Diagnostic and Therapeutic Equipment II | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM602 | Radiological Equipment | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM603 | Biosensors and Transducers | 3 | 0 | 0 | 3 | 45 |
| 4 | U19BM910 | Professional Elective – Medical Device Design | 3 | 0 | 0 | 3 | 45 |
| 5 | U19BM911 | Professional Elective – Hospital Planning and Management | 3 | 0 | 0 | 3 | 45 |
| Open Elective | | | | | | | |
| 6 | U19CE1002 | Municipal Solid Waste Management | 3 | 0 | 0 | 3 | 45 |
| | U19EC1002 | Embedded and Real Time Systems | | | | | |
| | U19EE1003 | Innovation, IPR and Entrepreneurship Development | | | | | |
| | U19EE1004 | Renewable Energy Systems | | | | | |
| | U19FT1001 | Fundamentals of Fashion Design | | | | | |
| | U19MC1003 | Smart Automation | | | | | |
| | U19ME1004 | Renewable Energy Sources | | | | | |
| Practical | | | | | | | |
| 7 | U19BM604 | Diagnostic and Therapeutic Equipment Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM605 | Biosensors and Transducers Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19BM606 | Summer Internship / Summer Project | 0 | 0 | 2 | 1 | 30 |
| 10 | U19GE601 | Soft Skills and Aptitude – IV | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 22 | |

Approved By

Chairman, Biomedical Engineering BoS
Dr.S.Prabakar

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Biomedical Engineering, Sixth Semester BE BME Students and Staff, COE

COURSE OUTCOMES

On successful completion of this course, the student will be able to

- Classify the various equipment used in ICU.
- Illustrate the types of diathermies and its applications.
- Infer the basics of critical care equipment and its application in medicine.
- Explain the various extracorporeal and special diagnostic devices used in hospitals.
- Summarize the importance of patient safety against electrical hazard.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | 1 | 1 | - | 2 | - | - | - | 1 | 1 | - | - | 1 | - | - |
| CO2 | 1 | 1 | - | 1 | 2 | - | - | - | 1 | - | - | - | - | - | - |
| CO3 | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - | - | - | - |
| CO4 | 1 | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - |
| CO5 | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - | - | - | - |

UNIT I PATIENT MONITORING AND BIOTELEMETRY 9

Patient monitoring systems, ICU/CCU Equipment, bed side monitors, Infusion pumps, Central consoling controls. Radio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

UNIT II DIATHERMY 9

Introduction to Diathermy – Short wave diathermy, ultrasonic diathermy, Microwave diathermy, Surgical Diathermy- Principle of surgical diathermy, Surgical diathermy machine, Safety Aspects in Electro-Surgical units, Surgical diathermy analyzers.

UNIT III EXTRACORPOREAL DEVICES& SPECIAL CARE TECHNIQUES 9

Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenators, finger pump, roller pump, Anesthesia Machine, Hemo Dialyser unit, Oxygen concentrator – Lithotripsy, Principles of Cryogenic technique and application, Endoscopy, Laparoscopy, Oscopes.

UNIT IV DENTAL EQUIPMENT 9

Need for Dental care-Dental Patient Chairs, Operatory Cabinetry, Delivery Systems, Dental Operatory Lights, X-ray Imaging Equipment, Sterilization Equipment, Handpieces, Utility Equipment, Specialized equipment's –Intraoral Cameras, introduction to Chairside CAD/CAM Systems, Dental 3D Imaging Systems, Surgical Microscopes, Dental Lasers, Endodontic Equipment, Dental Sleep Medicine Equipment.

UNIT V PATIENT SAFETY

9

Physiological effects of electricity – important susceptibility parameters – Macro shock – Micro shock hazards – Patient’s electrical environment – Isolated Power system – Conductive surfaces-Electrical safety codes and standards – IEC 60601-1 2005 standard, Basic Approaches to Protection against shock, Introduction to HVAC system, Electrical safety analyzer – Testing the Electric system.

TOTAL: 45 Hours

TEXT BOOKS:

1. John G. Webster, Medical Instrumentation Application and Design, Wiley India Pvt. Ltd, New Delhi, 4th edition, 2015.
2. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson education, 2012.

REFERENCE BOOKS:

1. Leslie Cromwell, Biomedical Instrumentation and measurement, Prentice Hall of India, New Delhi, 2nd edition, 2015.
2. Richard Aston, Principles of Biomedical Instrumentation and Measurement, Merrill Publishing Company, 1990.
3. L.A Geddes and L.E.Baker, Principles of Applied Biomedical Instrumentation, 3rd edition, 2008.
4. Myer Kutz, Standard Handbook of Biomedical Engineering and Design, McGraw Hill, 2003.
5. Khandpur.R.S, Handbook of Biomedical Instrumentation, Tata McGraw Hill, New Delhi, 3rd edition, 2014.

COURSE OUTCOMES**On successful completion of this course, the student will be able to**

- Describe the working principle of X-ray machine and its application.
- Illustrate the principle of computed tomography.
- Interpret the technique used for visualizing various sections of the body using MRI
- List the applications of radio nuclide imaging.
- Explain the methods of radiation safety.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| Cos | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 1 | 3 | 3 | 3 | - | 1 | - | - | - | - | 1 | 2 | 2 | - |
| CO2 | 3 | 1 | 3 | 3 | 3 | - | 1 | - | - | - | - | 1 | 2 | 2 | - |
| CO3 | 3 | 1 | 3 | 3 | 3 | - | 1 | - | - | - | - | 1 | 2 | 2 | - |
| CO4 | 3 | 1 | 3 | 3 | 3 | - | 1 | - | - | - | - | 1 | 2 | 2 | - |
| CO5 | 3 | 1 | 3 | 3 | 3 | - | 1 | - | - | - | - | 1 | 2 | 2 | 2 |

UNIT I MEDICAL X-RAY EQUIPMENT**9**

Nature of X-rays- X-Ray absorption – X- Ray Equipment – X-Ray Tube, collimator, Bucky Grid, power supply, Digital Radiography- discrete digital detectors, storage phosphor and film scanning, X-ray Image Intensifier tubes – Fluoroscopy –Digital Fluoroscopy, Angiography- cineangiography, Digital subtraction Angiography, Mammography.

UNIT II COMPUTED TOMOGRAPHY**9**

Principles of tomography, CT Generations, X- Ray sources- X- Ray detectors-Viewing systems- spiral CT scanning – Ultra fast CT scanners. Image reconstruction techniques-back projection and iterative method.

UNIT III MAGNETIC RESONANCE IMAGING**9**

Fundamentals of magnetic resonance- - rotation and precession – Relaxation processes T1 and T2, Instrumentation of MRI system-System magnet (Permanent, Electro magnet and Super conductors), generations of gradient magnetic fields, Radio Frequency coils, shim coils, Principle of Fmri and DTI.

UNIT IV NUCLEAR MEDICINE SYSTEM**9**

Fundamentals of NMR – Radio Isotopes- alpha, beta, and gamma radiations, Radiation detectors – gas filled, ionization chambers, proportional counter, GM counter and scintillation Detectors, Gamma camera – Principle of operation, collimator, photo multiplier tube, pulse height analyzer, Principles of SPECT and PET.

UNIT V RADIATION THERAPY AND RADIATION SAFETY**9**

Radiation therapy- Effects of Radiation- linear accelerator, Tele gamma Machine– stereotactic radiotherapy, 3D conformal radiation therapy – Intensity-Modulated Radiation Therapy – Image-Guided Radiation Therapy, Brachy therapy and Gamma knife- Dosimeter- film badges, Thermo Luminescent dosimeters- electronic dosimeter-Radiation protection in medicine-radiation protection principles-ICRP.

TOTAL:45 Hours

TEXTBOOKS:

1. Willam R Hendee and Russell Ritenour, Medical Imaging Physics, Wiley-Liss, Fourth Edition 2002.
2. Paul Suetens, Fundamentals of Medical Imaging, Second Edition, Cambridge university press, Second Edition 2009.

REFERENCEBOOKS

1. Steve Webb, The Physics of Medical Imaging, Adam Hilger, Philadelphia, 1988
2. Gopal B. Saha, Physics and Radio biology of Nuclear Medicine, Springer, Third edition, 2006.
3. B.H. Brown, PV Lawford, RH Smallwood, DRHose, DC Barber, Medical physics and biomedical Engineering, -CRC Press, 1999.
4. Myer Kutz, Standard hand book of Biomedical Engineering and design, McGrawHill, 2003.

COURSE OUTCOMES:**At the end of the course learners will be able to**

- Describe the purpose and methods of measurements
- Classify the Biomedical Sensors and Transducers.
- Interpret about the Photoelectric and Piezoelectric Transducers
- Describe the principle and components of Biosensors.
- Explain the principles of Biochemical sensors.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | 1 | - | - |
| CO2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 2 | 1 | |
| CO4 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 1 | - | - |
| CO5 | 3 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | 1 | 2 | 2 | 2 |

UNIT I SCIENCE OF MEASUREMENT**9**

Measurement System–Instrumentation–Classification and Characteristics of Transducers– Static and Dynamic–Errors in Measurements– Calibration–Primary and secondary standards

UNIT II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS**9**

Strain Gauge: Gauge factor, Types of strain gauges - Biomedical applications, strain gauge as displacement & pressure transducers. Active type: Thermocouple–biomedical applications. LVDT, Capacitive transducer, Inductive transducer. Passive types: Thermo Resistive- Resistance Temperature Detectors (RTD), Thermistor, biomedical applications.

UNIT III PHOTOELECTRIC AND PIEZOELECTRIC TRANSDUCERS**9**

Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photoconductive cells, photo diodes, phototransistor, Spectrophotometry. Piezoelectric transducers- modes of operation of piezoelectric crystals- uses of piezoelectric materials and transducers, biomedical applications as ultrasound transducers.

UNIT IV INTRODUCTION TO BIOSENSOR**9**

Basic principle and Components of a biosensor, Molecular recognition, Classification of biosensors based on transducers, Piezoelectric biosensors, Magneto elastic biosensors, Field effect transistor-based biosensor, Calorimetric biosensor, Non-invasive biosensors

Electrochemical techniques and Characteristics, Ionization transducers, electrochemical transducers, Membranes used in biosensors for selectivity, Enzymatic biosensors, Biomarkers for diagnosis of diseases, Glucose oxidase-based glucose biosensors for diabetes: Non-invasive and Implantable glucose biosensors. Biomedical applications of enzyme biosensors.

TOTAL: 45 Hours

TEXTBOOKS

1. A.K.Sawhney, "Electrical & Electronics Measurement and Instrumentation", 10th edition, Dhanpat Rai & Co, New Delhi, 2010.
2. Principles of Applied Biomedical Instrumentation L.A Geddas and L.E.Baker – John Wiley and sons.
3. Chandran Karunakaran Kalpana Bhargava Robson Benjamin, Biosensors and Bioelectronics, 1st Edition, Hardcover ISBN: 9780128031001, Imprint: Elsevier, Published Date: 29th July 2015.

REFERENCES

1. Ernest O Doebelin and Dhanesh N Manik, Measurement systems, Application and design, 5th edition, Mc Graw-Hill, 2007.
2. Keith Brindley, Sensors & Transducers, Heinemann Newnes, Great Britain, 1988 Harry Thomas, Handbook of Bio medical Instrumentation, Reston, Virginia 2000
3. Xueji Zhan, Electrochemical Sensors, Biosensors and their Biomedical Applications 1st Edition
4. L.A Geddas and L.E.Baker, "Principles of Applied Biomedical Instrumentation", John Wiley and Sons, Third Edition, Reprint 2008.
5. Albert D. Helfrick and William D.Cooper. "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.

COURSE OUTCOMES**On successful completion of this course, the student will be able to**

- Identify the Principles of Hospital Planning and Management
- Summarize the functional hospital organization and administrative services
- Discuss about Human Management in Hospitals and training of healthcare workers
- Explain various supportive services in the hospitals.
- Elaborate the ways of equipment maintenance in hospitals..

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|---|--|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| CO's | Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | - | - | - | - | 1 | - | 2 | - | 2 | 2 | 1 | - | - | 2 |
| CO2 | 2 | - | - | - | - | 1 | - | 2 | - | 2 | 2 | 1 | - | - | 2 |
| CO3 | 2 | - | - | - | - | 1 | - | 2 | - | 2 | 1 | 1 | - | - | 2 |
| CO4 | 2 | - | - | - | - | 1 | - | 2 | - | 2 | 1 | 1 | - | - | 2 |
| CO5 | 2 | - | - | - | - | 1 | 2 | 2 | - | 2 | 1 | 1 | - | - | 2 |

UNIT I OVERVIEW OF HOSPITAL PLANNING 9

The role of hospitals in Healthcare -, Hospital Planning and Design, -Guiding principles in Planning - Regionalization of hospital services – Equipment Planning- Functional Planning -Financial Planning– Climatic consideration in design -Distinction between Hospital and Industry, Different Departments of clinical services.

UNIT II FUNCTIONAL HOSPITAL ORGANIZATION AND ADMINISTRATIVE SERVICES 9

Distinction between Hospital and Industry– Public relations in hospitals, Ethical and Legal aspects of Hospital Administration, Disaster Management, Quality Assurance through record, review and Medical audit, Evaluation of Hospital Services- Clinical Information Systems Medical Transcription, Medical Records Department – Central Sterilization and Supply Department – Pharmacy– Food Services - Laundry Services- Challenges in Hospital Administration.

UNIT III HOSPITAL MANAGEMENT AND TRAINING 9

Effective Hospital Management- Materials Management- Manpower planning- Organizing- Directing and Leading- Controlling- Training of healthcare workers – Waste transport staff, Operators of treatment plants - Immunization of healthcare workers – Management of occupational blood exposure, Hepatitis A and B, Prophylaxis, HIV PEP, HCV, H1N1- Infection control practices.

UNIT IV CLINICAL SUPPORTIVE SERVICES 9

Radiology and Imaging Services- Laboratory Services- Operation Theatre Suite- Central Sterile Supply Department (CSSD)- Outpatient Services- Intensive Care Unit- The Nursing Unit and Nursing Services- Pharmacy.

UNIT V EQUIPMENT MAINTENANCE MANAGEMENT

9

Organizing Maintenance Operations- Paper Work Control, Maintenance Job Planning, Maintenance Work Measurement and Standards- Preventive Maintenance- Computerized Maintenance Management System (CMMS), Maintenance Budgeting and Forecasting- Maintenance Training- Contract Maintenance.

TOTAL : 45 Hours

TEXTBOOKS:

Sakharkar B. M., Principles of Hospital Administration and Planning, Second Edition, Jaypee Brothers, 2009.

Sharma D. K. Goyal R. C., Hospital Administration and Human Resource Management, PHI Learning Private Limited, 2017.

G.D.Kunders, "Hospitals – Facilities Planning and Management", TMH, New Delhi – 5th edition Reprint 2007.

REFERENCES:

Lawrence F. Wolper, Health Care Administration, Managing Organized Delivery System, Fifth Edition, Jones and Bartlett Publishers, 2011.

Madhuri Sharma, Hospital Waste Management and its monitoring, Jaypee, 2017

COURSE OUTCOMES

On successful completion of this course, the student will be able to

- Classify the medical devices standards and requirements.
- Summaries the concept of medical device development.
- Recall the engineering design and project metrics.
- Demonstrate the testing and validation of medical equipment.
- Interpret the various design transfer and manufacturing methods

| CO/PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO's | Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 2 | 1 | - |
| CO2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 2 | 1 | - |
| CO3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 2 | 1 | - |
| CO4 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 2 | 1 | - |
| CO5 | 3 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | 1 | 2 | 2 | - |

UNIT I MEDICAL DEVICES STANDARDS AND REQUIREMENTS 9

FDA, Medical devices classification, Medical Devices Directive Process – Harmonized Standards, ISO13485, ISO 14971, IEC60601-1, IEC 62304. Reliability, Concept of failure, Product Design and Development Process.

UNIT II CONCEPT DEVELOPMENT 9

Product Definition Process - Quality Function Deployment-Human Factors-Business Proposal. Safety and Risk Management - Tools, Documents and Deliverables.

UNIT III DESIGN ENGINEERING 9

Hardware Design, Hardware Risk Analysis, Design and Project Metrics, Design for Six Sigma, Software Design, Software Coding, Software Risk Analysis, Software Metrics.

UNIT IV TESTING AND VALIDATION 9

Basis and Types of Testing, Hardware Verification and Data Analysis, Software Verification and Data Analysis.

UNIT V DESIGN TRANSFER AND MANUFACTURING 9

Transfer to Manufacturing, Hardware Manufacturing, Software Manufacturing, Configuration Management, Intellectual Property-Copy Rights-Trademarks-Trade Secrets.

TOTAL : 45 Hours

TEXTBOOKS:

1. Peter Ogrodnik, Medical Device Design Innovation from Concept to Market, Elsevier, 2013.
2. Richard C. Fries and Marcel Dekker AG, Handbook of Medical Device Design, 2nd edition, 2005.

REFERENCES:

1. Jagdish Chaturvedi, Inventing medical devices: A perspective from India, Create Space Independent Publishing Platform , 1st edition, 2015.
2. Theodore R. Kucklick , The Medical Device R&D Handbook, Second Edition, CRC Press,2012.
3. Gail Baura, Medical Device Technologies: A Systems Based Overview Using Engineering,Elsevier science, 2012.
4. Matthew B.Weinger, Michael E, Wiklund, DaryleJ. Gardner-Bonneau, Handbook of Humanfactors in Medical Device Design, Taylor and Francis group, 2010.

COURSE OUTCOMES:

After completion of this course the students will be able to

- Evaluate the performance of temperature, pressure, displacement & torque - measurement using relevant sensors/transducers.
- Demonstrate the characteristics of an LDR, load cell & pH electrodes.
- Infer the characteristics of Biosensors and transducers.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-------------|-------------|-------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|--------------|--------------|--------------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
| CO1 | 3 | - | 2 | - | - | - | - | - | - | - | - | 2 | - | 2 | - |
| CO2 | 3 | - | 2 | - | - | - | - | - | - | - | - | 2 | - | 2 | - |
| CO3 | 3 | 3 | 2 | - | - | 2 | - | - | - | - | - | 2 | - | 2 | - |

List of Experiments:

1. Temperature measurement using AD590 IC sensor
2. Displacement measurement by using a capacitive transducer
3. Experiment on optical Transducers- LDR, LED, Photo Transistors
4. Pressure and displacement measurement by using LVDT
5. Tensile and compressive Load Measurement using Load Cell
6. Torque measurement using Strain gauge
7. Characteristics Study of Bio transducers – Pressure, Temperature, Humidity
8. Characteristics Study of Bio electrodes – ECG, EMG, EEG
9. Study & Characterization of pH electrodes.
10. Measurement of Blood Glucose Level
11. Study of PCR Kit
12. Study of Gas Sensors

TOTAL: 30 Hours

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Measure the different bioelectrical signals.
- Analyze the various physiological signals using telemetry.
- Demonstrate various diagnostic and therapeutic techniques.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | - | 2 | - | - | - | - | - | - | - | - | 2 | - | 2 | - |
| CO2 | 3 | - | 2 | - | - | - | - | - | - | - | - | 2 | - | 2 | - |
| CO3 | 3 | 3 | 2 | - | - | 2 | - | - | - | - | - | 2 | - | 2 | - |

LIST OF EXPERIMENTS:

1. Measurement of visually and auditory evoked potential
2. Galvanic skin resistance (GSR) measurement
3. Measurement of output intensity from shortwave and ultrasonic diathermy
4. Measurement of various physiological signals using biotelemetry
5. Electrical safety measurements
6. Measurement of stimulation current waveforms used in medical stimulator
7. Analyze the working of ESU—cutting and coagulation modes
8. Study the working of Defibrillator and pacemakers
9. Study of ECG, EEG and EMG electrodes.
10. Study of ventilators and Ultrasound Scanners
11. Study of speech signals using speech signal trainer kit.
12. Measurement of Oxygen Saturation and Heart Rate using Pulse-oximeter

TOTAL: 30 Hours

| Semester –VI | U19GE601-SOFT SKILLS AND APTITUDE – IV (Common to All except Civil) | L | T | P | C | Marks |
|--|---|---|---|---|---|-------|
| | | 0 | 0 | 2 | 1 | 100 |
| Course Outcomes | | | | | | |
| At the end of the course the student will be able to: | | | | | | |
| 1. Demonstrate capabilities in job-oriented company selection processes using the hands-on approach | | | | | | |
| 2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests | | | | | | |
| 3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in company-specific internal tests | | | | | | |
| 1. Soft Skills | Demonstrating Soft -Skills capabilities with reference to the following topics: | | | | | |
| | a. Mock group discussions | | | | | |
| | b. Mock interviews | | | | | |
| | c. Mock stress interviews | | | | | |
| 2. Quantitative Aptitude and Logical Reasoning | Solving problems with reference to the following topics: | | | | | |
| | a. Functions and Polynomials | | | | | |
| | b. Clocks and Calendars | | | | | |
| | c. Data Sufficiency: Introductions, 3 Options Data Sufficiency, 4 Options Data Sufficiency and 5 Options Data Sufficiency. | | | | | |
| | d. Logical reasoning: Cubes, Non Verbal reasoning and Symbol based Reasoning. | | | | | |
| | e. Decision making table and Flowchart | | | | | |
| | Campus recruitment papers: Solving of previous year questions paper of all major recruiters | | | | | |
| | f. Miscellaneous: Cognitive gaming Puzzles-(Picture, Word and Number based), IQ Puzzles, Calculation Techniques and Time Management Strategies. | | | | | |
| | g. Trigonometry.- Concepts | | | | | |
| 3. Verbal Aptitude | Demonstrating English language skills with reference to the following topics: | | | | | |
| | a. Writing captions for given pictures | | | | | |
| | b. Reading comprehension | | | | | |
| | c. Critical reasoning | | | | | |
| | d. Theme detection | | | | | |
| | e. Jumbled sentences | | | | | |
| | f. Writing a story on given pictures | | | | | |
| | g. Company specific verbal questions | | | | | |

S. Anita
06/01/2023

Dr.S.Anita

Head/Training

Department of Placement Training
Sona College of Technology,
Salem-636 005.

COURSE OUTCOMES:

At the end of the course, the students will be able to,

- Describe the basics of Hospital Management.
- Illustrate the knowledge of Human resource management and marketing in hospitals.
- Apply various Quantitative methods in healthcare management.
- Amalgamate their knowledge in Hospital information system and supportive services.
- Explain the quality and safety aspects in Hospital.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO 12 | PSO1 | PSO2 | PSO3 |
| CO1 | - | - | 3 | - | 2 | 3 | 3 | - | - | - | - | 1 | - | - | 3 |
| CO2 | - | - | 3 | - | 2 | 3 | 3 | - | - | - | - | 1 | - | - | 3 |
| CO3 | - | - | 3 | - | | 3 | 3 | - | - | - | - | 1 | - | - | 3 |
| CO4 | - | - | 3 | - | 3 | 2 | - | - | - | - | - | 1 | - | - | 3 |
| CO5 | - | - | 3 | - | - | 3 | 3 | 3 | - | - | - | 1 | - | - | 3 |

UNIT I INTRODUCTION TO HOSPITAL ADMINISTRATION

9

Distinction between Hospital and Industry, Challenges in Hospital Administration, Hospital Planning, Equipment Planning, Functional Planning, Current Issues in Hospital Management, Role of Manager, Leadership, Motivation, Organizational behaviour, Strategic planning, Ethics and Law, Fraud and abuse.

UNIT II HUMAN RESOURCE MANAGEMENT AND MARKETING

9

Principles of HRM, Functions of HRM, Profile of HRD Manager, Tools of HRD, Human Resource Inventory, Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines, Methods of Training, Leadership grooming and Training, Promotion, Transfer.

UNIT III QUANTITATIVE METHODS IN HEALTHCARE MANAGEMENT 9

Introduction to quantitative decision-making methods in healthcare management, Forecasting, Decision making in healthcare facilities, Facility location, Facility layout, Reengineering, Staffing, Scheduling, Productivity, Resource allocation, Supply chain and inventory management, Quality Control, Project Management, Queuing models and capacity planning.

UNIT IV HOSPITAL INFORMATION SYSTEM AND SUPPORTIVE SERVICES 9

Clinical Information Systems, Administrative Information Systems, Support Service Technical Information Systems, Medical Records Department, Central Sterilization and Supply Department – Pharmacy, Food Services, Laundry Services, Telemedicine.

UNIT V QUALITY AND SAFETY ASPECTS IN HOSPITAL MANAGEMENT 9

Quality system, Elements, implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 – 9004. Features of ISO 9001, ISO 14000, Environment Management Systems. NABA, JCI, NABL. Security, Loss Prevention, Fire Safety, Alarm System, Safety Rules.

TOTAL: 45 Hours

TEXT BOOKS:

1. 1.R.C. Goyal, Hospital Administration and Human Resource Management, PHI, 4th Edition, 2006.
2. 2.G.D. Kunders, Hospitals – Facilities Planning and Management, TMH, New Delhi, 5th Reprint, 2007.

REFERENCE BOOKS:

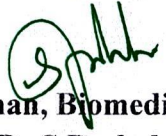
1. 1.Sharon B. Buchbinder and Nancy H. Shanks, Introduction to Healthcare Management, Jones and Bartlett Learning, 2017
2. 2.Blane, David, Brunner, Health and SOCIAL Organization: Towards a Health Policy for the 21st Century, Eric Calrendon Press, 2002.
3. 3.Yasar A. Ozcan, Quantitative Methods in Healthcare management, Jossey Bass- John Wiley and Sons, 2009.

BME
VI

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VII Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|--|---|---------|----------|-----------|-------------|---------------------|
| Theory | | | | | | | |
| 1 | U19BM701 ✓ | Medical Image Processing | 3 | 0 | 0 | 3 | 45 |
| 2 | U19BM702 ✓ | AI in Health and Medicine | 3 | 0 | 0 | 3 | 45 |
| 3 | U19BM907 ✓ | Professional Elective – Biomedical waste Management | 3 | 0 | 0 | 3 | 45 |
| 4 | U19BM909 ✓ | Professional Elective – Rehabilitation Engineering | 3 | 0 | 0 | 3 | 45 |
| 5 | U19BM2003 ✓ | Professional Elective- Basic Life Support and first Aid | 3 | 0 | 0 | 3 | 45 |
| 6 | U19CE1004 ✓ | Open Elective – Disaster Management ✓ | 3 | 0 | 0 | 3 | 45 |
| | U19CS1001 ✓ | Open Elective - Big Data Analytics | | | | | |
| | U19CS1002 ✓ | Open Elective - Cloud Computing | | | | | |
| | U19EC1007 ✓ | Open Elective - CMOS VLSI Design | | | | | |
| | U19EE1002 ✓ | Open Elective - Energy Conservation and Management | | | | | |
| | U19EE1003 ✓ | Open Elective - Innovation, IPR and Entrepreneurship Development | | | | | |
| | U19FT1001 ✓ | Open Elective - Fundamentals of Fashion Design | | | | | |
| | U19ME1002 ✓ | Open Elective - Industrial Safety | | | | | |
| | U19ME1004 ✓ | Open Elective - Renewable Energy Sources | | | | | |
| U19IT1001 ✓ | Open Elective - Problem Solving Techniques using Java Programming | | | | | | |
| Practical | | | | | | | |
| 7 | U19BM703 ✓ | Medical Image Processing Laboratory | 0 | 0 | 2 | 1 | 30 |
| 8 | U19BM704 ✓ | AI in Medicine Laboratory | 0 | 0 | 2 | 1 | 30 |
| 9 | U19BM705 ✓ | Hospital Training | 0 | 0 | 2 | 1 | 30 |
| Total Credits | | | | | | 21 ✓ | |

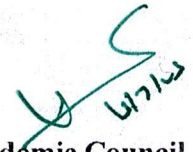
Approved By



**Chairman, Biomedical Engineering BoS
Dr.S.Prabakar**



**Member Secretary, Academic Council
Dr.R.Shivakumar**



**Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Biomedical Engineering, Seventh Semester BE BME Students and Staff, COE

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Discuss the Fundamentals of Medical Image Processing.
- Classify the various Intensity Transformation and Filtering Methods.
- Explain about the Image Segmentation and Restoration.
- Summarize the Registration and Visualisation process in Medical Image
- Illustrate the Image Compression and Retrieval techniques.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| CO's | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 1 | 2 | 3 | - | - | - | - | - | 1 | 1 | 3 | 2 | - |
| CO2 | 3 | 2 | 1 | 3 | 3 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |
| CO3 | 3 | 2 | 1 | 3 | 3 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |
| CO4 | 3 | 2 | 1 | 3 | 3 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |
| CO5 | 3 | 2 | 1 | 3 | 3 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |

UNIT I FUNDAMENTALS OF MEDICAL IMAGE PROCESSING AND TRANSFORMS⁹

Overview of Image Processing system and human Visual system, Image representation – pixel and voxels, Gray scale and color models, Medical image file formats- DICOM, ANALYZE 7.5, NIFTI and INTERFILE, Discrete sampling model and Quantization, Relationship between the pixels, Arithmetic and logical operations, Image quality and Signal to Noise ratio, Image Transforms- 2D DFT, DCT, KLT.

UNIT II INTENSITY TRANSFORMATION AND FILTERING

9

Gray level transformation- Log transformation, Power law transformation, Piece wise linear transformation. Histogram processing- Histogram equalization, Histogram Matching. Spatial domain Filtering-Smoothing filters, sharpening filters, Frequency domain filtering- Smoothing filters. Sharpening filters, Homomorphic filtering. Medical image enhancement with Hybrid filters.

UNIT III IMAGE SEGMENTATION AND RESTORATION

9

ROI definition -Detection of discontinuities-Edge linking and boundary detection – Region based segmentation- Morphological processing, Active contour models. Image Restoration- Noise models- Restoration in the presence of Noise – spatial filtering, Periodic noise reduction by frequency domain filtering, linear position- Invariant degradation, Estimation of degradation function, Inverse filter- Wiener filtering-Geometric transformation.

UNIT IV REGISTRATION AND VISUALISATION

9

Feature representation and description, Registration-Rigid body transformation, principal axes registration, and feature based. Visualisation-Orthogonal and perspective projection in medicine, Surface based rendering, Volume visualisation in medicine.

UNIT V IMAGE COMPRESSION AND RETRIEVAL

9

Image compression: Introduction- Image compression models, Error free compression, Lossy compression methods, and Image compression standards - JPEG, Medical image Archive and retrieval system, Quality evaluation of compressed medical images.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, Pearson Education, 3rd edition, 2016.
2. Wolfgang Birkfellner, Applied Medical Image Processing: A Basic course, CRC Press, 2011.

REFERENCE BOOKS:

1. Isaac N. Bankman, Handbook of Medical Image Processing and Analysis, 2nd Edition, Elsevier, 2009.
2. Atam P. Dhawan, Medical Image Analysis, Wiley-Interscience Publication, NJ, USA 2003.
3. Milan Sonka, Image Processing, Analysis And Machine Vision, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.
4. Anil Jain K, Fundamentals of Digital Image Processing, PHI Learning Pvt. Ltd., 2011.
5. William K Pratt, Digital Image Processing, John Willey, 2002.

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COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Classify the models of Artificial intelligence
- Describe the collection of Decision-making models in AI.
- Identify the appropriate computational tools in biomedicine.
- Analyse the performance of specific models as applied to biomedical problems
- Interpret the ethics in artificial intelligence

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| CO's | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 1 | - | 2 | - | - | - | - | - | - | 2 | 2 | 2 | - |
| CO2 | 3 | 3 | 1 | 1 | 2 | - | - | - | - | - | - | 2 | 2 | 2 | - |
| CO3 | 3 | 3 | - | 1 | 2 | - | - | - | - | - | - | 2 | 2 | 2 | - |
| CO4 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 | - |
| CO5 | 3 | 3 | 2 | 1 | - | 1 | - | 1 | - | - | - | 2 | 2 | 2 | 2 |

UNIT I INTRODUCTION TO HUMAN AND ARTIFICIAL INTELLIGENCE 9

Philosophical foundations of AI: History, Computational models of Intelligence. Intelligent agents - Agent based system. Review of relevant mathematical and statistical concepts: logarithmic loss, cross entropy optimizing cost functions; linear and logistic regression. Knowledge Representation: Propositional logic, first-order logic.

UNIT -II DECISION-MAKING 9

Basics of utility theory, sequential decision problems - decision network- policy -Decision process in infinite horizon: Optimal policy, Value iteration - policy iteration- Partially observable decision process.

UNIT-III LEARNING TECHNIQUES 9

Forms of Learning: supervised & semi-supervised, unsupervised, reinforced, and transfer learning. Supervised & semi-supervised: Decision trees, non-parametric methods for learning, support vector machines. Unsupervised: basic and advanced clustering techniques, dimensionality reduction (feature selection and feature extraction). Reinforced Learning.

UNIT-IV AI IN DIAGNOSIS AND PROGNOSIS 9

Unique characteristics and challenges in medicine and healthcare; History, intelligent and expert systems in medicine. Risk stratification, patient outcome prediction, disease progression modeling - Case Studies.

UNIT-V AI IN TREATMENT AND MEDICAL ETHICS 9

Treatment Effect Estimation – Medical Question Answering - Analysis of tissue morphology and other medical imaging applications - Ethics of AI: bias, fairness, accountability, and transparency in machine learning; Ethical, Legal, and Social Issues of AI in medicine and healthcare.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Stuart Russell and Peter Norvig, - "Artificial Intelligence: A Modern Approach", Pearson Education, 2014.
2. David Poole and Alan Mackworth, - "Artificial Intelligence: Foundations of Computational agents", Cambridge University, 2011.
3. Gerhard Weiss, —Multi Agent Systems, Second Edition, MIT Press, 2013.

REFERENCE BOOKS:

1. Michael Matheny, Sonoo Thadaney Israni, Mahnoor Ahmed, and Danielle Whicher, Editors "Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril", National Academy of Sciences, USA, 2019.
2. Tony J. Cleophas and Aeilko H. Zwinderman. "Machine Learning in Medicine - a Complete Overview". Springer. 2015.
3. Peter Harrington. 2012. Machine Learning in Action. Manning Publications Co., Greenwich, CT, USA.
4. Selected seminal and contemporary readings from peer-reviewed literature such as Proceedings of Machine Learning in Healthcare, Artificial Intelligence in Medicine, IEEE Transactions on Biomedical and Health Informatics, and other relevant venues.



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COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Summarize the overview of biomedical waste management.
- Apply knowledge in coding and treatment of biomedical waste
- Classify the different types of waste disposal procedures and management
- Develop knowledge in safety and regulatory guidelines in waste management
- Illustrate different methods of solid, biomedical, and hazardous waste management

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| CO's | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | - | 2 | - | - | 1 | 2 | - | - | - | - | 1 | - | - | 2 |
| CO2 | 2 | 2 | - | 1 | - | 1 | 1 | - | - | - | - | 1 | - | - | 2 |
| CO3 | 2 | - | 2 | - | - | 1 | 1 | - | - | - | - | 1 | - | - | 2 |
| CO4 | 2 | - | - | - | - | 1 | 1 | - | - | - | - | 1 | - | - | 2 |
| CO5 | 2 | - | - | - | - | 1 | 1 | - | - | - | - | 1 | - | - | 2 |

UNIT I INTRODUCTION AND TYPES OF BIOMEDICAL WASTE 9

Definition – Types of wastes, major and minor sources of biomedical waste, Categories and classification of biomedical waste – infectious waste, genotoxic waste, waste sharps, composition of bio medical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization.

UNIT II IMPACTS & LEGISLATION 9

Health impacts – direct and indirect Hazards, potential hazards, basic information, infection, infection agents; Legislation – bio medical waste handling rules – CPCB guidelines, BARC guidelines; radioactive waste disposal – WHO guidelines – management in developing countries.

UNIT III GENERATION AND SEGREGATION 9

Color coding – yellow, red, blue, white –contents of waste bag, label. Biomedical waste – collection and handling – infection control system – needle sticks injury, hospital policy – segregation, decontaminating, disinfection unit – autoclaving, sharp waste containers, shredding, incrimination. biomedical symbol, microwave, hydropulping, plasma torch.

UNIT IV TREATMENT AND DISPOSAL METHODS 9

Various methods of refuse processing, recovery, recycle and reuse, composting, aerobic and anaerobic, incineration, pyrolysis and energy recovery, Disposal methods – Impacts of open dumping, site selection, sanitary land filling, design criteria and design examples, leachate and gas collection systems, leachate treatment.

UNIT V MANAGEMENT ISSUES AND SAFETY REGULATIONS

9

Recycling, reuse, health and safety practices, protective equipments usage, occupational health programmers. Safety, budget allocation, maintenance, records, annual reports. Hazardous Substance Safety- OSHA Hazard Communication Standard, DOT Hazardous Material Regulations, Healthcare Hazardous Materials, Medical Gas Systems, Hazardous Waste Operations and Emergency Response Standard, Respiratory Protection.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Tweedy, James T., Healthcare hazard control and safety management-CRC Press_Taylor and Francis. 2014.
2. Anantpreet Singh, Sukhjit Kaur, Biomedical Waste Disposal, Jaypee Brothers Medical Publishers (P) Ltd. 2012.
3. Mohd Faisal Khan, Hospital Waste Management: Principle and Guidelines, Kanishka Publishers, 2010.

REFERENCE BOOKS:

1. Pavoni et al., "Handbook of solid waste disposal: materials and energy recovery. Composting, sanitary landfill, innovations in disposal, materials recovery, energy recovery, European solid waste management, and selection of solid waste management techniques". 1975.
2. R.C.Goyal, —Hospital Administration and Human Resource Management, PHI – Fourth Edition, 2006
3. V.J. Landrum, —Medical Waste Management and disposal, Elsevier, 1991
4. Madhuri Sharma, Hospital Waste Management and its Monitoring, Jaypee Brothers Medical Publishers, 2007.
5. Mohammad Mohsin, Hospital: Waste Management, VDM Publishing, 2010.



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COURSE OUTCOMES

At the end of the course learners will be able to

- Explain the basic principles of rehabilitation Engineering
- Design orthotic and prosthetic devices
- Distinguish various types of mobility aids
- Enumerate Auditory and speech assist devices
- Differentiate sensory augmentation and its substitution

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| CO's | Programme Outcomes (Pos) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 1 | - | - | - | 1 | - | - | - | - | - | 1 | 1 | 1 | - |
| CO2 | 3 | 1 | 2 | 2 | 2 | 1 | - | - | - | - | - | 2 | 2 | 2 | - |
| CO3 | 3 | 2 | 3 | | 2 | 2 | - | - | - | - | - | 2 | 2 | 2 | - |
| CO4 | 3 | 3 | - | 2 | 2 | 2 | - | - | - | - | - | 2 | 2 | 2 | - |
| CO5 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 | - |

UNIT I INTRODUCTION TO REHABILITATION

9

Definition, Concept of Rehabilitation: Types of Physical Impairments, Principles of Assistive Technology Assessment, Principles of Rehabilitation Engineering - Key Engineering Principles, Key Ergonomic Principles, Engineering Concepts in Sensory & Motor rehabilitation.

UNIT II ORTHOTICS & PROSTHETICS IN REHABILITATION

9

Types of orthosis - FO, AFO, KAFO, HKAF0 and prosthesis, Partial Foot Prostheses – Foot – ankle assembly, Trans femoral Prostheses, Prosthetic Hand, Advance and automated prosthetics and orthosis, Externally powered and Controlled orthotics & prosthetics, - FES system, Restoration of Hand function, Restoration of standing and walking.

UNIT III MOBILITY AIDS

9

Electronic Travel Appliances (ETA): Path Sounder, Laser Cane, Ultrasonic Torch, Sonic Guide, Light Probes, Nottingham Obstacle Sensors, Electro cortical Prosthesis, Polarized Ultrasonic Travel aids, Materials used for wheel chairs, Type of Wheel Chairs, design of wheel Chair, Walking frames, Parallel bars, Rollators, Quadripods, Tripods & walking sticks, Crutches.

UNIT IV AUDITORY AND SPEECH ASSIST DEVICES

9

Types of deafness, hearing aids, application of DSP in hearing aids, Cochlear implants, Voice synthesizer, speech trainer.

UNIT V SENSORY AUGMENTATION AND SUBSTITUTIONS

9

Classification of Visual Impairments, Prevention and cure of visual impairments, Visual Augmentation, Tactile vision substitution, auditory substitution and augmentation, tactile auditory substitution, Assistive devices for the visual impaired.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Joseph D. Bronzino, The Biomedical Engineering Handbook, Third Edition: Three Volume Set, CRC Press, 2006
2. MacLauchlan, M, and Gallagher, P, Enabling Technologies – Body Image and Body Function, Churchill Livingstone, 2004.
3. Mann, W.C., (Ed). Smart Technology for Aging, Disability, and Independence – The State of the Science, Wiley, New Jersey, 2005..

REFERENCE BOOKS:

1. Muzumdar, A, Powered Upper Limb Protheses – Control, Implementation and Clinical Application, Springer, 2004.
2. Rory A Cooper, An Introduction to Rehabilitation Engineering, Taylor &Francics, CRC Press, 2006.
3. Horia- Nocholai Teodorecu, L.C.Jain ,Intelligent systems and technologies in rehabilitation Engineering; CRC; December 2000.

Dr. S. PRABAKAR, M.E., Ph.D.,
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COURSE OUTCOMES

On successful completion of this course, the student will be able to

- Analyse the Various BLS and First Aid Techniques
- Apply Respiratory techniques and AED at critical conditions
- Categorise different Trauma care techniques
- Adopt various first techniques for sensory, poisoning and bites
- Propose various techniques at emergency situations

CO/PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | - | - | - | - | 3 | 1 | 1 | 1 | - | - | 1 | - | - | - |
| CO2 | 3 | - | - | - | - | 1 | 2 | 1 | - | - | - | 1 | 1 | - | - |
| CO3 | 3 | - | - | - | - | 1 | 1 | 1 | 1 | - | - | 1 | - | - | - |
| CO4 | 3 | - | - | - | - | 3 | 2 | 1 | - | - | - | 1 | - | - | 1 |
| CO5 | 3 | - | - | - | - | 2 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 |

UNIT I INTRODUCTION

9

General Concepts of Basic Life Support (BLS) – Chain of survival. BLS for adults: Adult BLS Algorithm, CPR, One Rescuer and Two Rescuer BLS for Adults. BLS for children: BLS Algorithm children, One Rescuer and Two Rescuer BLS for children. BLS for Infants: One Rescuer and Two Rescuer BLS for infants. First Aid: Basic First Aid techniques, Law. Resuscitation, Top to Toe Assessment, Hygiene and Hand Washing.

UNIT II RESPIRATORY AND CIRCULATORY SYSTEM MANAGEMENT

9

Respiration: No Breathing or Difficult Breathing, Drowning, Strangulation and Hanging, Choking, Suffocation By Smoke or Gases - Airway Management: Mouth-to-Barrier Device Breathing, Bag-Mask Device. E-C clamp technique and 2 hands technique, Laryngeal Mask Airway. Chest Discomforts, Bleeding, First Aid for Bleeding – AED: AED for Adults, AED for Children and Infant – Case Studies.

UNIT III TRAUMA CARE

Wounds and Injuries: Types of Wounds, Head – Chest – Abdominal – Crush Injuries – Shock. Fractures – Dislocations – Strains and Sprains. First Aid for Unconsciousness, Stroke, Fits-Convulsions- Seizure. Management of Diarrhoea, Food Poisoning and Diabetes-Hyperglycaemia and Hypoglycaemia. – Case Studies.

UNIT IV FIRST AID FOR SENSORY SYSTEM, POISONING, BITES AND STINGS 9

Burn wounds, Heatstroke, Frostbites, Hypothermia. First aid for different types of Poisoning. Bites and stings: Animal bites, Snake bites, Insect stings and bites. Foreign bodies in eye, ear, nose and skin. – Case Studies.

UNIT V SPECIFIC EMERGENCY SITUATIONS AND FIRST AID TECHNIQUES 9

Emergencies at work, Road and traffic accidents, Emergencies in rural area, Disasters and Multiple casualty accidents, Emergency triage. First Aid Techniques: Dressings, Bandages and Transport Techniques– Case Studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Dr. Karl Disque, Basic Life Support Provider Hand Book, Satori Continuum Publishing, USA, 2021.
2. INDIAN FIRST AID MANUAL – 7th Edition, St. John Ambulance Association (India) – Indian Red Cross Society National Headquarters, New Delhi, 2016.

REFERENCE BOOKS:

1. Basic Life Support Training Manual, 1st Edition, Published by in Medical Development Division, Ministry of Health Malaysia, Malaysia in December 2017.
2. Valerie C. Scanlon, Tina Sanders, Essentials of Anatomy and Physiology, 5th Edition, F. A. Davis Company



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Sona College of Technology, Salem-5

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Create an algorithm using intensity transformation and analyze the characteristics of the given image.
- Develop a program to analyze the texture of digital image using statistical properties.
- Apply segmentation and thresholding technique to obtain region of interest of a digital image.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| CO's | Programme Outcomes (Po's) and Programme Specific Outcome (PSO's) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - |
| CO2 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - |
| CO3 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - |

LIST OF EXPERIMENTS:

1. Perform digital Image fundamental operations -Resizing, Cropping, Image conversion and basic arithmetic operations.
2. Develop an algorithm for Image Enhancement using histogram equalization.
3. Implement DFT analysis of digital images using masking operation.
4. Apply Gray level transformation in spatial domain.
5. Perform the Image Transformation in frequency domain using transforms.
6. Create an algorithm to segment an image using edge detection, line detection and boundary detection.
7. Perform the Morphological Operations of digital image using Dilation, Erosion and Opening, Closing.
8. Feature extraction in medical images
9. Medical Image Compression techniques.
10. Medical image fusion.

TOTAL: 30 PERIODS



05.07.2023

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COURSE OUTCOMES

At the end of the course, students will be able to

- Design heuristics and apply different search techniques in game playing and problem solving
- Effectively communicate and disseminate knowledge in AI domain in the context of biomedical applications.
- Apply knowledge representation and natural Language processing concepts in implementing medical data processing.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | | |
| CO's | Programme Outcomes (Po's) and Programme Specific Outcome (PSO's) | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - |
| CO2 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - |
| CO3 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - |

LIST OF EXPERIMENTS:

1. Implement state space search using A* Algorithm
2. Hill climbing algorithm and Genetic Algorithm
3. Adversarial search and Game Playing.
4. Creating rule base and infer the proof using First order Predicate logic.
5. Solving n-Queen's problem.
6. Solving travelling salesman problem
7. ECG signal datasets preparation for AI workflows
8. ECG Classification using ML
9. ECG Classification Using LSTM
10. ECG Classification using Transfer Learning
11. Study of Disease detection with computer vision

TOTAL: 30 PERIODS



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PREAMBLE
To
Disaster Management

We observe that during the last three decades, disaster both natural and man-made occur frequently and their impact on life, live hoods, natural resources, property, infrastructure and facilities is very severe. Though hazards and disasters could not be prevents, by taking preparedness activities, we can minimize their harmful effects.

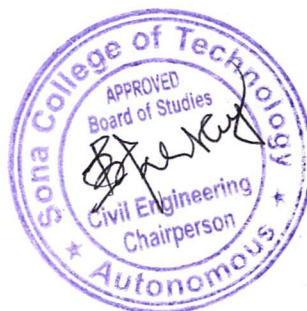
This course on disaster management emphasizes the need for disaster preparedness rather than emergency response. It throws light on risk assessments, risk resolution and risk sharing and transfer. The importance of community participation, building self-reliant resilient communities and awareness creation is highlights in this course. Application of modern communication tools, remote sensing and GIS technologies in search and resource operations and stream lining activities is elaborated. Way and means of financial arrangements to carry out disaster management activities are discussed.

The physics of earthquake and tsunamis is explained. Safety measures against tsunamis are described. The functioning and tsunamis warning system is described.

| COURSE CODE | COURSE NAME | | | | | | | | | | | | L | T | P | C |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------|-----|---|---|
| U19CE1004 | DISASTER MANAGEMENT | | | | | | | | | | | | 3 | 0 | 0 | 3 |
| Course Objective (s): The Purpose of learning this course is to: | | | | | | | | | | | | | | | | |
| 1. | Provide knowledge on the types and effects of disasters. | | | | | | | | | | | | | | | |
| 2. | Impart basic knowledge to reduce the impact of disasters. | | | | | | | | | | | | | | | |
| 3. | Understand the relationship and impact of development projects on environment and society. | | | | | | | | | | | | | | | |
| 4. | Disseminate the National policy and role played by our country during disasters. | | | | | | | | | | | | | | | |
| 5. | Provide basic knowledge in assessment of disasters with case study. | | | | | | | | | | | | | | | |
| Course Outcome (s) (COs): At the end of this course, the students will be able to: | | | | | | | | | | | | | | | | |
| CO1 | Distinguish various types of disasters, their causes and impacts on environment and society (K2) | | | | | | | | | | | | | | | |
| CO2 | Explain different phases of disaster management cycle (K3) | | | | | | | | | | | | | | | |
| CO3 | Assess vulnerability and prepare disaster risk reduction measures (K4) | | | | | | | | | | | | | | | |
| CO4 | Explain the vulnerability profile of India(K5) | | | | | | | | | | | | | | | |
| CO5 | Prepare hazard zonation maps for all types of hazards (K4) | | | | | | | | | | | | | | | |
| Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate: | | | | | | | | | | | | | | | | |
| CO – PO Mapping | | | | | | | | | | | | | | | | |
| Cos | Pos | | | | | | | | | | | | PSOs | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS | | |
| CO1 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | | |
| CO2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | |
| CO5 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | | |
| CO (Avg) | 3 | 2.6 | 3 | 2.6 | 2.6 | 2.8 | 3 | 2.8 | 2.8 | 2.8 | 2.8 | 3 | 2.8 | 2.8 | | |
| Correlation Level: 1:Slight (Low) 2:Moderate (Medium) 3:Substantial (High) | | | | | | | | | | | | | | | | |
| UNIT-I | INTRODUCTION TO DISASTERS | | | | | | | | | | | | 9 Hours | | | |
| Definitions: Disaster, Hazard, Vulnerability, Resilience, Disaster Preparedness - Classification of Disasters - Causes for Disasters - Impacts of Disasters on Society, Environment, Economics, Politics, Health, etc. - Types of Vulnerability - The Sphere Project | | | | | | | | | | | | | | | | |
| UNIT-II | APPROACHES TO DISASTER RISK REDUCTION | | | | | | | | | | | | 9 Hours | | | |
| Phases of Disaster Management Cycle - Culture of safety, prevention, mitigation, and preparedness - Community-based Disaster Risk Reduction - Structural and Non-structural mitigation measures | | | | | | | | | | | | | | | | |

| UNIT-III | INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT | 9 Hours |
|--|--|------------------------|
| Linkage between Development and Disasters -Impact of Development Projects on Environment and Society - Climate Change Adaptation - IPCC - India's Participation - Relevance of Indigenous Knowledge, Appropriate Technology, and Local Resources | | |
| UNIT-IV | DISASTER RISK MANAGEMENT IN INDIA | 9 Hours |
| Hazards-Vulnerability Profile of India - Components of Disaster Relief: Water, Sanitation, Food, Shelter, Health, etc. - National Policy and Disaster Management - Institutional Framework for Disaster Management in India - Role of NGOs in Disaster Risk Reduction - Role of Armed Forces during Disasters | | |
| UNIT-V | DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS | 9 Hours |
| Application of Information Technology, Remote Sensing Technology, and Geographic Information System in Disaster Risk Reduction - Case Studies on Landslide Hazard Zonation, Seismic Assessment of Buildings and Infrastructures, Drought Assessment, Coastal Flooding Assessment, Storm Surge Assessment, Fluvial and Pluvial Floods Assessment, Forest Fires Assessment | | |
| | | TOTAL: 45 Hours |
| TEXT BOOKS: | | |
| 1. | Singhal J.P. "Disaster Management", Laxmi Publications, 2010. | |
| 2. | Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. | |
| 3. | Pardeep Sahni and Madhavi Malalgoda Ariyabandu, "Disaster Risk Reduction in South Asia", PHI Learning Private Limited, Delhi- 110092, 2017 | |
| 4. | Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011 | |
| 5. | Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010. | |
| REFERENCES: | | |
| 1. | Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005 | |
| 2. | Government of India, National Disaster Management Policy,2009. | |

P. V. A.



COURSE OUTCOMES:

At the end of the course the students will be able to

1. Provide an overview of cloud computing
2. Explain the various tasks in developing cloud services
3. Analyze the provision of cloud computing services to different users
4. Configure the various cloud services according to the environment.
5. Analyze various ways to collaborate online

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 1 | 1 | 2 | 1 | 2 | 0 | 1 | 0 | 2 | 1 | 2 | 2 | 2 |
| CO2 | 2 | 1 | 2 | 3 | 3 | 2 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 |
| CO3 | 2 | 1 | 3 | 3 | 3 | 2 | 0 | 1 | 0 | 3 | 3 | 2 | 3 | 3 |
| CO4 | 2 | 1 | 2 | 3 | 3 | 2 | 0 | 1 | 0 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 2 | 2 | 3 | 3 | 3 | 1 | 0 | 1 | 0 | 2 | 3 | 2 | 3 | 3 |

UNIT I Understanding Cloud Computing**6**

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

UNIT II Developing Cloud Services**10**

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon – Google App Engine – IBM Clouds

UNIT III Cloud Computing for Everyone**10**

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT IV Using Cloud Services**10**

Collaborating on Calendars, Schedules and Task Management – Exploring Online Calendar Applications- Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Spread sheets- Collaborating on Databases – Storing and Sharing Files

05.07.2023

Regulation 2019


Dr. B. SATHIYABHAMA, B.E., M.Tech., Ph.D.
PROFESSOR & HEAD,
Dept. of Computer Science and Engineering
SONA COLLEGE OF TECHNOLOGY
SALEM - 636 005

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services –
Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware –
Collaborating via Blogs and Wikis

Total:45 hours

TEXT BOOK:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

REFERENCE BOOK:

1. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

Dr. B. SATHIYABHAMA, B.E., M.Tech., Ph.D.
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SALEM - 636 005

Course Outcomes

After successful completion of this course, the students should be able to

- 1) Design HDL code for combinational circuits and sequential circuits
- 2) Analyze MOS transistor theory
- 3) Illustrate the fabrication processes of CMOS
- 4) Design combinational circuit design.
- 5) Architectural choices and performance tradeoffs involved in designing

Pre-requisite

Digital Electronics

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 2 | 1 | 2 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 1 | 3 | 3 |
| CO2 | 1 | 2 | 2 | 2 | 2 | | 2 | 3 | | 1 | 2 | 1 | 3 | 3 |
| CO3 | 2 | 2 | 3 | 3 | 2 | | 2 | 2 | | 2 | 1 | 1 | 3 | 3 |
| CO4 | 2 | 2 | 2 | 3 | 2 | | 2 | 3 | | 2 | 2 | 1 | 3 | 3 |
| CO5 | 1 | 2 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 3 | 3 |

Unit I VERILOG HDL

9

Overview of Digital Design with Verilog HDL – Hierarchical Modeling Concepts – Basic Concepts – Modules and Ports – Gate-Level Modeling – Dataflow Modeling – Behavioral Modeling – Test Benches

Unit II MOS TRANSISTOR THEORY

9

Introduction – MOS Transistors – CMOS Logic – Inverter – NAND gate – CMOS Logic Gates – Compound - MOS Transistor Theory – MOS Structure - nMOS and pMOS Transistor Operation – Long Channel V-I Characteristics – C-V Characteristics – Non-ideal I-V Effects

05.07.2023

Dr. R. S. Sabeenian
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Professor and Head of Department
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Salem - 636 005. Tamilnadu, India.

Regulations 2019

| | | |
|-----------------|---|----------|
| Unit III | CMOS INVERTER AND ITS TECHNOLOGY | 9 |
| | DC Transfer Characteristics CMOS Inverter – CMOS Technologies – nMOS Fabrication – n-well Process – SOI – Twin Well Process - Layout Design Rules – CMOS Process Enhancement - Stick Diagram – Inverter – CMOS NAND – CMOS NOR. | |
| Unit IV | COMBINATIONAL CIRCUIT DESIGN | 9 |
| | Static CMOS – Pseudo logic– Dynamic Circuits – Pass-Transistor Circuits – CMOS with Transmission Gates – Source of Power Dissipation. | |
| Unit V | DESIGNING ARITHMETIC BUILDING BLOCKS AND FPGA | 9 |
| | Data path circuits, architectures for ripple carry adders (RCA), high speed adders, carry look ahead adder (CLA), Accumulators, Multipliers, Barrel shifters – Introduction to FPGA - FPGA Architecture – FPGA implementation | |


TOTAL : 45 HOURS

Text Book

- 1) Neil H. E Weste and David Money Harris, "CMOS VLSI Design a circuits and systems perspective", 4th Edition, Pearson, 2015..
- 2) Ciletti, "Advanced Digital Design with the Verilog HDL, 2nd Edition ", Pearson Education, Second Edition, 2011

References

- 1) Jan M. Rabaey, Anantha Chandrakasan ,Borivoje Nikolic, "Digital Integrated Circuits a design perspective", Pearson Education, 2nd edition, 2016
- 2) Charles H. Roth, Jr., Lizy Kurian John,"Digital System Design using VHDL", Cengage, 3rd edition, 2018
- 3) Pucknell D.A and Eshraghian K., "Basic VLSI Design", Third Edition, PHI, 2003.


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**PREAMBLE
TO
ENERGY CONSERVATION AND MANAGEMENT**

Energy is one of the most important resources to sustain our lives. At present we still depend a lot on fossil fuels and other kinds of non-renewable energy. The extensive use of renewable energy including solar energy needs more time for technology development. In this situation Energy Conservation (EC) is the critical needs in any countries in the world.

Energy saving is important and effective at all levels of human organizations – in the whole world, as a nation, as companies or individuals. Energy Conservation reduces the energy costs and improves the profitability.

Energy costs are often treated as a fixed overhead by organisations. But, by taking the right approach to energy management it is possible to make considerable savings. Successful energy management must combine an effective strategy with the right practical interventions. Many organisations would like to save energy, but they need to make energy management an integral part of running the organisation to ensure success. Energy Management is very important for the management of factories/companies, and Energy Conservation is one of its major topics.

S. Padma
15.7.23

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COURSE OUTCOMES

At the end of the course the students will be able to

1. Assess role of energy in global economic development.
2. Explain methodology of energy audit and concept of instruments used.
3. Discuss various lamps and design energy efficient illumination schemes.
4. Apply energy conservation concepts in buildings.
5. Identify the energy conserving opportunities in utilities.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 2 | 3 | 3 | 3 | | 2 | | | 2 | 3 | 3 | 3 | 2 |
| CO2 | 2 | 2 | 3 | 3 | 3 | | | | 2 | | | 3 | 3 | 2 |
| CO3 | 2 | 2 | 3 | 3 | 3 | 3 | | | 3 | | 2 | 3 | 3 | 2 |
| CO4 | 2 | 2 | 3 | 3 | 3 | 2 | | 3 | | | | 3 | 3 | 2 |
| CO5 | 2 | 2 | 3 | 3 | 3 | | 3 | | | 3 | | 3 | 3 | 2 |

UNIT- I ENERGY SCENARIO AND BASICS

9

Classification of Energy – Purchasing Power Parity – Energy Security – Strategy to meet future energy requirements – Objectives and features for electricity act 2003 – Energy efficiency standards and labeling – Study of Global and Indian primary energy reserves – Study of energy scenario for India – Energy and environment – Global environmental issues – Types of Energy – Electrical and Thermal energy basics – Energy units and conversions.

UNIT- II ENERGY MANAGEMENT AND AUDIT

9

Definition and objectives of energy management and audit – Need for energy audit – Types of energy audit – Methodology for conducting detailed energy audit – ENCON opportunities and measures – Energy audit report. Energy costs – Benchmarking – Energy performance – Fuel and Energy substitution – Instruments and metering for energy audit – Basic principles, components of material and energy balance – Sankey diagram – Financial analysis terms – Payback period, ROI, NPV, IRR.

UNIT- III LIGHTING SYSTEMS

9

Introduction – Terms in Lighting and Illumination – Light sources - Lamp types – Arc Lamps, Vapour lamps – Incandescent lamp, Fluorescent lamp – Energy saving lamps – CFL, LED – Lighting design for interiors – Indoor and outdoor lighting schemes – Energy saving opportunities – Energy efficient lighting controls.

UNIT- IV ENERGY CONSERVATION IN BUILDINGS

9

Energy conservation building code (ECBC) – Compliance approaches – ECBC guidelines on Building envelope, HVAC system, Service hot water, Water pumps – Energy consumption in Escalators and Elevators – Building Energy Management Systems – Star ratings – Energy Efficiency Measures in AC and Lighting system.

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UNIT- V ENERGY EFFICIENT OPPORTUNITIES IN UTILITIES

9

Introduction to Compressed air system components – Heat transfer loops in refrigeration systems – Standards and labelling of room air conditioners – Introduction to Fans, Blowers and Compressors – Types of pumps, Pump curves – Efficient operation of pumps – Components of cooling towers and its efficient operation - Introduction to DG set system.

Energy Efficiency and energy savings in Compressed Air System, HVAC system, Fans and Blowers, Pumping system, Cooling towers, and DG sets.

Lecture: 45; Tutorial: 00; Total: 45

TEXT BOOKS:

1. "General Aspects of Energy Management and Energy Audit", Bureau of Energy Efficiency, Fourth Edition, 2015.
2. "Energy Efficiency in Electrical Utilities", Bureau of Energy Efficiency, Fourth Edition, 2015.

REFERENCE BOOKS:

1. Chakrabarti A, "Energy Engineering and Management", PHI, 2011.
2. Murphy W R, McKay G, "Energy management", Elsevier, 2009.
3. Rajput R K, "Utilization of Electrical Power", Lakshmi Publications, 2006.

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PREAMBLE
TO
Innovation, IPR and Entrepreneurship Development

The open elective course syllabus has been framed by Entrepreneurship Development Cell of Sona College of Technology on above mentioned title for even semester. The course covers a wide range of topics from Innovation, Intellectual Property Right and entrepreneurial Competitiveness and competency, basic requirements of setting of an enterprise/startups, factors influencing entrepreneurship, Barriers to Entrepreneurship & Concepts, Issues of Entrepreneurship Failure, Idea selection, Innovation & creativity, design thinking.

The course also covers identifying and selecting a good business opportunity, market survey & research, techno-economic feasibility assessment and preparation of preliminary project reports, management of working capital, costing, break even analysis, taxation, income tax, GST, provision of incentives, subsidies & concessions, entrepreneurship finance and angels & ventures capital fund etc. Benefit out of Government policies to small scale industries and business incubators.

S. Padma
15.7.23

Dr. S. PADMA, M.E., Ph.D.
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Department of EEE,
Sona College of Technology
Salem-636 005. Tamil Nadu.

COURSE OUTCOMES

At the end of this course the students will be able to,

- Acquire the knowledge for establishment of an enterprise and management,
- Derive the innovative ideas, right approach to the problem and arrive solution for problem with IPR and its legal aspects.
- Prepare the project report preparation and assessment of Business.
- Acquire the knowledge on costing, Techno-economic aspects, find out the sources of finance and opportunities in business.
- Identify the support system for Entrepreneurs by Government and venture capitals.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | 3 | | | 3 | 3 | | 3 | 3 | 3 | 3 | | 3 |
| CO2 | | | 3 | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 |
| CO3 | | | 3 | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 |
| CO4 | | | 3 | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 |
| CO5 | | | 3 | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 |

UNIT I ENTREPRENEURSHIP & MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT II INNOVATION, CREATIVITY, DEVELOPMENT PROCESS AND LEGAL ASPECTS 9

Innovation and Creativity- An Introduction, Innovation in Current Environment, Types of Innovation Sources of new Ideas, Methods of generating innovative ideas, creating problem solving, product planning and development process. Legal aspects of business (IPR, Labor law).

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, GST.

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UNIT V SUPPORT TO ENTREPRENEURS

9

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Lecture: 45; Tutorial: 0; Total: 45 Hrs

TEXT BOOKS:

1. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013. 99
2. Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", 9 th Edition, Cengage Learning, 2014.

REFERENCES:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2 nd Edition Dream tech, 2005.
3. Rajeev Roy, "Entrepreneurship" 2 nd Edition, Oxford University Press, 2011.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.
5. Innovation and Entrepreneurship Book by Peter Drucker,
6. James Larminie and John Lowry, "Electric Vehicle Technology Explained " John Wiley & Sons, 2003.

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15-7-23
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COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Define and discuss the fashion and related terms and reason for change in fashion and the classification
2. Describe clothing and its purpose, Role of clothing and its status.
3. Describe the selection of clothing for various age groups, Fashion apparel and wardrobe planning.
4. Explain the elements and principles of the design, with the effects in the apparel
5. Bounce out the theme and development of portfolio.

| CO/PO, PSO Mapping | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | | | | | | | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | | | | | | | | | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | | | | | | | | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | | | | | | | | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | | | | | | | 3 | 3 | 3 | 3 | 3 |

UNIT I Introduction to Fashion 9

Origin of fashion - terms and definitions - reasons for change in fashion - classification of fashion – Style, Classic, FAD, Trend – theories of fashion – movement of fashion - fashion cycle.

UNIT II Introduction to Clothing 9

Understanding clothing - Purpose of clothing: protection, modesty, attraction etc - Importance of clothing - Clothing Culture, Men and Women clothing and ornamentation - Role and status of clothing - Clothing according to climatic conditions – factors to be considered in the selection of clothing

UNIT III Selection of clothes 9

Clothes for children, middle-aged and adults. Types of clothes according to different types of human figure, Different materials for different clothes, Fabrics and colours suitable for different garments.

Planning for clothing needs: Formal clothing, Clothes for parties, Clothes for sports, Casual Clothes for casualwear. **Wardrobe Planning:** Wardrobe for men and women

UNIT IV Elements and Principles of Design 9

Elements of Design: Introduction on basics Elements of design - Silhouette, Details, Texture, Color, Lines,

Principle of design: Introduction to principles of Elements of design - Proportion, Balance, Rhythm, Center of Interest, Harmony

UNIT 5 Design and Development

9

Boards: Mood board, fabric board, colour board, accessory board. Fashion illustration – head theories, Illustration techniques – strokes, hatching, shading; Colouring techniques – Medias for colouring. Portfolio presentation – styles of presentation - Fashion shows.

TOTAL: 45 hours

TEXT BOOKS

1. Munslow, Janine, McKelvey, Kathryn “**Fashion Design Process Innovation and Practice**”, 2nd Edition , wiley , 2012.
2. Nicola White, Ian Griffiths, “**The Fashion Business Theory, Practice, Image**”, Berg, 2000.

REFERENCE

1. Sumathi, G. J. **Elements of fashion and apparel design**. New Age International, 2007.
2. Kathryn McKelvey “**Fashion Source Book**” Balckwell Publishing New Delhi.
3. Mills, Jane, and Janet K. Smith. **Design concepts**. Fairchild Books, 1985.
4. Rasband J. **Wardrobe strategies for women**. Fairchild Publications; 2002.
5. Jarnow JA, Judelle B, Guerreiro M. **Inside the fashion business**. Wiley; 1981.

5/8

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COURSE CODE U19ME1002

L T P C

COURSE NAME INDUSTRIAL SAFETY

3 - - 3

Course Outcomes

Upon completion of this course the students will be able to

- CO1** Summarize various legal provisions available in safety regulation.
- CO2** Analyze industrial environment hygiene and develop precautionary measure to avert occupational diseases.
- CO3** Demonstrate the uses of different grades of fire protection systems related with different classes of fire.
- CO4** Develop Agronomical study of different work environment in industries.
- CO5** Discuss the importance of safety training and its impact on shop floor of factories.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
| COs, POs PSOs Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO - 1 | 3 | - | - | - | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 |
| CO - 2 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 2 | 2 | - | 2 | 2 | 3 |
| CO - 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |
| CO - 4 | 2 | 1 | 3 | 3 | 3 | 3 | 2 | 3 | 1 | 2 | - | 2 | 3 | 3 |
| CO - 5 | 1 | 3 | 3 | 3 | - | 3 | - | 3 | 3 | 3 | 2 | 3 | 2 | 2 |

Unit I BASICS OF SAFETY ENGINEERING & ACTS

L 9 T 0

Evolution of modern safety concept –safety performance monitoring. Acts – factories act – 1948 – Statutory authorities – inspecting staff – Tamilnadu Factories Rules 1950 under Safety and health – environment act – 1986 – Air act 1981, water act 1974 – other acts. Safety in industries – General safety concepts, machine guarding, hazards in metal removing process, welding process, cold and hot working process.

Unit II OCCUPATIONAL HEALTH AND INDUSTRIAL HYGIENE

L 9 T 0

(Basic concepts, related hazards and exposure limits)

Physical Hazards – Noise, heat, radiation, vibration, recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases. Biological and Ergonomical Hazards-Basic concepts. Occupational Health-Concept and spectrum of health – functional units and activities of occupational health services, pre-employment and post-employment medical examinations – occupational related diseases, levels of prevention of diseases, notifiable occupational diseases. Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, Preliminary Hazard Analysis (PHA), human error analysis, hazard operability studies (HAZOP), safety warning systems.

Unit III FIRE ENGINEERING AND EXPLOSIVE CONTROL

L 9 T 0

Fire properties of solid, liquid and gases – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers – Principles of explosion – Explosion Protection – Electrical Safety. Electrical Hazards – Primary and Secondary hazards – concept of earthing – protection systems – fuses, circuit breakers and over load relays – first aid cardiopulmonary resuscitation techniques.

Unit IV ERGONOMICS

L 9 T 0

Introduction to ergonomics: The focus of ergonomics, ergonomics and its areas of application in the work system, modern ergonomics, and future directions for ergonomics. Anatomy, Posture and Body Mechanics: anatomy of the spine and pelvis related to posture, posture stability and posture adaptation, low back pain, risk factors for musculoskeletal disorders in the workplace, effectiveness and cost effectiveness. Anthropometry and its uses in ergonomics, Applications of human factors engineering, man as a sensor, man as information processor, man as controller – Ergonomics in IT industries.

Unit V SAFETY EDUCATION AND TRAINING

L 9 T 0


Importance of training – identification of training needs – training methods – programs, seminars, conferences, competitions – motivation – communication – role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety Training.

Total Number of hours: 45**Learning Resources****Text Books**

1. Krishnan N.V., "Safety Management in Industry", Jaico Publishing House, Bombay, 1997.
2. Hand book of "Occupational Safety and Health", National Safety Council, Chicago, 1982.

Reference Books

1. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.
2. Guidelines for Hazard Evaluation Procedures Centre for Chemical Process Safety, AICHE 1992.
3. The factories Act 1948, Madras Book Agency, Chennai, 2000.
4. Introduction to Ergonomics, R.S. Bridger, Taylor & Francis.



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COURSE CODE U19ME1004

L T P C

COURSE NAME RENEWABLE ENERGY SOURCES

3 - - 3

Prerequisites- subject: Environmental Sciences.**Course Outcomes**

Upon completion of this course the students will be able to

- CO1** Discuss the power demand scenario in world level and impact of various renewable energy sources in satisfying power demand.
- CO2** Explain the different components and the principle of operation and the application of solar PV system and Bio Mass power generation system.
- CO3** Outline in the components and to find the suitability based on the performance of wind energy conversion system, geothermal and hydel power system.
- CO4** Describe the components of tidal power generation scheme and wave energy scheme and to discuss the performance of two schemes.
- CO5** Compare and contrast the various components and methods of Ocean Energy Conversion Systems.

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs, POs PSOs Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO - 1 | 3 | 3 | 3 | - | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO - 2 | 3 | - | 3 | 3 | 3 | 3 | 3 | - | 3 | 3 | 3 | 3 | 3 | 3 |
| CO - 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | 3 | 3 | 3 | 3 | 3 | 3 |
| CO - 4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | 3 | 3 | 2 | 3 | 3 | 3 |
| CO - 5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |

Unit I INTRODUCTION

L 9 T 0

World energy use – reserves of energy resources – energy cycle of the earth – environmental aspects of energy Utilization – renewable energy resources and their importance.

Unit II SOLAR & BIO ENERGY

L 9 T 0

Introduction – extra-terrestrial solar radiation – radiation at ground level – collectors – solar cells – applications of solar energy – Biomass Energy – Introduction – Biomass Conversion – Biogas Production – Ethanol Production – Pyrolysis and Gasification – Direct Combustion – Applications.

Unit III GEO THERMAL AND HYDRO ENERGY SOURCES

L 9 T 0

Geothermal energy – types of geothermal energy sites, site selection, and geothermal power plants, Hydro energy – Feasibility of small, mini and micro hydro plants: scheme, layout and economics.

Unit IV WIND AND TIDAL ENERGY

L 9 T 0

Introduction – Wind Energy – Wind speed and power relation – Power extracted from wind – wind distribution and wind speed predictions – types of Wind power systems.

Introduction – origin of tides – power generation schemes – Wave Energy – basic theory – wave power Devices.

Unit V OTHER RENEWABLE ENERGY SOURCES

L 9 T 0


Introduction – Open and Closed OTEC cycles – Ocean Currents – Salinity Gradient Devices – Potential impacts of harnessing the different renewable energy resources.

Total Number of hours: 45**Learning Resources****Text Books**

1. Twidell John; Weir, Tony, "Renewable energy resources", Taylor & Francis, 2010
2. Godfrey Boyle, "Renewable energy – power for a sustainable future", Oxford University Press, 2010
3. Kothari DP, Singal KC and Rakesh Ranjan, 'Renewable Energy Sources and Emerging Technologies' PHI Learning Pvt. Ltd.2011.
4. S.A. Abbasi and Naseema Abbasi, "Renewable energy sources and their environmental impact", Prentice- Hall of India, 2001.

Reference Books

1. T.N.Veziroglu, Alternative Energy Sources, Vol 5 and 6, McGraw Hill, 1978.
2. G D Rai, "Non-conventional sources of energy", Khanna Publishers, 2002.
3. G D Rai, "Solar energy utilization", Khanna Publishers, 2005.
4. MukundR.Patel, "Wind and Solar Power Systems", CRC Press, Taylor and Francis, 2005.
5. Yogi Goswami, 'Principles of Solar Engineering' CRC Press, 2015, ISBN 10: 1466563788


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PREAMBLE

The students opting for this course will learn to code in Java and improve the programming and problem-solving skills. Through this course, the students will acquire appropriate skills to design algorithms as well as develop and debug programs. We are excited to offer a unique course structure, designed to support learners of different engineering departments and to fulfill their dreams of pursuing a career in an IT industry.

This course aims to satisfy the curiosity of the learners who wants to know how a ticket is booked in railways, or how an electricity consumption bill is generated. After the completion of the course, learners will be able to code real time problems in JAVA programming language.

COURSE OUTCOMES

1. Apply Object Oriented Programming concepts and basic features of Java to write programs for solving problems
2. Write java programs with objects and classes of java
3. Develop real time systems using java inheritance concepts
4. Build java applications using exceptions and I/O
5. Solve real time problems using java packages and connect java applications with relational databases using JDBC for storing and retrieving sensitive data

| CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak | | | | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs | Programme Outcomes (POs) and Programme Specific Outcome (PSOs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | 3 | 3 | 2 | 3 | | | | | | | | | 3 |
| CO2 | | 3 | 3 | 2 | 3 | | | | | | | | | 3 |
| CO3 | | 3 | 3 | 2 | 3 | | | | | | | | | 3 |
| CO4 | | 3 | 3 | 2 | 3 | | | | | | | | | 3 |
| CO5 | | 3 | 3 | 2 | 3 | | | | | | | | | 3 |

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Introduction to Object Orientation- Need for Object Oriented Paradigm- Characteristics of Object Oriented Programming - The History and Evolution of Java – An Overview of Java – Java Virtual Machine - Data Types –Variables - Arrays – Operators- Control Statements - Command Line Arguments

UNIT II OBJECTS AND CLASSES 9

Introducing Classes - Class fundamentals - Declaring Objects – Introducing Methods – Constructors- Parameterized Constructor – Copy Constructor – this keyword- Method Overloading – Constructor Overloading –Access control – Static keyword– Nested and Inner classes – Local Inner class

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UNIT III INHERITANCE AND INTERFACE

9

Inheritance basics – Types of Inheritance – Super keyword – Method Overriding – Abstract Classes - final keyword- Interfaces- Default Interface Methods-Use static methods in an interface- Nested interfaces

UNIT IV EXCEPTION HANDLING AND I/O

9

Exception Handling Fundamentals – Exception Types – Uncaught Exception – Using try and catch – Multiple catch clauses – Nested try statements – throw – throws – finally - finalize method - I/O FileInputStream – I/O FileOutputStream

UNIT V PACKAGES AND JDBC CONNECTIVITY

9

Working with predefined and user defined packages - Access Protection – Importing Packages - Basics of JDBC Connectivity – SQL Queries – create – insert – select - delete – update.


TOTAL: 45 HOURS

TEXT BOOK

1. Herbert Schildt, “Java™: The Complete Reference”, Ninth Edition, Tata McGraw Hill, 2014.

REFERENCES

1. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Ninth Edition, Prentice Hall, 2013.
2. K. Arnold, D. Holmes and J. Gosling, “The JAVA programming language”, Fourth Edition, Addison Wesley Professional, 2005.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Third Edition, Addison Wesley, 2000.
4. C. Thomas Wu, “An introduction to Object-oriented programming with Java”, Fifth Edition, Tata McGraw-Hill Publishing company Ltd., 2009.



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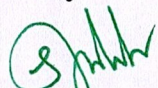


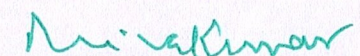
BME
VIII


Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019
Branch: Biomedical Engineering

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|----------------------|-------------|--------------|---------|----------|-----------|-----------|---------------------|
| Practical | | | | | | | |
| 1 | U19BM801 | Project Work | 0 | 0 | 24 | 12 | 360 |
| Total Credits | | | | | | 12 | |

Approved By


Chairman, Biomedical Engineering BoS
Dr.S.Prabakar


Member Secretary, Academic Council
Dr.R.Shivakumar 6/12/23


Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Biomedical Engineering, Eighth Semester BE BME Students and Staff, COE