

SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode-638455



Regulation 2025
(Students admitted from AY 2025-26)
(Autonomous)

Curriculum and Syllabus
Choice Based Credit System (CBCS)
BE- BIOMEDICAL ENGINEERING



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)

Curriculum and Syllabus

BE- Biomedical Engineering

I. Program Educational Objective (PEO)

PEO1: Foundational Concepts: To enable the graduates to demonstrate their skills in design and develop medical devices for health care system through the core foundation and knowledge acquired in engineering and biology.

PEO2: Professionalism: To enable the graduates to exhibit leadership in health care team to solve health care problems and make decisions with societal and ethical responsibilities.

PEO3: Innovation: To Carryout multidisciplinary research, addressing human healthcare problems and sustain technical competence with ethics, safety and standards.

II. Program Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

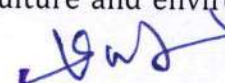
PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).


Chairman
BoS/BME

- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- PO8: Individual and Collaborative Teamwork:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for (i) Independent and life-long learning (ii) adaptability to new and emerging technologies and (iii) Critical thinking in the broadest context of technological change. (WK8)

III. Program Specific Outcomes (PSOs)

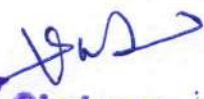
- 1. Core Skills:** To design and develop diagnostic and therapeutic devices that reduces physician burnout and enhance the quality of life for the end user by applying fundamentals of Biomedical Engineering.
- 2. Problem Solving Skills:** To apply software skills in developing algorithms for solving healthcare related problems in various fields of Medical sector.
- 3. Social Consciousness:** To adapt to emerging information and communication technologies (ICT) to innovate ideas and solutions for current societal and scientific issues thereby developing indigenous medical instruments that are on par with the existing technology


Chairman
BoS/BME

Year	Sem	Course name	PO											PSO		
			1	2	3	4	5	6	7	8	9	10	11	1	2	3
I	I	Induction Programme														
		Communicative English-I	-	-	-	2	-	1	-	2	3	-	3	-	-	-
		Matrices and Calculus	3	3	1	1	-	-	-	2	-	2	3	-	-	-
		Engineering Physics	3	3	2	1	2	-	-	-	-	-	1	-	-	-
		Engineering Chemistry	3	2	2	1	1	3	-	-	-	-	1	-	-	-
		Problem Solving using C Programming	2	3	3	3	2	-	-	-	-	2	2	3	3	3
		Heritage of Tamils	-	-	-	-	-	1	1	-	1	-	-	-	-	-
		Idea Lab	2	3	3	3	2	-	-	-	-	2	2	3	3	3
		Yoga for Human Excellence	3	2	1	-	1	3	1	-	-	-	1	-	-	-
	II	Communicative English - II	-	1	1	-	-	1	1	2	3	-	2	-	-	-
		Numerical Methods and Differential Equations	3	3	1	1	1	-	-	2	-	2	3	-	-	-
		Medical Physics	3	2	2	1	-	1	-	-	-	-	2	3	1	-
		Anatomy and Human Physiology	3	3	2	2	-	-	-	-	1	-	-	3	3	2
		Python Programming	3	3	1	1	1	1	-	-	-	-	-			
		Engineering Graphics	3	1	2	-	2	-	-	-	3	-	2	2	2	-
		Tamils and Technology	2	-	-	-	-	2	2	2	2	-	2			
		Vision Exploration Lab	3	-	-	3	-	-	-	-	-	-	-	2	1	1
II	III	Transforms Techniques and Partial Differential Equations	3	3	1	1	-	-	-	2	-	-	3	-	-	-
		Electronic Devices and Circuits	3	3	3	-	-	-	-	-	-	-	-	1	-	-
		Biosensors and Measurements	3	3	2	1	-	-	-	-	-	-	-	1	-	-
		Fundamentals of Electric Circuits	3	3	2	1	-	-	-	-	-	-	1	1	-	-
		Object oriented programming	3	3	1	1	1	-	-	-	-	-	-	-	1	1
		Biosciences for Medical Engineering	3	3	2	-	-	-	-	-	-	-	-	1	-	-
		Electronic Devices and Circuits Laboratory	2	2	2	1.6	1	-	-	-	-	-	-	2	2	2
		Biosensors and Measurements Laboratory	3	2	1	1	1	-	-	1	2	-	-	-	1	1
		Biosciences Laboratory	3	2	1	1	-	-	-	1	2	1	-	2	-	-
	IV	Soft and Analytical Skills-I	3	3	1	1	1	-	-	-	1	1	-	-	1	1
		Probability Theory and	3	3	-	-	-	-	-	3	-	-	2	-	-	-

	Statistical methods														
	Biomedical Instrumentation	3	2	1	1	-	-	-	-	-	1	-	2	1	-
	Analog and Digital Integrated Circuits	3	2	1	1	1	-	-	-	-	-	-	2	-	-
	Biocontrol Systems	3	2	2	2	-	-	-	-	-	-	-	2	1	-
	Microprocessors and Microcontrollers	3	2	2	2	1	-	-	1	1	1	-	2	1	-
	Biosignal Processing	3	2	2	2	1	-	-	1	1	1	-	2	1	-
	Biomedical Instrumentation Laboratory	3	3	1	1	1	1	-	1	1	1	-	1	-	1
	Analog and Digital Integrated Circuits Laboratory	3	3	1	1	1	-	-	1	1	1	-	1	-	-
	Soft and Analytical Skills-II	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mandatory Courses-III	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation


Chairman
BoS/BME

SUMMARY OF CREDITS

S.No	Course Category	Credits per Semester								Total Credits	Credits in %	Credits as per AU Curriculum R-2025
		I	II	III	IV	V	VI	VII	VIII			
1	HUM	5	4	-	-	-	2	3	-	14	8.33	18
2	BS	11	6	4	3	-	-	-	-	24	14.20	21
3	ES(G)	-	4	-	-	-	-	-	-	4	2.38	07
4	ES(PC)	4	8	20.5	19	16.5	10	7	-	85	50.29	75
5	ES(PE)	-	-	-	-	3	6	6	-	15	8.92	16
6	OE	-	-	-	-	-	-	3	-	3	1.78	03
7	SL	-	-	-	-	-	1	-	-	1	0.59	01
8	SD	2	2	-	1	4	4	2	8	23	13.69	24
9	MC	√		√	√							
Total Credits / Semester		22	24	24.5	23	23.5	23	21	08	169	100	165

CATEGORIZATION OF COURSES

- i. Basic Science (BS)
- ii. Humanities (HUM)
- iii. Engineering Science (ES)
 - ❖ General (G)
 - ❖ Programme Core (PC)
 - ❖ Programme Elective (PE)
 - ❖ Emerging Technology (ET)
- iv. Open Elective (OE)
- v. Self-Learning (SL)
- vi. Skill Development (SD)
- vii. Value Added (VA) Courses
- viii. Off Campus (OC) Courses
- ix. Mandatory Courses (MC)

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)
Students Admitted AY 2025-26
Curriculum and Syllabus
B.E. Biomedical Engineering

SEMESTER I

SEMESTER I												
S.No	Course Code	Course Title	Category	Periods/ Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Induction Program												
1.	25IPA11	Induction Programme	-	-	-	-	-	0		-	-	-
Theory												
2.	25ENI11	Communicative English - I	HUM	3	0	2	5	4	4,5,8,9,16	50	50	100
3.	25MAT11	Matrices and Calculus	BS	3	0	0	3	3	4, 8, 9, 11	40	60	100
4.	25PHI11	Engineering Physics	BS	3	0	2	5	4	3,4,9,11,12	50	50	100
5.	25CYI11	Engineering Chemistry	BS	3	0	2	5	4	4, 6, 7	50	50	100
6.	25CSI11	Problem Solving using C Programming	ES(PC)	3	0	2	5	4	4, 8, 9, 10,17	50	50	100
7.	25TAT11	Heritage of Tamils	HUM	1	0	0	1	1	3,4,8,11,16	40	60	100
Practicals												
8.	25MEL11	Idea Lab	SD	0	0	4	4	2	4, 8, 9, 11, 12	60	40	100
Mandatory Course												
9.	25MDC11	Yoga for Human Excellence	MC	0	0	1	1	0	3, 4, 5, 10, 16	100	-	100
Total				16	0	13	29	22				

[Signature]
Chairman
BoS/BME

SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

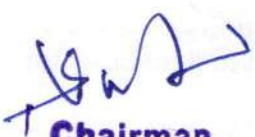
Regulation 2025 (UG)
Students Admitted AY 2025-26

Curriculum and Syllabus
B.E. Biomedical Engineering

SEMESTER II

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Theory												
1.	25ENI21	Communicative English - II	HUM	2	0	2	4	3	4,5,8,9,16	50	50	100
2.	25MAT21	Numerical Methods and Differential Equations	BS	3	0	0	3	3	4, 8, 9, 11	40	60	100
3.	25PHT24	Medical Physics	BS	3	0	0	3	3	3,4,9,10,17	40	60	100
4.	25BMI21	Anatomy and Human Physiology	ES(PC)	3	0	2	5	4	4, 6, 7, 9, 12, 13	50	50	100
5.	25CSI21	Python Programming	PC	3	0	2	5	4	4, 8, 9, 10,17	50	50	100
6.	25MEI21	Engineering Graphics	ES(G)	3	0	2	5	4	4, 8,9,11	50	50	100
7.	25TAT21	Tamils and Technology	HUM	1	0	0	1	1	2,4,6,9,11	40	60	100
Practicals												
8.	25EEL21	Vision Exploration Lab	SD	0	0	4	4	2	4, 8, 9, 10,12, 13,17	60	40	100
Total				18	0	12	30	24				

Chairman
BoS/BME


Chairman
BoS/BME



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)
Students Admitted AY 2025-26
Curriculum and Syllabus
B.E. Biomedical Engineering

SEMESTER III

S.No	Course Code	Course Title	Category	Periods/ Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Theory												
1.	25MAT32	Transform Techniques and Partial Differential Equations	BS	3	1	0	4	4	4,8,9,17	40	60	100
2.	25ECT31	Electronic Devices and Circuits	ES(PC)	3	0	0	3	3	4,7,9,12	40	60	100
3.	25BMT31	Biosensors and Measurements	ES(PC)	3	0	0	3	3	4	40	60	100
4.	25EET35	Fundamentals of Electric Engineering	ES(PC)	3	0	0	3	3	4,7,9	40	60	100
5.	25CSI34	Object oriented programming	ES(PC)	3	0	2	5	4	4,8,9	50	50	100
6.	25BMT32	Biosciences for Medical Engineering	ES(PC)	3	0	0	3	3	3,4	40	60	100
Practicals												
7.	25ECL31	Electronic Devices and Circuits Laboratory	ES(PC)	0	0	3	3	1.5	4,9,12	60	40	100
8.	25BML31	Biosensors and Measurements Laboratory	ES(PC)	0	0	3	3	1.5	3,4	60	40	100
9.	25BML32	Biosciences Laboratory	ES(PC)	0	0	3	3	1.5	3,4	60	40	100
Mandatory Course												
10.		Mandatory Courses-II&	MC	3	0	0	3	0		100	-	100
Total				22	1	11	33	24.5				

& Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-II)

Chairman
BoS/BME



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE (Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)

Students Admitted AY 2025-26

Curriculum and Syllabus

B.E. Biomedical Engineering

SEMESTER IV

S.No	Course Code	Course Title	Category	Periods/ Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Theory												
1.	25MAT41	Probability Theory and Statistical Methods	BS	3	0	0	3	3	2,4,8,9,12	40	60	100
2.	25BMT41	Biomedical Instrumentation	ES(PC)	3	0	0	3	3	1,3,4	40	60	100
3.	25BMT42	Analog and Digital Integrated Circuits	ES(PC)	3	0	0	3	3	3,4,9	40	60	100
4.	25BMT43	Biocontrol Systems	ES(PC)	3	0	0	3	3	3,4,9,12	40	60	100
5.	25ECT44	Microprocessor and Microcontroller	ES(PC)	3	0	0	3	3	4,9,11	40	60	100
6.	25BMI41	Biosignal Processing	ES(PC)	3	0	2	5	4	3,4,9,10,12	50	50	100
7.	25SDC41	Soft and Analytical skills-I	SD	1	0	0	1	1	4,8,10	100	-	100
Practicals												
8.	25BML41	Biomedical Instrumentation Laboratory	ES(PC)	0	0	3	3	1.5	3,4	60	40	100
9.	25BML42	Analog and Digital Integrated Circuits Laboratory	ES(PC)	0	0	3	3	1.5	3,4,9	60	40	100
Mandatory Course												
10.		Mandatory Courses-III&	MC	3	0	0	3	0		100	-	100
Total				22	0	8	30	23				

& Mandatory Course-III is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-III)



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)

Students Admitted AY 2025-26

Curriculum and Syllabus

B.E. Biomedical Engineering

SEMESTER V

S.No	Course Code	Course Title	Category	Periods/ Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Theory												
1.	25BMT51	Embedded Systems and IoMT	ES(PC)	3	0	0	3	3	3,9,10,11,16,17	50	50	100
2.	25BMT52	Diagnostic and Therapeutic Equipment	ES(PC)	3	0	0	3	3	3,9,10,11,17	40	60	100
3.	25BMT53	Radiological equipment	ES(PC)	3	0	0	3	3	3,9,10,11,17	40	60	100
4.	25BMI51	Healthcare Data Analytics	ES(PC)	3	0	2	5	4	3,9,10,11,16,17	50	50	100
5.		Programme Elective I*	ES(PE)	-	-	-	-	3		40	60	100
6.	25SDC51	Soft and Analytical skills-II	SD	1	0	0	1	1	4,8	100	-	100
7.		Industry oriented course-I	SD	1	0	2	3	2		50	50	100
Practicals												
8.	25BML51	Embedded Systems and IoMT Laboratory	ES(PC)	0	0	3	3	1.5	4,9,11,12	60	40	100
9.	25BML52	Diagnostic and Therapeutic Equipment Laboratory	ES(PC)	0	0	4	4	2	3,4,9,10,12	60	40	100
10.	25BML53	Summer Internship	SD	0	0	0	0	1	3,4,6,7,8	100	-	100
Total				-	-	-	-	23.5				
For Honours Degree												
11.		Capstone Design Project-Level I	SD	0	0	12	12	6		40	60	100
OR												
12.		Honours Elective-III	T	3	0	0	3	3		40	60	100
13.		Honours Elective-IV	T	3	0	0	3	3		40	60	100
For Minor Degree												
14.		Minor Elective-III	T	3	0	0	3	3		40	60	100
15.		Minor Elective-IV	T	3	0	0	3	3		40	60	100

* Programme Elective - I shall be chosen from the list of Professional electives (Verticals) offered by same Programme.



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)

Students Admitted AY 2025-26

Curriculum and Syllabus

B.E. Biomedical Engineering

SEMESTER VI

SEMESTER VI												
S.No	Course Code	Course Title	Category	Periods/ Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Theory												
1.	25BMT61	Biomechanics	ES(PC)	3	0	0	3	3	3,9,10	40	60	100
2.	25BMT62	Medical Ethics and Regulatory Standards	ES(PC)	3	0	0	3	3	3,8,10, 16	40	60	100
3.	25BMI61	Medical Image Processing	ES(PC)	3	0	2	5	4	3,4,9	50	50	100
4.		Programme Elective II*	ES(PE)	-	-	-	-	3		40	60	100
5.		Programme Elective III*	ES(PE)	-	-	-	-	3		40	60	100
6.		Climate change and sustainability	HUM	2	0	0	2	2	12,13	40	60	100
7.		Industry oriented course-II	SD	1	0	2	3	2		50	50	100
8.		Self learning course	SL	1	0	0	0	1		100	-	100
Practicals												
9.	25BML61	Mini project	SD	0	0	0	4	2	3,4,6,7,9, 11,13	100	-	100
Total				-	-	-	-	23				
For Honours Degree												
10.		Capstone Design Project- Level II	SD	0	0	12	12	6		40	60	100
OR												
11.		Honours Elective-III	T	3	0	0	3	3		40	60	100
12.		Honours Elective-IV	T	3	0	0	3	3		40	60	100
For Minor Degree												
13.		Minor Elective-III	T	3	0	0	3	3		40	60	100
14.		Minor Elective-IV	T	3	0	0	3	3		40	60	100

* Programme Elective - II and III shall be chosen from the list of Programme electives (Verticals) offered by same Programme.

** Open Elective - I shall be chosen from the list of open electives offered by other Programmes.

@ The students individually undergo Hospital training in reputed firms/ research institutes / laboratories for the specified duration (04 Weeks) during summer vacation. After the completion of training, a detailed report should be submitted within ten days from the commencement of VII semester.



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)

Students Admitted AY 2025-26

Curriculum and Syllabus

B.E. Biomedical Engineering

SEMESTER VII

SEMESTER VII												
S.No	Course Code	Course Title	Category	Periods/ Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Theory												
1.	25UHV71	Universal Human Values - II	HUM	3	0	0	3	3	4,12,15, 16	40	60	100
2.	25BMT71	Innovation and Entrepreneurship in Healthcare	ES(PC)	3	0	2	5	4	3,9,10	40	60	100
3.	25BMT72	Hospital Management	ES(PC)	3	0	0	3	3	3,9,12	40	60	100
4.		Programme Elective IV*	ES(PE)	-	-	-	-	3		40	60	100
5.		Programme Elective V*	ES(PE)	-	-	-	-	3		40	60	100
6.		Open Elective – I**	OE	3	0	0	3	3		40	60	100
Practicals												
7.	25BML71	Hospital Training@	SD	0	0	0	0	2	3,4	100	-	100
Total				-	-	-	-	21				
For Honours Degree												
8.		Capstone Design Project-Level III	SD	0	0	12	12	6		40	60	100
OR												
9.		Honours Elective-III	T	3	0	0	3	3		40	60	100
10.		Honours Elective-IV	T	3	0	0	3	3		40	60	100
For Minor Degree												
11.		Minor Elective-III	T	3	0	0	3	3		40	60	100
12.		Minor Elective-IV	T	3	0	0	3	3		40	60	100

* Programme Elective - IV and V shall be chosen from the list of Professional electives (Verticals) offered by same Programme

@ The students undergone Hospital Training during VI semester summer vacation and same will be evaluated in VII semester.



SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE

(Autonomous)

Gobichettipalayam, Erode -638455

Regulation 2025 (UG)

Students Admitted AY 2025-26

Curriculum and Syllabus

B.E. Biomedical Engineering

SEMESTER VIII

S.No	Course Code	Course Title	Category	Periods/ Week			Total Contact Period	Credits	SDG Mapping	Max.Marks		
				L	T	P				CA	ES	TM
Theory												
1.	25BML81	Project Work	SD	0	0	16	16	8	4,8,9,10,17	60	40	100
Total				-	-	-	-	8				

TOTAL CREDITS: 169

Chairman
BoS/BME

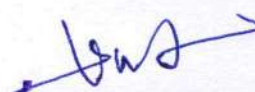
Chairman
BoS/BME

MANDATORY COURSES II

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25MDC31	Introduction to Women and Gender Studies	MC	3	0	0	3	0	100	-	100
2.	25MDC32	Elements of Literature	MC	3	0	0	3	0	100	-	100
3.	25MDC33	Film Appreciation	MC	3	0	0	3	0	100	-	100
4.	25MDC34	Disaster Risk Reduction and Management	MC	3	0	0	3	0	100	-	100

MANDATORY COURSES III

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25MDC41	Well Being with Traditional Practices -Yoga, Ayurveda and Siddha	MC	3	0	0	3	0	100	-	100
2.	25MDC42	History of Science and Technology in India	MC	3	0	0	3	0	100	-	100
3.	25MDC43	Political and Economic Thought for a Humane Society	MC	3	0	0	3	0	100	-	100
4.	25MDC44	State, Nation Building and Politics in India	MC	3	0	0	3	0	100	-	100
5.	25MDC45	Industrial Safety	MC	3	0	0	3	0	100	-	100


Chairman
BoS/BME

PROGRAMME ELECTIVE COURSES: VERTICALS

Vertical I Bio Engineering	Vertical II Medical Device Development	Vertical III Management Healthcare	Vertical IV Assistive technology	Vertical V Digital Health	Verticals VI Health care Communication Technology
Biomaterials	Foundation Skills in Integrated Product Development	Clinical Engineering	Extended reality in Healthcare	Medical Imaging Systems	Medical Informatics
Artificial Organs and Implants	Medical Device Design	Hospital Planning and Management	Rehabilitation Engineering	Telehealth Technology	Ambulatory services
Neural Engineering	Advancements in Healthcare Technology	Medical Waste Management	Physiological Modelling	Biometric systems	Biotelemetry and telemedicine
Principles of Tissue Engineering	Rapid Prototyping	Economics and Management for Engineers	Robotics in Medicine	Deep learning for Biomedical applications	Critical Care and operation theatre Equipment
Genetic Engineering	Specialized Therapeutic Equipment	Forensic Science in Healthcare	Assistive Technology and Devices	Brain Computer Interface and Applications	Healthcare equipment maintenance and trouble shooting
Nuclear medicine	Ophthalmology and Dentistry Equipment	Quality management in Hospital	Sports Engineering and Technology	Bio Inspired Computing	NANO technology in medicine
Bio MEMS	Biomedical optics and photonics	Health policy and equipment	Ergonomics for healthcare	Soft computing and its applications	Home Medicare technology
Genomics	Biostatistics	Patient safety, Standards and Ethics	Artificial Intelligence in Healthcare	Speech and Audio Signal Processing	Pattern recognition



**Chairman
BoS/BME**

Registration of Programme Elective Courses from Verticals:

Programme Elective Courses will be registered in Semesters V, VI and VII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Programme Electives from a particular vertical or from different verticals. Further, only one Programme Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E./B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2025 (Clause 12).


Chairman
BOS/BME

PROGRAMME ELECTIVE COURSES: VERTICALS**VERTICAL 1: BIO ENGINEERING**

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25BME11	Biomaterials	PE	3	0	0	3	3	40	60	100
2.	25BME12	Artificial Organs and Implants	PE	3	0	0	3	3	40	60	100
3.	25BME13	Neural Engineering	PE	3	0	0	3	3	40	60	100
4.	25BME14	Principles of Tissue Engineering	PE	3	0	0	3	3	40	60	100
5.	25BME15	Genetic Engineering	PE	3	0	0	3	3	40	60	100
6.	25BME16	Nuclear medicine	PE	3	0	0	3	3	40	60	100
7.	25BME17	Bio MEMS	PE	3	0	0	3	3	40	60	100
8.	25BME18	Genomics	PE	3	0	0	3	3	40	60	100

VERTICAL 2: MEDICAL DEVICE DEVELOPMENT

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25BME21	Foundation Skills in Integrated Product Development	PE	3	0	0	3	3	40	60	100
2.	25BME22	Medical Device Design	PE	3	0	0	3	3	40	60	100
3.	25BME23	Advancements in Healthcare Technology	PE	3	0	0	3	3	40	60	100
4.	25BME24	Rapid Prototyping	PE	3	0	0	3	3	40	60	100
5.	25BME25	Specialized Therapeutic Equipment	PE	3	0	0	3	3	40	60	100
6.	25BME26	Ophthalmology and Dentistry Equipment	PE	3	0	0	3	3	40	60	100
7.	25BME27	Biomedical optics and photonics	PE	3	0	0	3	3	40	60	100
8.	25BME28	Biostatistics	PE	2	0	2	4	3	40	60	100

VERTICAL 3: MANAGEMENT HEALTHCARE

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25BME31	Clinical Engineering	PE	3	0	0	3	3	40	60	100
2.	25BME32	Hospital Planning and Management	PE	3	0	0	3	3	40	60	100
3.	25BME33	Medical Waste Management	PE	3	0	0	3	3	40	60	100
4.	25BME34	Economics and Management for Engineers	PE	3	0	0	3	3	40	60	100
5.	25BME35	Forensic Science in Healthcare	PE	3	0	0	3	3	50	50	100
6.	25BME36	Quality management in Hospital	PE	3	0	0	3	3	40	60	100
7.	25BME37	Health policy and equipment	PE	3	0	0	3	3	40	60	100
8.	25BME38	Patient safety, Standards and Ethics	PE	3	0	0	3	3	40	60	100

VERTICAL 4: ASSISTIVE TECHNOLOGY

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25BME41	Extended reality in Healthcare	PE	3	0	0	3	3	40	60	100
2.	25BME42	Rehabilitation Engineering	PE	3	0	0	3	3	40	60	100
3.	25BME43	Physiological Modelling	PE	3	0	0	3	3	40	60	100
4.	25BME44	Robotics in Medicine	PE	3	0	0	3	3	40	60	100
5.	25BME45	Assistive Technology and Devices	PE	3	0	0	3	3	40	60	100
6.	25BME46	Sports Engineering and Technology	PE	3	0	0	3	3	40	60	100
7.	25BME47	Ergonomics for healthcare	PE	3	0	0	3	3	40	60	100
8.	25BME48	Artificial Intelligence in Healthcare	PE	3	0	0	3	3	40	60	100

VERTICAL 5: DIGITAL HEALTH

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25BME51	Medical Imaging Systems	PE	3	0	0	3	3	40	60	100
2.	25BME52	Telehealth Technology	PE	3	0	0	3	3	50	50	100
3.	25BME53	Biometric systems	PE	3	0	0	3	3	40	60	100
4.	25BME54	Deep learning for Biomedical applications	PE	3	0	0	3	3	40	60	100
5.	25BME55	Brain Computer Interface and Applications	PE	3	0	0	3	3	40	60	100
6.	25BME56	Bio Inspired Computing	PE	3	0	0	3	3	40	60	100
7.	25BME57	Soft computing and its applications	PE	3	0	0	3	3	40	60	100
8.	25BME58	Speech and Audio Signal Processing	PE	3	0	0	3	3	40	60	100

VERTICAL 6: HEALTH CARE COMMUNICATION TECHNOLOGY

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
1.	25BME61	Medical Informatics	PE	3	0	0	3	3	40	60	100
2.	25BME62	Ambulatory services	PE	3	0	0	3	3	40	60	100
3.	25BME63	Biotelemetry and telemedicine	PE	3	0	0	3	3	40	60	100
4.	25BME64	Critical Care and operation theatre Equipment	PE	3	0	0	3	3	40	60	100
5.	25BME65	Healthcare equipment maintenance and trouble shooting	PE	3	0	0	3	3	50	50	100
6.	25BME66	NANO technology in medicine	PE	3	0	0	3	3	40	60	100
7.	25BME67	Home Medicare technology	PE	3	0	0	3	3	40	60	100
8.	25BME68	Pattern recognition	PE	3	0	0	3	3	40	60	100

[Signature]
Chairman
BOS/BME

OPEN ELECTIVES

S. NO.	COURSE CODE	COURSE TITLE	Category	PERIODS PER WEEK			Total Contact Period	Credits	Max. Marks		
				L	T	P			CA	ES	TM
OFFERED BY DEPARTMENT OF CIVIL ENGINEERING											
1	25CE011	Civil and Infrastructure Engineering	OE	3	0	0	3	3	40	60	100
2	25CE012	Environmental Pollution and waste management	OE	3	0	0	3	3	40	60	100
3	25CE013	Environmental Impact Assessment	OE	3	0	0	3	3	40	60	100
4	25CE014	Building Services	OE	3	0	0	3	3	40	60	100
5	25CE015	Water, Sanitation and Health	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING											
1	25CS011	Foundation of AR/VR	OE	3	0	0	3	3	40	60	100
2	25CS012	Web Designing	OE	3	0	0	3	3	40	60	100
3	25CS013	Block Chain fundamentals	OE	3	0	0	3	3	40	60	100
4	25CS014	Knowledge Management	OE	3	0	0	3	3	40	60	100
5	25CS015	Cloud Computing Essentials	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING											
1	25EC011	Basics of Electronics in Automation	OE	3	0	0	3	3	40	60	100
2	25EC012	Wireless Optical Communication	OE	3	0	0	3	3	40	60	100
3	25EC013	Soft Computing techniques	OE	3	0	0	3	3	40	60	100
4	25EC014	Consumer electronics	OE	3	0	0	3	3	40	60	100
5	25EC015	Principles of communication Engineering	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING											
1.	25EE011	Renewable Energy Sources	OE	3	0	0	3	3	40	60	100
2.	25EE012	Electrical Vehicle	OE	3	0	0	3	3	40	60	100
3.	25EE013	Energy Auditing and Conservation	OE	3	0	0	3	3	40	60	100
4.	25EE014	Domestic and Industrial Electrical Installations	OE	3	0	0	3	3	40	60	100
5.	25EE015	Embedded System Design and Control	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING

1	25ME011	Industrial Instrumentation	OE	3	0	0	3	3	40	60	100
2	25ME012	Energy Technology	OE	3	0	0	3	3	40	60	100
3	25ME013	Reverse Engineering	OE	3	0	0	3	3	40	60	100
4	25ME014	Fire Safety Engineering	OE	3	0	0	3	3	40	60	100
5	25ME015	Entrepreneurship Development	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

1	25ADO11	Introduction to Big Data	OE	3	0	0	3	3	40	60	100
2	25ADO12	Principles of Data Science	OE	3	0	0	3	3	40	60	100
3	25ADO13	Data Visualization and its Applications	OE	3	0	0	3	3	40	60	100
4	25ADO14	Data Warehousing and Mining	OE	3	0	0	3	3	40	60	100
5	25ADO15	Principles of Cyber Security	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT INFORMATION TECHNOLOGY

1	25ITO11	Basics of Java Programming	OE	3	0	0	3	3	40	60	100
2	25ITO12	Ethical Hacking	OE	3	0	0	3	3	40	60	100
3	25ITO13	E-Commerce and Applications	OE	3	0	0	3	3	40	60	100
4	25ITO14	Basics of Android Application Development	OE	3	0	0	3	3	40	60	100
5	25ITO15	Introduction to Web Design	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT OF PHARMACEUTICAL TECHNOLOGY

1	25PTO11	Nutraceuticals	OE	3	0	0	3	3	40	60	100
2	25PTO12	IPR for Pharma Industry	OE	3	0	0	3	3	40	60	100
3	25PTO13	Pharmaceutical Nanotechnology	OE	3	0	0	3	3	40	60	100
4	25PTO14	Basics of Human Anatomy and physiology	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT BIOMEDICAL ENGINEERING

1	25BM011	Biosensors and Instrumentation	OE	3	0	0	3	3	40	60	100
2	25BM012	Medical Robotics	OE	3	0	0	3	3	40	60	100
3	25BM013	Biometric Technology	OE	3	0	0	3	3	40	60	100
4	25BM014	Healthcare Management systems	OE	3	0	0	3	3	40	60	100
5	25BM015	IoT in Healthcare	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT OF COMPUTERSCIENCE AND ENGINEERING (CYBER SECURITY)

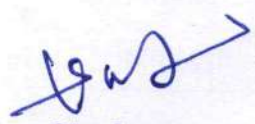
1	25CRO11	Mobile Device Security	OE	3	0	0	3	3	40	60	100
2	25CRO12	Malware Analysis	OE	3	0	0	3	3	40	60	100
3	25CRO13	Hardware Security	OE	3	0	0	3	3	40	60	100
4	25CRO14	Web and Mobile Application Security	OE	3	0	0	3	3	40	60	100
5	25CRO15	Information Security	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT OF COMPUTERSCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE ENGINEERING)

1	25AM011	AI for Everyone	OE	3	0	0	3	3	40	60	100
2	25AM012	Machine Learning and its Applications	OE	3	0	0	3	3	40	60	100
3	25AM013	Quantum AI	OE	3	0	0	3	3	40	60	100
4	25AM014	Reinforcement Learning	OE	3	0	0	3	3	40	60	100
5	25AM015	Network Automation using AIML	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT OF BIOTECHNOLOGY

1	25BT011	Biotechnology for Engineers	OE	3	0	0	3	3	40	60	100
2	25BT012	Enzyme Technology	OE	3	0	0	3	3	40	60	100
3	25BT013	Introduction to Plant Biotechnology	OE	3	0	0	3	3	40	60	100
4	25BT014	Biofuels	OE	3	0	0	3	3	40	60	100
5	25BT015	Forensic Technology	OE	3	0	0	3	3	40	60	100


Chairman
BoS/BME

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

25ENI11

COMMUNICATIVE ENGLISH-I
(Common to B.E./B.Tech. All Branches)

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To build a strong foundation in basic grammar and communication skills through structured activities in listening, speaking, reading and writing.
- To develop the ability to express, describe and summarize ideas clearly using appropriate language structures and professional formats.
- To enhance technical communication by practicing structured descriptions, storytelling and data-based writing tasks.
- To enable clear and logical expression through organized speech, note-making and grammar-focused writing.
- To refine expressive and comparative communication skills using advanced vocabulary, professional formats and contextual grammar.

UNIT-I

BUILDING BLOCKS OF COMMUNICATION

6+6

- Grammar** : Parts of Speech -Verbs - Word formation - Articles
- Listening** : Listening to Short Conversations & Descriptions
- Speaking** : Introducing oneself - Narrating Personal Experience
- Reading** : Reading Comprehension -Skimming - Scanning - Speed reading
- Writing** : Formal Letter Writing (Seeking Permission for Industrial Visit & In plant Training) - Instruction Writing

UNIT-II

PROFESSIONAL AND SOCIAL COMMUNICATION

6+6

- Grammar** : Conjunction- Preposition- Cause And Effect Expression- Purpose and Means
- Listening** : Listening for Specific Information (Gap Filling); Listening the Announcement for Data
- Speaking** : Introducing the Peers- Describing about Person, Place, Things, Food, Culture, etc.
- Reading** : Reading Newspaper Articles & Technical Blogs
- Writing** : Professional Email Writing – Checklist



Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

UNIT-III

COMPREHENSION AND PRESENTATION SKILLS

6+6

- Grammar** : Types of Sentence - Negatives -Types of Question (Y/N & WH) - Degrees of Comparison.
- Listening** : Listening to TED Talks and Short Technical Reels
- Speaking** : Story Telling & Role Play
- Reading** : Reading comprehension- Reading Print Interview and Answering to the Questions
- Writing** : Paragraph Writing- Data Interpretation & Transcoding (Bar, Pie & Flow Chart)

UNIT-IV

ENGLISH FOR WORKPLACE READINESS

6+6

- Grammar** : Tense (Simple, Continuous, Perfect & Perfect Continuous)
Listening : Listening to Inspirational Speech & Professional Interviews
Speaking : Extempore Speech- Asking for Information (Direction & General Enquiries)
Reading : Reading Engineering/ Technical Essays - Reading Brochures
Writing : Note Making & Note Taking - Recommendation Writing

UNIT-V

ENGLISH FOR FORMAL AND FUNCTIONAL COMMUNICATION

6+6

- Grammar** : Modal Auxiliaries - Homophones & Homonyms - Numerical Adjectives - Phrasal Verbs
- Listening** : Listening to Telephonic Conversation- Listening to Product Description
- Speaking** : Master of Ceremony(MoC): Welcome Address & Vote of Thanks
- Reading** : Reading Graphical Materials for Comparison - Reading Advertisement
- Writing** : Report Writing (Accident/ Survey) - Compare and Contrast Essay Writing

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course,

CO1: Learners will be able to apply basic grammar rules and effectively use LSRW skills for formal and informal communication.

CO2: Learners will be able to construct coherent descriptions and summaries using appropriate connectors, prepositions, and professional vocabulary.

CO3: Learners will be able to describe processes and products clearly in spoken and written formats using suitable sentence structures and data interpretation skills.

SVHEC –R 2025


Chairman
BoS / S&H

letters.

CO 3: Use conditional sentences, participate confidently in debates and discussions, follow interview protocols, analyze editorials and compose professional emails.

CO 4: Use reported speech, describe processes, listen and respond to reviews, read with fluency and draft formal invitation letters.

CO 5: Apply grammar structures, face interviews confidently, match texts with headings, and draft job applications with resumes.

TEXT BOOKS:

1. Department of English, Anna University, "English for Engineers & Technologists" Orient Blackswan Private Ltd, 2020.
2. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, & CO, Department of English, Anna University, "English for Science & Technology" Cambridge University Press, 2021.

REFERENCE BOOKS:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communication–Principles and Practices", Oxford Univ. Press, New Delhi, 2016.
2. Lakshminarayanan, "A Course Book on Technical English", Scitech Publications (India) Pvt.Ltd. 2012.
3. Aysha Viswamohan, "English For Technical Communication (With CD)", McGraw Hill Education, ISBN : 0070264244, 2008.
4. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House, 2016.

E. RESOURCES:

- <https://learnenglish.britishcouncil.org/>

CO's-PO's MAPPING :

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	-	-	-	-	-	3	3	-	3
CO3	-	-	-	-	-	-	-	3	3	-	2
CO4	-	-	-	-	-	-	-	3	3	-	2
CO5	-	-	-	-	-	-	-	3	3	-	2
AVR	-	-	-	-	-	-	-	3.00	3.00	-	2.40

1- Low, 2- Medium, 3-High, "-" No Correlation

25MAT11

MATRICES AND CALCULUS
(Common to B.E./B.Tech. all Branches)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the concepts of eigen values, eigenvectors and quadratic forms.
- To develop the skill on the geometric properties of curves using differential calculus.
- To equip students to analyze and optimize the functions of several variables.
- To make the students understand various techniques of integration
- To apply vector calculus and its principles to evaluate vector fields.

UNIT-I

MATRICES

9

Eigen values and Eigen vectors of a real matrix – Characteristic equation–Properties of Eigen values and Eigen vectors – Cayley - Hamilton theorem – Reduction of a quadratic form to canonical form by orthogonal transformation–Nature of quadratic forms.

UNIT-II

DIFFERENTIAL CALCULUS

9

Curvature – Radius of curvature (Cartesian Co – ordinates only) – Centre of curvature and Circle of curvature – Involute and Evolute (Parabola, Ellipse)

UNIT-III

FUNCTIONS OF SEVERAL VARIABLES

9

Euler's theorem for homogenous functions - Jacobians – Taylor's series expansion – Maxima and Minima for functions of two variables – Methods of Lagrangian multipliers.

UNIT-IV

INTEGRAL CALCULUS

9

Definite and Indefinite integrals - Substitution rule - Techniques of Integration : Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Improper integrals.

UNIT-V

VECTOR CALCULUS

9

Irrotational and solenoidal vector fields – Green's theorem in plane , Gauss divergence theorem and Stoke's theorem (Cube, Cuboid and Rectangular parallelepiped only).

TOTAL: 45 PERIODS

SVHEC-R2025


Chairman
BoS/S&H

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

COURSE OUTCOMES:

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

- CO1: Assimilate the eigen values and eigen vectors in reduction of quadratic form into canonical form.
- CO2: Analyze the center of curvature, circle of curvature and develop the evolutes.
- CO3: Expand the Taylor series and calculate the extreme value for function of several variables.
- CO4: Apply different methods of integration in solving practical problems
- CO5: Apply the divergence and curl in vector integral theorems of vector fields.

TEXTBOOKS :

1. James Stewart, "Calculus : Early Transcendental", Cengage Learning, 9th Edition, New Delhi, 2023. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8]
2. Grewal. B. S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2020.

REFERENCE BOOKS :

1. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2022
2. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2021
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2019
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2019

CO's - PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	-	-	-	2	-	2	3
CO2	3	3	2	2	-	-	-	3	-	2	3
CO3	3	3	2	2	-	-	-	3	-	2	3
CO4	3	3	2	1	-	-	-	2	-	2	3
CO5	3	2	2	1	-	-	-	2	-	2	3
AVG	3.00	2.80	2.00	1.40	-	-	-	2.40	-	2.00	3.00

1- Low, 2- Medium , 3-High, "-" No Correlation

25PHI11

ENGINEERING PHYSICS
(B.E./B. Tech. - Common to all branches)

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To make the students effectively achieve an understanding of mechanics
- Provide knowledge of elastic property, thermal property of materials and its applications
- Impart knowledge of laser and their applications
- Introduce the essential principles of fiber optics and its applications
- Equipping the students to successfully understand the importance of quantum physics

UNIT-I

MECHANICS

10

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – Motion of the CM – Moment of inertia – Theorems of M.I. – M.I of a diatomic molecule – Torque – Rotational energy state of a rigid diatomic molecule – Torsional pendulum – double pendulum.

UNIT-II

PROPERTIES OF MATTER

10

Elasticity- Hooke's law – stress – strain diagram – Poisson's ratio – Factors affecting elasticity – bending of beams - Bending moment equation – Depression of a cantilever – Young's modulus by uniform bending – I-shaped girders.

UNIT-III

LASER

9

Lasers: Stimulated absorption – Spontaneous emission – Stimulated emission – Population inversion-Einstein's coefficients derivation and their relations – Pumping methods – Types of lasers – CO₂ laser, Semiconductor lasers (Homojunction & Heterojunction) – Holography - Industrial and Medical Applications of lasers.

UNIT-IV

FIBER OPTICS

8

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types of optical fibres (Material, Refractive Index, Mode) – Attenuation, Dispersion, Bending – Fiber optics communication system (qualitative) – Temperature and Displacement sensors – Fiber optic endoscope.

UNIT-V

QUANTUM PHYSICS

8

Photons and light waves – Electrons and matter waves – The Schrodinger equation (Time dependent and time independent forms) – Particle in a one-dimensional rigid box for Eigen value and Eigen function – tunneling (qualitative) – Electron microscope - Scanning Tunneling microscope.

TOTAL: 45 PERIODS

LIST OF EXERCISE/EXPERIMENTS

1. Determination of rigidity modulus of wire and moment of inertia of regular objects – Torsion pendulum.
2. Determination of Young's modulus by Uniform bending method.
3. Determination of Simple harmonic oscillations of cantilever.
4. Determination of the wavelength of the laser using grating
5. Determination of width of the groove of CD using laser.
6. Determination of numerical aperture and acceptance angle in an optical fiber.
7. Determination particle size of Lycopodium powder using semiconductor laser.
8. Determination of thickness of a material by Air-wedge method.

TOTAL: 30 PERIODS

TOTAL: 45 + 30 = 75 PERIODS

COURSE OUTCOME

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

- C01:** Demonstrate the foundational knowledge in Mechanics
- C02:** Interpret the elastic properties of solid materials and their applications
- C03:** Apply the comprehended knowledge about laser and its applications
- C04:** Apply the comprehended knowledge about fibre optic communication system in various engineering applications.
- C05:** Understand the fundamental principles of quantum mechanics.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow, "An Introduction to Mechanics," McGraw Hill Education (Indian Edition), 2021.
2. Arthur Beiser, Shobhit Mahajan, S.Rai Choudhury, "Concepts of Modern Physics," McGraw-Hill (Indian Edition), 2024.

REFERENCE BOOKS:

1. K.Thyagarajan and A.Ghatak, "Lasers: Fundamentals and Applications," Laxmi Publications, (Indian Edition), 2023
2. D.Halliday, R.Resnick and J.Walker, "Principles of Physics," Wiley (Indian Edition), 2021

3. N.Garcia, A.Damask and S.Schwarz, "Physics for Computer Science Students," Springer-Verlag, 2012

PRACTICAL REFERENCES:

1. A.K. Katiyar (Author), C.K. Pandey, Engineering Physics: Theory and Practical Paperback, 2015.

Learning Resources:

1. <https://archive.nptel.ac.in/courses/113/106/113106039/>
2. <https://vlab.amrita.edu/?sub=1>

CO's- PO's MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	3	2	1	1	-	-	-	-	-	-
C02	3	3	2	1	1	-	-	-	-	-	-
C03	3	2	2	1	2	-	-	-	-	-	-
C04	3	2	2	1	2	-	-	-	-	-	-
C05	3	3	1	1	2	-	-	-	-	-	-
AVG	3	3	2	1	2	-	-	-	-	-	-

1- Low, 2- Medium , 3-High, "-" No Correlation

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

25CYI11

ENGINEERING CHEMISTRY
(B.E./B.Tech-Common to all branches)

L T P C
3 0 2 4

COURSE OBJECTIVES:

- To provide foundational knowledge on water quality and water treatment processes.
- To introduce the principles of nanochemistry, methods of synthesizing nanomaterials, and their applications.
- To familiarize students with polymer chemistry, polymerization techniques, and the manufacturing methods of plastics.
- To impart knowledge on fuels and combustion, including manufacturing of fuels, fuel analysis, and alternative energy sources.
- To develop an understanding of electrochemistry and its applications in energy storage devices and electric vehicles.

UNIT-I

WATER AND ITS TREATMENT

9

Water quality parameters – Estimation of hardness by EDTA method - Boiler troubles - Internal treatment and External treatment of boiler feed water – Ion exchange method and zeolite process – Desalination method: Reverse Osmosis.

UNIT-II

NANOCHEMISTRY

9

Basics of Nanochemistry - Size-dependent properties - Types of nanomaterials: nanoparticle, nanowire, nanorod and nanotube - Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, electrochemical deposition - Applications of nanomaterials.

UNIT-III

POLYMER CHEMISTRY

9

Basics of polymer chemistry - Mechanism of polymerization: Addition (Free Radical); condensation and copolymerization - Thermoplastics & thermosetting plastics - Preparation, properties and uses of Nylon 6, 6 and Epoxy resin - Fabrication of plastics - (Compression, Injection & Extrusion moulding).

UNIT-IV

FUELS AND COMBUSTION

9

Classification of fuels - Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method) - Manufacture of synthetic petrol (Bergius process) - Knocking - octane number, cetane number - Power alcohol and biodiesel - Flue gas analysis - ORSAT Method.

UNIT-V

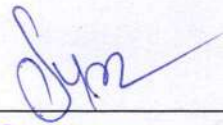
ELECTROCHEMISTRY AND STORAGE DEVICES

9

Types of cells – types of electrodes: calomel electrode, glass electrode – Nernst equation – EMF series - Batteries: Primary battery - Dry cell, Secondary battery - lead acid battery and lithium-ion-battery; H₂-O₂ fuel cell; Supercapacitors - Electric vehicles.

TOTAL: 45 HOURS

SVHEC R-2025


Chairman
BoS / S&H

LIST OF EXPERIEMENTS

1. Determination of types and amount of alkalinity in a water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Conductometric titration of barium chloride against sodium sulphate (precipitation titration).
7. Estimation of iron content of the given solution using potentiometer.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.

TOTAL: 30 HOURS

GRAND TOTAL: 45 + 30 = 75 HOURS

COURSE OUTCOMES:

At the end of the course the students will be able

- C01:** Assess the quality of water from water quality parameter and propose suitable treatment methodologies to treat water.
- C02:** Summarize the basic concepts of nanochemistry in designing the synthesis of nanomaterials for engineering and technology applications.
- C03:** Understand the basic knowledge of polymers to apply the futuristic material needs.
- C04:** Familiar with the concepts of fuels for engineering processes and applications.
- C05:** Apply the concept of electrochemistry in the fabrication of energy storage devices.

TEXT BOOKS:

1. Dr. A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Limited, 23rd Edition, 2023.
2. S. S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCE BOOKS:

1. Shashi Chawla, "A Text Book of Engineering Chemistry", Dhanpat Rai & Co (Pvt.) Ltd, New Delhi, 2011.

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

2. O.G. Palanna, "Engineering Chemistry", McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.

ONLINE SOURCES:

Unit1:

https://www.youtube.com/watch?v=4SRMmqH2s4&list=PLLy_2iUCG87AZvtaiuD3r4HATrBKhb90P (IIT ROORKEE NPTEL) & <https://www.youtube.com/watch?v=o6iurO2Cwd0> (NPTEL-NOC IITM)

Unit 2:

<https://www.youtube.com/watch?v=0EWCqCIsFOA&list=PLyqSpQzTE6M8682dGkNTN8936vSY4CbqZ> (NPTEL-NOC IITM)

Unit 3:

<https://www.youtube.com/watch?v=jSNlmOwpYg&list=PLbMVogVj5nJT0slH3tuas5Blp1DG8ZpMj> (NPTELHRD)

Unit 4:

<https://www.youtube.com/watch?v=1-EliKQ0erA> (AKTU DIGITAL EDUCATION)

Unit 5:

<https://www.youtube.com/watch?v=nh2xbyOaERw> &

<https://www.youtube.com/watch?v=iFVVv23ZzGE> (IIT ROORKEE NPTEL)

CO's- PO's MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	3	3	3	1	3	-	-	-	-	-
C02	3	2	2	1	3	3	-	-	-	-	2
C03	3	2	2	2	2	2	-	-	-	-	-
C04	3	2	3	2	2	2	-	-	-	-	-
C05	3	2	2	2	2	2	-	-	-	-	-
AVG	3	2	2	2	2	2	-	-	-	-	2

1- Low, 2- Medium , 3-High, "-" No Correlation

25CSI11	PROBLEM SOLVING USING C PROGRAMMING	L	T	P	C
SDG No: 4, 8, 9, 10,17	(Common to: B.E. / B.Tech. all Branches)	3	0	2	4

COURSE OBJECTIVES:

- To learn how to think algorithmically to solve a problem.
- To gain knowledge of fundamental programming concepts in C programming.
- To explore the basic concept of arrays and pointers.
- To learn concept of functions and structures.
- To gain proficiency in file handling techniques.

UNIT-I**COMPUTATIONAL THINKING****9**

Overview of Computational Thinking and Key Techniques – Overview of Software Development Life Cycle – Introduction to Algorithmic Thinking – Elements: Sequence, Selection and Repetition – Representation of Flow Chart – Overview of Flow algorithm Tool – Pseudo- code– Introduction to programming languages

UNIT-II**BASICS OF C PROGRAMMING****9**

Introduction to C - Structure of C Programming - Compiling - Executing and Debugging - Character Set - Tokens - Identifiers - Data Types - Variable - Constants - Evaluating Expression - Type Conversion - Input and Output - Decision control and looping statements

UNIT-III**ARRAYS AND POINTERS****9**

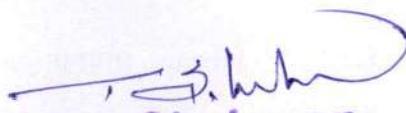
Introduction to Arrays - Declaration and Initialization of Single Dimensional Arrays - Array Operations - Declaration and Initialization of Two-Dimensional Arrays - Multidimensional Arrays - Declaring and Initializing Strings - Reading and Writing Strings - String Operations - Array of Strings. Introduction to Pointers - Pointer operators - Pointer arithmetic - Arrays and pointers - Array of pointers.

UNIT-IV**FUNCTIONS AND STRUCTURES****9**

Function - Types of Function – Elements - Pass by value - Pass by reference – Recursion - Storage Classes. Introduction to structures - Declaring and Defining Structure Variables - Accessing Structure Members - Structure Initialization - Nested structures - Array of structure – typedef - Union

UNIT-V**FILE PROCESSING****9**

Files: Introduction – Using files in C – Read data from files – Writing data to files – Error handling during File operation – Command line arguments.



Chairman
BoS/CSE&IT

TOTAL : 45 PERIODS

PRACTICAL EXERCISES:

1. Implementation of algorithm, flowchart and pseudo code to solve electricity billing.
2. Implementation of algorithm, flowchart and pseudo code to solve retail shop billing.
3. Implementation of if, if-else, nested if and switch statements.
4. Implementation of while, do-while and for loops.
5. Implementation of sorting and searching algorithms.
6. Implementation of one-dimensional array, passing array to functions and array operations.
7. Implementation of programs for implementing various string operations like "copy", "finding length", "compare", "concatenate" with and without built-in library functions.
8. Implementation of pointer operators, call by reference, pointers with array.
9. Implementation of function calls, recursion, call by value.
10. Implementation of structure and nested structure.
11. Implementation of array of structures.
12. Implementation of file operations.
13. Implementation of file to read N character using file functions.

TOTAL: 30 PERIODS

TOTAL: 75 (45+30) PERIODS

COURSE OUTCOMES:

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

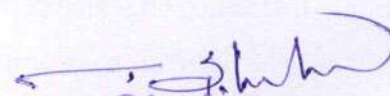
- CO 1 :** Construct algorithmic solutions for a given computational problem.
- CO 2 :** Demonstrate the understanding of fundamental concepts of C programming.
- CO 3 :** Utilize appropriate concepts of arrays and pointers to solve the programming problems effectively.
- CO 4 :** Apply concepts of functions and structures in C programming
- CO 5 :** Implement file I/O operations to store and retrieve data from files.

TEXT BOOKS:

1. GVenkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2023.
3. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2023.

REFERENCE BOOKS:

1. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2023
2. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C",
SVHEC - R2025


Chairman
BoS/CSE&IT

McGraw-Hill Education, 2024.

3. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2022.

4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2024.

E-RESOURCES:

1. Tutorial point - <https://www.tutorialspoint.com/c-programming/index.htm>
2. Greek for geeks - <https://www.geeksforgeeks.org/c-programming-language/>

CO's – PO's & PSO's MAPPING

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	1	2	-	3	3	1	2	2
CO2	2	3	2	1	2	1	1	2	-	3	2	2	2	2
CO3	3	2	2	1	3	1	1	2	-	3	3	2	2	2
CO4	2	3	3	1	2	2	1	2	-	3	2	2	3	2
CO5	2	2	3	2	1	-	-	2	1	2	2	2	2	2
AVG	2.2	2.4	2.4	1.2	2	1.3	1	2	1	2.8	2.4	1.8	2.2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation


Chairman
BoS/CSE&IT

25STAT11

தமிழர் மரபு

L T P C
1 0 0 1

(B.E./B.Tech- அனைத்து பாடப்பிரிவுகளுக்கும் பொதுவானது)

பாடநெறி நோக்கங்கள்:

- தமிழின் இலக்கியங்கள் மற்றும் நவீன இலக்கியங்களைப் புரிந்துகொள்ளுதல்
- தமிழ் கலாச்சார பாரம்பரியத்தைக் கற்றுக்கொள்ளுதல்
- தமிழர்களின் பல்வேறு கலைவடிவங்களைக் கண்டறிதல்
- தமிழர்களின் திணைக்கோட்பாடுகளை விளக்குதல்
- இந்திய சுதந்திர போராட்ட இயக்கங்களுக்கும் இந்திய கலாச்சாரத்திற்குமான தமிழர்களின் பங்களிப்பை உணர்தல்

அலகு - I

மொழி மற்றும் இலக்கியம்

3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் ஆறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமணப் பௌத்த மதங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு - II

மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை

3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு - III

நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகள்

3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு - IV

தமிழர்களின் திணைக் கோட்பாடுகள்

3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவு, கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு - V

இந்திய தேசிய இயக்கம் மற்றும்

3

இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிற்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

பாடநெறி முடிவுகள்:

இப்பாடத்தைப் படிப்பதின் முடிவில் மாணவர்கள்

- C01: தமிழின் பல்வேறு இலக்கியங்களைப் பற்றிய அறிவைப் பெறுவார்கள்
- C02: தமிழ் கலாச்சார பாரம்பரியத்தின் தனித்தன்மையைக் கற்றுக்கொள்வார்கள்
- C03: தமிழகத்தின் பல்வேறு கலைவடிவங்களைக் கண்டறிவார்கள்
- C04: தமிழர்களின் திணைக்கோட்பாடுகளை அறிந்துகொள்வார்கள்
- C05: தமிழ் சுதந்திரப்போராட்ட வீரர்கள் மற்றும் தமிழ் கலாச்சாரத்தை இந்தியாவின் மற்ற பகுதியுடன் ஒப்பிடும் திறனைப் பெறுவார்கள்

மின் -ஆதாரங்கள்:

1. <https://www.tamilvu.org/>

CO's -PO's விவரணையாக்கம்::

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	-	-	-	-	-	1	1	-	1	-	-
C02	-	-	-	-	-	1	1	-	1	-	-
C03	-	-	-	-	-	1	1	-	1	-	-
C04	-	-	-	-	-	1	1	-	1	-	-
C05	-	-	-	-	-	1	1	-	1	-	-
AVG	-	-	-	-	-	1	1	-	1	-	-

Shree Venkateshwara Hi-Tech Engineering College

25TAT11

HERITAGE OF TAMILS
(B.E./B.Tech-Common to all branches)

L T P C
1 0 0 1

COURSE OBJECTIVES:

- To understand the Sangam and modern literature of Tamil
- To learn the heritage of Tamil culture
- To recognize the various art forms of Tamils
- To explain the Thinaï concept of Tamils
- To realize the contribution of Tamils to Indian national movement and Indian culture

UNIT-I

LANGUAGE AND LITERATURE

3

Language Families in India - Dravidian Languages - Tamil as a Classical Language - Classical Literature in Tamil - Secular Nature of Sangam Literature - Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land- Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT-II

HERITAGE - ROCK ART PAINTINGS

3

TO MODERN ART - SCULPTURE

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT-III

FOLK AND MARTIAL ARTS

3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT-IV

THINAI CONCEPTS OF TAMILS

3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT-V

**CONTRIBUTION OF TAMILS TO INDIAN
NATIONAL MOVEMENT AND INDIAN CULTURE**

3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India - Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine - Inscriptions & Manuscripts - Print History of Tamil Books.

Shree Venkateshwara Hi-Tech Engineering College

COURSE OUTCOMES:

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

- C01:** Gain knowledge about various literatures of Tamil
- C02:** Learn the uniqueness of Tamil cultural heritage
- C03:** Find various art forms of Tamil Nadu
- C04:** Understand the Thinaï concepts in Tamil
- C05:** Distinguish the contribution of Tamils to Indian national movement and Indian culture

E- RESOURCES:

1. <https://www.tamilvu.org/>

CO's -PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	-	-	-	-	-	1	1	-	1	-	-
C02	-	-	-	-	-	1	1	-	1	-	-
C03	-	-	-	-	-	1	1	-	1	-	-
C04	-	-	-	-	-	1	1	-	1	-	-
C05	-	-	-	-	-	1	1	-	1	-	-
AVG	-	-	-	-	-	1	1	-	1	-	-

25EN121

COMMUNICATIVE ENGLISH – II
(Common to B.E./B.Tech. All Branches)

L T P C
2 0 2 3

COURSE OBJECTIVES:

- To develop the learners' fundamental communication skills by introducing basic grammar, everyday conversations, and descriptive writing.
- To enable learners to understand and apply advanced grammar structures, enhance their listening skills for process comprehension, improve presentation abilities, read technical documents, and write formal complaint and editorial letters.
- To equip learners with essential communication skills for interviews, group discussions, debates, and professional correspondence.
- To develop learners' skills in reported speech, descriptive speaking, review listening, fluent reading, and formal correspondence.
- To prepare learners for job interviews, professional speaking, resume writing, and job-related communication.

UNIT-I INTRODUCTION TO EFFECTIVE COMMUNICATION 6+3

- Grammar** : Prefix/ Suffix- Active and Passive Voice- Model Passive
- Listening** : Listening to Short literary Texts - Listening to a Presentation and Completing Gap Filling Exercise
- Speaking** : Talking about Daily Routine, Hobbies, Favorites, Family, etc.
- Reading** : Describing a Product through Comparing & Contrasting it with other Products
- Writing** : Writing a short biography on Achievers based on given hints.

UNIT-II PROCESS COMMUNICATION AND TECHNICAL WRITING 6+3

- Grammar** : Subject - Verb Agreement -Infinitives - Gerunds
- Listening** : Listening to Process Description and Drawing a Flow Chart
- Speaking** : General and Technical Presentation.
- Reading** : Reading Technical Manuals.
- Writing** : Writing Complaint Letter to Companies - Letter to the Editor.

SVHEC –R 2025


Chairman
BoS / S&H

UNIT-III	ADVANCED COMMUNICATION FOR PROFESSIONAL SUCCESS	6+3
-----------------	--	------------

- Grammar** : If Clause -One Word Substitution
- Listening** : Listening to Interview Techniques and Etiquettes
- Speaking** : Participating in Group Discussion - Developing Persuasive Skills and Argument Construction (Debate)
- Reading** : Reading of Articles (Editorials)
- Writing** : Compose Emails for Internship Request, Placement Enquires and Industrial Visits

UNIT-IV	DESCRIPTIVE AND INTERACTIVE COMMUNICATION	6+3
----------------	--	------------

- Grammar** : Reported Speech - Compound Words
- Listening** : Listening to Book and Movie Review
- Speaking** : Describing Working Mechanism
- Reading** : Reading for Improving Fluency and Intonation.
- Writing** : Writing letter of Invitation, Acceptance and Declination

UNIT-V	CAREER-ORIENTED COMMUNICATION SKILLS	6+3
---------------	---	------------

- Grammar** : Content vs. Function Words – Fixed & Semi Fixed Expression - Relative Phrase
- Listening** : Listening to job Interviews and Answering to the Exercise
- Speaking** : Offline and Online Interviews.
- Reading** : Matching the Heading to the Paragraph.
- Writing** : Job Application & Internship Application with Resume.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the Course the students will able to

- CO 1:** Apply basic grammar, communicate daily situations, comprehend listening tasks, compare products and write short biographies.
- CO 2:** Correct grammar, present processes effectively, interpret technical texts and draft form:

SVHEC –R 2025


Chairman
BoS / S&H

letters.

CO 3: Use conditional sentences, participate confidently in debates and discussions, follow interview protocols, analyze editorials and compose professional emails.

CO 4: Use reported speech, describe processes, listen and respond to reviews, read with fluency and draft formal invitation letters.

CO 5: Apply grammar structures, face interviews confidently, match texts with headings, and draft job applications with resumes.

TEXT BOOKS:

1. Department of English, Anna University, "English for Engineers & Technologists" Orient Blackswan Private Ltd, 2020.
2. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, & CO, Department of English, Anna University, "English for Science & Technology" Cambridge University Press, 2021.

REFERENCE BOOKS:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communication–Principles and Practices", Oxford Univ. Press, New Delhi, 2016.
2. Lakshminarayanan, "A Course Book on Technical English", Scitech Publications (India) Pvt.Ltd. 2012.
3. Aysha Viswamohan, "English For Technical Communication (With CD)", McGraw Hill Education, ISBN : 0070264244, 2008.
4. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House, 2016.

E. RESOURCES:

- <https://learnenglish.britishcouncil.org/>

CO's-PO's MAPPING :

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	-	-	-	-	-	3	3	-	3
CO3	-	-	-	-	-	-	-	3	3	-	2
CO4	-	-	-	-	-	-	-	3	3	-	2
CO5	-	-	-	-	-	-	-	3	3	-	2
AVR	-	-	-	-	-	-	-	3.00	3.00	-	2.40

1- Low, 2- Medium, 3-High, "-" No Correlation

25MAT21 NUMERICAL METHODS AND DIFFERENTIAL EQUATIONS L T P C
(Common to B.E./B.Tech. all Branches) 3 0 0 3

COURSE OBJECTIVES:

- To introduce the basic concepts of solving algebraic and transcendental equations
- To introduce the numerical techniques of interpolation in various intervals and differentiation and integration in engineering and technology
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations
- To familiarize students how to solve the higher-order linear differential equations.
- To enable students to understand the definition and properties of the Laplace transform apply it to solve differential and integral equations and analyze the behavior of systems in the frequency domain .

UNIT-I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting-Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method.

UNIT-II INTERPOLATION, NUMERICAL DIFFERENTIATION AND 9
NUMERICAL INTEGRATION

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Numerical single integrations using Trapezoidal and Simpson's 1/3 rules

UNIT-III NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL 9
EQUATIONS

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's predictor corrector methods for solving first order differential equations.

UNIT-IV ORDINARY DIFFERENTIAL EQUATIONS 9

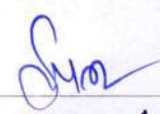
Linear higher order differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear differential equations

UNIT-V LAPLACE TRANSFORMS 9

Laplace transform: Sufficient conditions – Transform of elementary functions – Basic Properties – Transform of periodic functions. Inverse Laplace transform: Standard results – statement of Convolution theorem and its applications – Solution of linear second order ODE with constant coefficients using Laplace transformation techniques.

TOTAL : 45 PERIODS

SVHEC-R2025


Chairman
BOS / SAN

COURSE OUTCOMES:

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

- CO1 :** Apply the numerical techniques of interpolation in various intervals and differentiation and integration for engineering problems
- CO2 :** Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations
- CO3 :** Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications
- CO4 :** Apply various techniques in solving differential equations..
- CO5 :** Understand Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS:

- Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2019
- Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016

REFERENCE BOOKS:

- Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2015.
- Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016
- T.K.V Iyengar, B.krishna Gandhi, S.Ranganatham, M.V.S.S.N Prasad, " Laplace Transforms, Numerical Methods and complex variables", S.Chand, 10th march 2025.

CO's – PO's MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	1	-	-	2	-	2	3
CO2	3	3	2	1	1	-	-	2	-	2	2
CO3	3	3	2	1	1	-	-	2	-	2	3
CO4	3	3	2	1	1	-	-	2	-	2	3
CO5	3	2	2	1	1	-	-	2	-	3	3
AVG	3.00	2.80	2.00	1.00	1.00	-	-	2.00	-	2.20	2.80

1. Low, 2- Medium , 3-High, "-" No Correlation

SVHEC-R2025


Chairman
BOS / S&H

25PHT24

MEDICAL PHYSICS
(B.E. Bio Medical Engineering)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To provide understanding of the application of the radiation concepts and methods of Physics in Medical science
- To accentuate the principle, effects and clinical applications of ionizing, non-ionizing electromagnetic radiation
- To enunciate the fundamentals of acoustic waves and their interaction with human tissues
- To explore the effects of radiation in matter and how isotopes are produced
- To study effects of sound and light in human body

UNIT-I LOW ENERGY ELECTROMAGNETIC SPECTRUM AND ITS MEDICAL APPLICATION 9

Physics of radiation, Intensity of radiation-Ionizing and Non-ionizing Electromagnetic spectrum: Overview of non-ionizing radiation effects - Low Frequency Effects - Higher frequency effects., Radiation exposure control- Application

UNIT-II PRINCIPLES OF RADIOACTIVE NUCLIDES 9

Radioactive Decay – Isometric Transition – Gamma ray emission, alpha, beta, Positron decay, electron capture, Sources of Radioisotopes Natural and Artificial radioactivity, Radionuclide used in Medicine and Technology, Production of radionuclides – Cyclotron produced Radionuclide- Reactor produced Radionuclide-fission and neutron capture reaction

UNIT-III INTERACTION OF RADIATION WITH MATTER LIPIDS 9

Interaction of charged particles with matter – Linear energy transfer range, Bremsstrahlung, Interaction of X and Gamma radiation with matter- Photoelectric effect, Compton Scattering , Pair production, Attenuation of Gamma Radiation, Interaction of neutron with matter and their clinical significance

UNIT-IV RADIATION DOSE AND ITS EFFECTS 9

Dose and Exposure measurements – Units (SI), Inverse square law, Maximum permissible exposure, relationship between the dosimetric quantities, Radiation biology – effects of radiation, concept of LD 50, Stochastic and Non-stochastic effects, Radiation Syndrome.

UNIT-V

PRINCIPLES AND APPLICATIONS OF SOUND IN MEDICINE

9

Physics of sound, Normal sound levels, ultrasound fundamentals, Generation of ultrasound (Ultrasound Transducer), Interaction of Ultrasound with matter- Reflection, Transmission, Scanning methods, Artifacts, Ultrasound- Doppler effect, Clinical Applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- C01:** Interpret the properties of electromagnetic radiations and its effect on human
- C02:** Apply the principles and understand the production of radioactive nuclides
- C03:** Explain the interaction of radiation with matter
- C04:** Identify and Analyse the radiation quantities and its effects
- C05:** Demonstrate the knowledge on the properties of sound and its application in medicine

TEXT BOOKS:

1. B.H. Brown, R.H. Smallwood, D.C. Barber, P.V. Lawford, D.R. Hose, "Medical Physics and Biomedical Engineering", Institute of physics publishing, Bristol and Philadelphia, 2017
2. Gopal B. Saha, "Physics and Radiobiology of Nuclear Medicine", Fourth edition Springer, 2013

REFERENCE BOOKS:

1. W.J. Meredith and J.B. Massey, "Fundamental Physics of Radiology", Varghese Publishing house, Third Edition, 2013
2. Steve Webb, "The Physics of Medical Imaging", Taylor & Francis, Newyork, Second Edition, 2012
3. R.S. Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2010

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

CO's – PO's MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	3	1	1	1	-	-	-	-	-	-
C02	3	3	1	1	1	1	-	-	-	-	-
C03	3	3	1	1	1	-	-	-	-	-	-
C04	3	3	-	1	1	-	-	-	-	-	-
C05	3	3	-	1	1	1	-	-	-	-	-
AVG	3	3	1	1	1	1	-	-	-	-	-

1- Low, 2- Medium , 3-High, "-" No Correlation

25BMI21

SDG NO:

4,6,7,9,12,13

ANATOMY AND HUMAN PHYSIOLOGY

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

To impart knowledge of

- Integrate the individual functions of all the cells and tissues and organs into functional whole, the human body.
- Understand how physiological function depends on anatomical structure, with an emphasis on the functional anatomy of human organs.
- Emphasizes on the cardiovascular, respiratory, urinary and nervous system and their Interrelatedness.
- Stimulate the students to understand the basic functioning of every system and the resultant unified organization.
- Describe the physiological process of Nervous and sensory system.

UNIT-I

BASIC ELEMENTS OF HUMAN BODY

9

Cell – Cell Structure and organelles - Functions of each component in the cell. Cell membrane – transport across membrane - Action potential (Nernst, Goldman equation), Homeostasis. Tissue: Types, functions – Endocrine and exocrine glands

UNIT-II

SKELETAL AND MUSCULAR SYSTEM

9

Skeletal: Types of Bone and function – Physiology of Bone formation – Division of Skeleton – Types of joints and function – Types of cartilage and function. –Types of muscles – Structure and Properties of Skeletal Muscle- Changes during muscle contraction- Neuromuscular junction.

UNIT-III

CARDIOVASCULAR AND RESPIRATORY SYSTEM

9

Cardiovascular System: Structure – Conduction System of heart – Cardiac Cycle-Cardiac output. Blood: Composition – Functions - Haemostasis – Blood groups and typing. Blood Vessels – Structure and types - Blood pressure – Respiratory system: Parts of respiratory system – Respiratory physiology – Lung volumes and capacities – Gaseous exchange.

UNIT-IV

DIGESTIVE AND EXCRETORY SYSTEMS

9

Structure and functions of gastrointestinal system - secretory functions of the alimentary tract - digestion and absorption in the gastrointestinal tract - structure of nephron - mechanism of urine formation - skin and sweat gland - temperature regulation.

UNIT-V

NERVOUS AND SENSORY SYSTEM

9

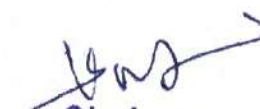
Structure and function of nervous tissue – Brain and spinal cord – Functions of CNS – Nerve conduction and synapse – Reflex action – Somatic and Autonomic Nervous system. Physiology of Vision, Hearing, Integumentary, Olfactory systems. Taste buds.

THEORY :45 PERIODS

LIST OF EXPERIMENTS

1. Collection of Blood Samples
2. Identification of Blood groups (Forward and Reverse)
3. Bleeding and clotting time
4. Estimation of Hemoglobin

SVHEC-R2025


Chairman
BoS/BME

5. Total RBC and WBC Count
6. Differential count of Blood cells
7. Estimation of ESR, PCV, MCH, MCV, MCHC
8. Hearing test – Tuning fork
9. Visual Activity – Snellen's Chart and Jaeger's Chart

PRACTICAL: 30 PERIODS

TOTAL (45+30): 75PERIODS

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- CO1:** Identify and explain basic elements of human body.
- CO2:** Explain the functions of skeletal and muscular system.
- CO3:** Describe the structure, function of cardiovascular system and respiratory system.
- CO4:** Discuss the structure of digestive and excretory system.
- CO5:** Describe the physiological process of Nervous and sensory system.

TEXT BOOKS:

1. Ross and Wilson "Anatomy and Physiology in Health and Illness", 14th International Edition, 1 July 2022.
2. Elaine.N. Marieb, "Essential of Human Anatomy and Physiology", Ninth Edition, Pearson Education, New Delhi, 2018.
3. Gopal B. Saha "Physics and Radiobiology of Nuclear Medicine", Third edition Springer, 2006.

REFERENCE BOOKS:

1. Guyton & Hall, "Text book of Medical Physiology", 13th Edition, Saunders, 2015.
2. Ranganathan T S, "Text book of Human Anatomy", S.Chand& Co. Ltd., New Delhi, 2012.
3. SaradaSubramanyam, K MadhavanKutty, Singh H D, "Textbook of Human Physiology", S. Chand and Company Ltd, New Delhi, 2012.

E-RESOURCES:

1. <http://nptel.ac.in/courses/107103004/7>, "Human physical dimension concern", Prof.MainakDas, IIT Kanpur.
2. <http://nptel.ac.in/courses/122103039/14>, "Nervous System", Prof.MainakDas, IIT Kanpur.

CO's – PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	1	1	-	-
CO2	3	3	2	-	-	-	-	-	-	-	1	1	-	-
CO3	3	3	2	-	-	-	-	-	-	-	1	1	-	-
CO4	3	3	3	-	-	-	-	-	-	-	1	1	-	-
CO5	3	3	3	-	-	-	-	-	-	-	1	1	-	-
AVG	3	3	2	-	-	-	-	-	-	-	1	1	-	-

1 -low, 2-medium, 3-high, '-' -no correlation

25CSI21
SDG No: 4, 8, 9, 10,17

PYTHON PROGRAMMING
 (Common to: B.E. / B.Tech. all Branches)

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand the basics of python data types and operators
- To learn to solve problems using Python conditionals and loops.
- To define Python , lists, tuples, dictionaries to represent complex data .
- To define python function and use function calls to solve problems.
- To develop python program using modules and files.

UNIT-I

PYTHON FUNDAMENTALS

9

Python Interpreter and Interactive Mode --Variables - Immutable variables - Data types - Tokens - Keywords - Operators - Python Reserved Words Statements - Indentation - Understanding error messages

UNIT-II

STRING AND CONTROL FLOW

9

Strings - Single-quote, double quote and multi-line strings - String Operations (Concatenation, Repetition, Indexing, Slicing, Splitting and Joining) Control Flow - If/Else Statements - for, while statements - Range () function - break and continue statement.

UNIT-III

LIST, TUPLES, DICTIONARIES

9

Lists - list operations - list slices - list methods - list loop - Tuples - assignment - tuple operations - Dictionaries - Operations and Methods in Dictionary - Looping and Dictionaries.

UNIT-IV

FUNCTIONS

9

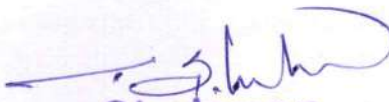
Functions- Elements of User Defined Functions - Fruitful Functions - Parameters and Arguments - Lambda Functions or Anonymous Functions - Scope - Function Composition

UNIT-V

MODULES AND FILES

9

Modules: Standard Modules - OS and SYS modules - User defined Modules - Importing modules - Writing into a File - Reading from a File - File Methods


Chairman
BoS/CSE&IT

TOTAL : 45 PERIODS

PRACTICAL EXERCISES:

List of Experiments

1. Python programming using simple Input/Output statements and data types.
2. Implement a python program using Operators.
3. Implementing programs using Strings.
4. Develop a python program using String operations.
5. Scientific problems using Decision making statements.
6. Develop a python program using Looping statements.
7. Create real-time applications using Lists
8. Applications using Tuples.
9. Develop real-time applications using Dictionaries.
10. Program using user defined functions.
11. Develop a python program using Lambda function.
12. Computations using NumPy functions.
13. Develop applications using File handling techniques.
14. Implement programs using written modules and Python Standard Libraries.

TOTAL : 30 PERIODS

TOTAL : 75(45+30) PERIODS

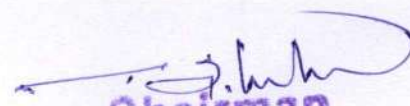
COURSE OUTCOMES:

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

- CO1 :** Understand and use the Python interpreter and IDE for writing, running, and debugging code using data types and operators.
- CO2 :** Write simple Python programs using conditionals and loops for solving problems.
- CO3 :** Decompose a Python program using Python lists, tuples, dictionaries etc.
- CO4 :** Decompose a Python program into functions.
- CO5 :** Read and write data from/to files in Python programs and perform mathematical and scientific calculations using the math modules.

TEXT BOOKS:

- 1.R. G. Dromey "How to Solve it by Computer", Pearson Education., 2024.
- 2.Robert Sedgewick "Introduction to Programming in Python", Pearson Education., 2024.


Chairman
BoS/CSE&IT

REFERENCE BOOKS:

1. John V. Guttag "Introduction to Computation and Programming using Python", The MIT press., 2016.
2. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

E-RESOURCES:

1. <https://www.python.org/>

CO's - PO's & PSO's MAPPING

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	2	2	2	2	2	2	3	3	3
CO2	2	3	3	3	2	2	2	2	2	2	2	3	3	3
CO3	2	2	3	2	2	2	2	2	2	1	2	3	3	3
CO4	1	2	3	3	1	2	2	2	2	1	2	2	3	3
CO5	2	2	3	3	2	2	2	2	2	1	2	2	3	3
AVG	1.8	2.4	3	2.8	1.8	2	2	2	2	1.4	2	2.6	3	3

1 - low, 2 - medium, 3 - high, '-' - no correlation


Chairman
BoS/CSE&IT

25TAT21

தமிழரும் தொழில்நுட்பமும்

L T P C
1 0 0 1

(B.E./B.Tech- அனைத்து பாடப்பிரிவுகளுக்கும் பொதுவானது)

பாடநெறி நோக்கங்கள்:

- நெசவு மற்றும் பானைத்தொழில்நுட்பத்தைப் புரிந்து கொள்ளுதல்
- சேர, சோழ, பல்லவ மற்றும் நாயக்கர்களின் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பத்தை ஒப்பிடுதல்
- தமிழர்களின் பல்வேறு உற்பத்தி தொழில்நுட்பத்தைப் பற்றிய அறிவைப் பெறுதல்
- தமிழர்களின் வேளாண்மை மற்றும் கடல்சார் அறிவைப் பெற்றுக்கொள்ளுதல்
- அறிவியல் தமிழையும் அதன் இணையப்பயன்பாட்டையும் கற்றல்

அலகு - I

நெசவு மற்றும் பானைத் தொழில்நுட்பம்

3

சங்க காலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு - II

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்

3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப்பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரம் சிற்பங்களும் கோவில்களும் - சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை

அலகு - III

உற்பத்தித் தொழில்நுட்பம்

3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

அலகு - IV

வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம்

3

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும்

வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மின்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்

அலகு - V

அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்

3

அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல்
- தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம்
- இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்

மொத்தம்: 15 பாடவேளைகள்

பாடநெறி முடிவுகள்:

இப்பாடத்தைப் படிப்பதின் முடிவில் மாணவர்கள்

- C01: நெசவு மற்றும் பானைத்தொழில்நுட்பத்தை பற்றிப் புரிந்துகொள்வார்கள்
C02: வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பத்தில் தமிழர்களின் அறிவைப் பெறுவார்கள்
C03: தமிழர்களின் உற்பத்தி தொழில்நுட்பத்தை கண்டறிவார்கள்
C04: தமிழர்களின் வேளாண்மை மற்றும் கடல்சார் அறிவைக் குறித்து விவாதிப்பார்கள்.
C05: பல்வேறு இணையப் பயன்பாடுகளில் அறிவியல் தமிழைப் பயன்படுத்திப்பார்ப்பார்கள்

மின் -ஆதாரங்கள்:

1. <https://www.tamilvu.org/>
2. <https://sorkuvai.com/>

CO's -PO's விவரணையாக்கம்:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	1	-	-	-	-	1	1	1	1	-	1
C02	2	-	-	-	-	2	2	2	2	-	2
C03	2	-	-	-	-	2	2	2	2	-	2
C04	1	-	-	-	-	1	1	1	1	-	1
C05	2	-	-	-	-	2	2	2	2	-	2
AVG	2	-	-	-	-	2	2	2	2	-	2

25STAT21

TAMILS AND TECHNOLOGY
(Common to B.E./B. Tech. all branches)

L T P C
1 0 0 1

COURSE OBJECTIVES:

- To understand about weaving and ceramic technology of Tamils
- To compare the design and constructive technology of Cheras, Cholas, Pallavas and Nayakkars
- To gain knowledge in various manufacturing technology of Tamils
- To analyse the agriculture and fishery knowledge of Tamils
- To learn about scientific Tamil and its usage in online platforms

UNIT-I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT-II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT-III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT-IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society

UNIT-V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing - Digitalization of Tamil Books - Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

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

- CO1:** Relate the weaving ceramic technology of Tamils
- CO2:** Understand the knowledge of Tamils in design and construction technology
- CO3:** Recognize the manufacturing technology knowledge of Tamils
- CO4:** Criticize the agriculture and fishery knowledge of Tamils
- CO5:** Apply scientific Tamil in Various online platforms

E- RESOURCES:

1. <https://www.tamilvu.org/>
2. <https://sorkuvai.com/>

CO's -PO's MAPPING:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011
C01	1	-	-	-	-	1	1	1	1	-	1
C02	2	-	-	-	-	2	2	2	2	-	2
C03	2	-	-	-	-	2	2	2	2	-	2
C04	1	-	-	-	-	1	1	1	1	-	1
C05	2	-	-	-	-	2	2	2	2	-	2
AVG	2	-	-	-	-	2	2	2	2	-	2

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

25MAT32 SDG NO.4,8,9,17	TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS (for B.E. CIVIL, MECH, BME & B.TECH BIO-TECH, PT)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDEs for solving standard partial differential equations.
- To introduce Fourier series analysis, which is central to many engineering applications apart from its use in solving boundary value problems.
- To acquaint students with Fourier series techniques used in solving heat flow problems in various situations
- To acquaint students with Fourier transform techniques used in wide variety of situations
- To introduce effective mathematical tools for solving partial differential equations that model several physical processes and for developing Z-transform techniques for discrete- time systems.

UNIT-I **PARTIAL DIFFERENTIAL EQUATIONS** **9+3**

Formation of partial differential equations – Solutions of standard types of first order partial differential equations - Lagrange's linear equation

UNIT-II **FOURIER SERIES** **9+3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range Fourier sine series and cosine series -Parseval's identity – Harmonic analysis.

UNIT-III **APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS** **9+3**

Classification of PDE – Method of separation of variables - Fourier series solutions of one-dimensional wave equation – One dimensional equation of heat conduction

UNIT-IV **FOURIER TRANSFORM** **9+3**

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions

UNIT-V **Z - TRANSFORMS AND DIFFERENCE EQUATIONS** **9+3**

Z-transforms - Elementary properties – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z – transforms

TOTAL : 60 PERIODS


Chairman
BoS / S&H

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to:

- C01:** Understand how to solve the given standard partial differential equations.
- C02:** Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- C03:** Appreciate the physical significance of Fourier series techniques in solving one dimensional heat flow problems and one-dimensional wave equations
- C04:** Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering
- C05:** Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2023.
2. Kreyszig E, "Advanced Engineering Mathematics", 10th Edition, John Wiley, New Delhi, India, 2023.

REFERENCE BOOKS:

1. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2021.
2. James. Glyn., "Advanced Modern Engineering Mathematics", 5th Edition, Pearson Education, New Delhi, 2018.
3. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
4. Wylie. R.C. and Barrett. L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_ma37/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma20/preview

CO's - PO's MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	3	1	1	-	-	-	2	-	-	3
C02	3	3	1	1	-	-	-	2	-	-	3
C03	3	3	1	1	-	-	-	2	-	-	3
C04	3	3	1	1	-	-	-	2	-	-	3
C05	3	3	1	1	-	-	-	2	-	-	3
Avg	3	3	1	1	-	-	-	2	-	-	3

1 - low, 2 - medium, 3 - high, '-' - no correlation

25ECT31
SDG No 4,7,9,12

ELECTRONIC DEVICES AND CIRCUITS
(For B.E - ECE and BME)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

To impart knowledge of

- The structure of basic electronic devices
- The operation and applications of semiconductor devices and transistors.
- BJT and MOSFET amplifier circuits and their frequency response
- The principles and characteristics of differential, tuned, and power amplifiers
- Principles of feedback amplifiers and oscillators

UNIT-I PN JUNCTION DEVICES

9

PN junction diode-structure, operation and V-I characteristics, diffusion and transient Capacitance-Rectifiers-Half Wave and Full Wave Rectifier, Zener diode-characteristics-Zener Reverse characteristics-Zener as regulator, Display devices-LED-characteristics, Laser diodes.

UNIT-II TRANSISTORS

9

BJT, JFET, MOSFET structure, operation, characteristics and biasing- UJT-Thyristor - SCR Structure and characteristics.

UNIT-III AMPLIFIERS

9

BJT small signal model-Analysis of CE, CB, CC amplifiers-Gain and frequency response. MOSFET small signal model-Analysis of CS and Source follower-Gain and frequency Response-High frequency analysis of CE amplifier. Introduction to LT Spice.

UNIT-IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER

9

Differential amplifier - Common mode and Differential mode analysis, Single tuned amplifiers - Gain and frequency response-Introduction to Power amplifiers-Class A, Class B and Class AB.

UNIT-V FEEDBACK AMPLIFIERS AND OSCILLATORS

9

Basic concepts of feedback -Properties of negative feedback,series,Shunt feedback- Positive feedback-Conditions for oscillations-RC Phase shift-Wein bridge,Hartley,Crystal and Colpitts Oscillators-Introduction to PCB Design

TOTAL: 45 PERIODS

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

- CO1: Understand the construction and characteristics of basic electronic devices.
- CO2: Comprehend the construction and functional characteristics of various transistors.
- CO3: Analyze the performance, gain and frequency response of BJT and MOSFET.
- CO4: Evaluate the performance of differential, tuned, multistage and power amplifiers.
- CO5: Design basic feedback amplifier and oscillator circuits.

TEXT BOOKS:

1. David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.
2. Donald A. Neamen, Microelectronics: Circuit Analysis and Design, McGraw-Hill Education, 4th Edition, 2021.
3. S. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, McGraw Hill Education (India), 5th Edition, 2022.

REFERENCE BOOKS:

1. Adel S. Sedra, Kenneth C. Smith, Tony Chan Carusone, and Vincent Gaudet, Microelectronic Circuits, Oxford University Press, 8th Edition, 2020.
2. Muhammad H. Rashid, Microelectronic Circuits: Analysis and Design, Cengage Learning, 3rd Edition, 2017 Thomas L. Floyd, "Electronic devices" Prentice Hall, 10th Edition, 2018.
3. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 11th Edition, 2021.

E-RESOURCES:

1. NPTEL-Online Courses and Video lectures: <https://nptel.ac.in/courses/108101091>

CO's - PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	2	1	1	-	-	-	-	-	2	1	1
CO2	3	3	2	2	1	2	-	-	-	-	-	3	1	1
CO3	3	3	3	2	2	2	-	-	-	1	-	2	2	2
CO4	3	3	3	3	2	2	-	-	1	1	-	2	3	1
CO5	3	2	3	2	2	1	1	-	1	2	1	2	2	3
AVG	3	3	3	2	2	2	1	-	1	1	1	2	2	2

1 -low, 2-medium, 3-high, '-'-no correlation


Chairman
BoS / ECE

25BMT31

BIOSENSORS AND MEASUREMENTS

L T P C
3 0 0 3

SDG No: 4

COURSE OBJECTIVES:

To impart knowledge on

- Principles of measurement systems, instrumentation, transducer characteristics, measurement errors, calibration procedures, and standards used in biomedical measurements.
- Operating principles of displacement, pressure, temperature, fiber optic, and light sensors for biomedical sensing and measurement applications.
- Performance characteristics and signal conversion mechanisms of photoelectric and piezoelectric sensors used in medical instrumentation systems.
- Operation of bridge circuits, impedance matching circuits, oscilloscopes, and recording devices for accurate acquisition and processing of biomedical signals.
- Suitability of various biosensors, biochemical sensors for specific healthcare and diagnostic applications.

UNIT-I SCIENCE OF MEASUREMENTS 6
Measurement System – Instrumentation - Classification and Characteristics of Transducers – Static and Dynamic - Errors in Measurements – Calibration and standards- Primary and secondary standards,.

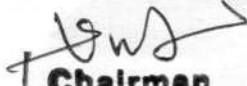
UNIT-II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS 9
Strain Gauge, Capacitive transducer, Inductive transducer, Hall effect transducer, LVDT, Passive types: RTD materials and range - thermistor characteristics, Active type: Thermocouple – characteristics, Fiber optic sensors-Light sensors in medicine.

UNIT-III PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS 9
Phototube, scintillation counter, photo multiplier tube (PMT), photovoltaic, photo conductive cells, photo diodes, phototransistor - Optical displacement sensors and optical encoder Piezoelectric active transducer - Equivalent circuit and its characteristics.

UNIT-IV RECORDING DEVICES AND BRIDGE CIRCUITS 9
Impedance matching circuits, AC and DC Bridges - Wheat stone bridge-Kelvin - Schering-CRO – block diagram, CRT – DSO - LCD monitor-PMMC writing systems-servo recorders-photographic recorder- Magnetic tape recorder-Inkjet recorder-thermal recorder.

UNIT-V BIOSENSORS 12
Biosensors: transduction mechanism in a biosensor and Classification -Electronic nose. Biological Sensor – baro receptors – Hemo receptors-Sensory receptors for smell-vision-Taste and Olfactory -Bio chemical Sensors for medicine-Bio mechanical sensor for medicine.

TOTAL: 45 PERIODS


Chairman
BoS/BME

COURSE OUTCOMES:

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

- CO1** Analyze measurement systems, transducer characteristics, calibration procedures, and measurement errors to evaluate the accuracy and reliability of biomedical measurements.
- CO2** Examine the appropriate displacement, pressure, temperature, fiber-optic, and light sensors for specific biomedical sensing and monitoring applications.
- CO3** Analyze the operating principles and performance characteristics of photoelectric and piezoelectric sensors for biomedical instrumentation systems.
- CO4** Evaluate the suitability of bridge circuits, oscilloscopes, and recording devices for biomedical signal acquisition, processing, and measurement applications.
- CO5** Assess suitable biosensors for healthcare diagnostics and biomedical monitoring systems.

TEXT BOOKS:

1. A.K.Sawhney, "Electrical & Electronics Measurement and Instrumentation", 10th edition, Dhanpat Rai & Co, New Delhi, 19th Revised edition 2011, Reprint 2014.
2. John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.
3. Ernest O Doebelin and Dhanesh N Manik, "Measurement systems, Application and design", 6th edition, McGraw-Hill, 2012.

REFERENCE BOOKS:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", 3rd edition, Tata McGraw-Hill, New Delhi, 2014.
2. Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 1st edition, 2016.

E-RESOURCES:

1. <http://nptel.ac.in/courses/112103174/3>, Sensors and Transducers by Prof. Alok Barua, IIT, Kharagpur.
2. <https://www.jove.com/librarians/resources>.

CO's - PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	1	1	-	1	2	1
CO2	3	3	2	2	2	-	-	-	1	1	-	1	3	2
CO3	3	3	2	2	2	-	-	-	1	1	-	1	3	2
CO4	3	3	3	3	2	-	-	-	1	1	-	1	3	3
CO5	3	3	3	2	2	-	-	-	2	2	-	1	3	3
AVG	3	3	2	2	2	-	-	-	1	1	-	1	3	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

25EET35 SDG NO:4,7,9	FUNDAMENTALS OF ELECTRIC ENGINEERING (For B.E- BME)	L	T	P	C
		3	0	0	3
Course Objectives:					
➤ To understand charge behavior, use different power sources, and solve DC networks using mesh and node analysis methods. ➤ To simplify complex circuits using Star-Delta transformations and apply circuit theorems to optimize multi-source networks. ➤ To study how DC motors/generators, synchronous alternators, and 3-phase induction motors work, along with their characteristics and uses. ➤ To model and calculate the efficiency, voltage regulation, and equivalent circuits of single-phase, three-phase, and auto-transformers. ➤ To learn about domestic wiring setups, low-voltage controls, safety earthing, and how power is transmitted and distributed across the grid.					
UNIT-I	BASIC CIRCUIT ANALYSIS	9			
Basic components of electric circuits, Charge, Current, Voltage and Power, Voltage and current sources, Ohms law, Kirchhoff's laws, Series and parallel connected Independent sources, Resistors in series and parallel, Voltage division and Current division rule, Mesh current and node voltage methods of analysis DC Circuits.					
UNIT-II	NETWORK REDUCTION AND THEOREMS	9			
Network Reduction: Source transformation, Star delta conversion. Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem to DC circuits.					
UNIT-III	ELECTRICAL MACHINES	9			
Construction and working principle, DC generators, EMF equation, Types and applications, Working principle of DC motors, Types and applications, Construction of Three phase alternator, Three phase induction motor.					
UNIT-IV	TRANSFORMER	9			
Single phase Transformer, Phasor diagram, Equivalent circuit, Testing, Efficiency and Voltage regulation, Three phase transformers, Applications, Auto transformers, Advantages.					
UNIT-V	Electrical Wiring & Power Systems	9			
Domestic Electrical Wiring, Switch Control Circuits, Earthing, Electrical Power System Generation, transmission, and distribution of electrical power, Introduction to electrical grid.					
TOTAL: 45 PERIODS					

COURSE OUTCOMES

The students will be able to

CO1	Analyze and solve electrical circuits using matrix methods.
CO2	Apply network theorems to analyze and improve circuit performance.
CO3	Understand the operation and applications of DC machines, alternators and induction motors.
CO4	Analyze transformer performance using equivalent circuits and efficiency tests.
CO5	Understand domestic wiring, earthing and power transmission systems.

Text Books:

1. Robert L. Boylestad & Brian A. Olivari, Introductory Circuit Analysis, 14th Edition, Pearson Education, 2023.
2. I. J. Nagrath & D. P. Kothari, Electric Machines, McGraw Hill Education, 6th Edition, 2023.
3. D.P. Kothari and I.J. Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020.

Reference Books:

1. V.K. Mehta & Rohit Mehta, Principles of Power System (Including Generation, Transmission, Distribution, Switchgear and Protection), S. Chand Publishing, Revised Edition, 2022.
2. Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014.
3. Charles Alexander and Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw Hill publishers, 7th edition, New Delhi, 2022.

Online Sources:

1. NPTEL-Online Courses and Video lectures: <https://nptel.ac.in/>

CO & PO MAPPING

CO/PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	1	-	3	2	1
CO2	3	3	2	2	-	-	-	-	-	1	-	3	3	2
CO3	3	3	3	3	-	-	-	-	-	1	-	3	3	3
CO4	3	3	3	3	-	-	-	-	-	1	-	3	3	3
CO5	3	3	3	2	-	-	-	-	-	1	-	3	3	3
Avg	3	2.8	2.4	2.2	-	-	-	-	-	1	-	3	2.8	2.4

1-low, 2-medium, 3-high, '-'-no correlation


Chairman
BoS / EEE

25CSI34
SDG No. 4,8,9

OBJECT ORIENTED PROGRAMMING
 (for B.E. BME)

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand the fundamental concepts of object-oriented programming and the syntax and features of the Java programming language.
- To apply inheritance, packages, interfaces, and polymorphism for designing modular and reusable Java applications.
- To develop robust applications using exception handling, multithreading, file handling, strings, collections, and generics.
- To design and implement interactive graphical user interfaces using JavaFX controls, layouts, menus, and event-driven programming.
- To solve real-world problems by integrating object-oriented concepts and Java technologies through practical programming and application development.

UNIT-I

INTRODUCTION TO OOP AND JAVA

9

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming –Java Buzzwords –Overview of Java –Data Types, Variables and Arrays –Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors- Methods -Access specifiers - Static members- Java Doc comments

UNIT-II

INHERITANCE, PACKAGES AND INTERFACES

9

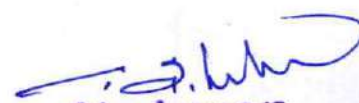
Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance –Super keyword –Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT-III

EXCEPTION HANDLING AND MULTITHREADING

9

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions–User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication–Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.


Chairman
 BoS/CSE&IT

UNIT-IV

I/O, GENERICS, STRING HANDLING

9

I/O Basics-Reading and Writing Console I/O- Reading and Writing Files. Generics: Generic Programming - Generic classes - Generic Methods - Bounded Types - Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT-V

JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS

9

JAVAFX Events and Controls: Event Basics - Handling Key and Mouse Events. Controls: Checkbox, Toggle Button - Radio Buttons - List View - Combo Box - Choice Box - Text Controls - Scroll Pane. Layouts - Flow Pane - H Box and V Box - Border Pane - Stack Pane - Grid Pane. Menus - Basics - Menu - Menu bars - Menu Item.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms(selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area() that prints the area of the given shape.
5. Solve the above problem using an interface Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
6. Implement exception handling and creation of user defined exceptions.
7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
8. Write a program to perform file operations.
9. Develop applications to demonstrate the features of generics classes.
10. Develop applications using Java FX controls, layouts and menus.

SVHEC-R2025


Chairman
BoS/CSE&IT

TOTAL: 30 PERIODS

TOTAL: 75(45+30)PERIODS

COURSE OUTCOMES:

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

- CO1:** Apply object-oriented programming concepts, including classes, objects, constructors, methods, inheritance, packages, and interfaces, to design and develop Java applications.
- CO2:** Develop robust Java programs by utilizing exception handling, user-defined exceptions, multithreading, synchronization, and wrapper classes for efficient problem solving.
- CO3:** Build Java applications using file handling, I/O streams, string manipulation, collections, and generics to process and manage data effectively.
- CO4:** Design and implement interactive GUI applications using JavaFX controls, layouts, menus, and event handling techniques to create user-friendly software.
- CO5:** Integrate Java programming concepts and practical development skills to analyze, design, and implement real-world software solutions through laboratory applications and projects.

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCE BOOK:

1. Cay S.Horstmann, "Core Java Fundamentals", Volume1,11thEdition,Prentice Hall,2018.

E-RESOURCES:

- 1.<http://www.delnet.in/>
2. https://onlinecourses.nptel.ac.in/noc22_cs43/preview

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	3	1	3	-	-	3	2	2	2	3	1	2
CO2	2	1	3	2	1	-	-	2	1	1	3	3	3	2
CO3	3	3	1	2	2	-	-	3	2	1	2	3	1	3
CO4	3	1	2	2	2	-	-	1	2	1	3	3	1	1
CO5	1	1	2	3	2	-	-	3	2	1	2	3	3	3
AVG	2	1.4	2.2	2	2	-	-	2.4	1.8	1.2	2.4	3	1.8	2.2

1- low,2 -medium,3- high,'-' no correlation

25BMT32
SDG No:3,4

BIOSCIENCES FOR MEDICAL ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

To impart knowledge of

- The classification, structural properties, and fundamental biological functions of major cellular macromolecules and nucleic acids.
- The dietary sources, daily requirements, physiological roles, and clinical deficiency syndromes of essential vitamins and minerals.
- Microbial structural characteristics alongside the functional principles of microscopy and advanced diagnostic immunological techniques.
- The pathophysiological mechanisms, cellular origins, and clinical effects of hemodynamic derangements and circulatory disorders.
- The processes of cellular injury, adaptation, tissue repair, neoplasia, cell death pathways, and their diagnostic methods.

UNIT-I **BIOCHEMISTRY - MACROMOLECULES** **10**
Classification, Structure, Function and Properties of Carbohydrate, Lipids, amino acids, Proteins, Nucleic acid (DNA and RNA).

UNIT-II **BIOCHEMISTRY - MICROMOLECULES** **10**
Classification, Source, Daily Requirement, Function and Deficiency symptoms of Vitamins and Minerals.

UNIT-III **MICROBIOLOGY AND IMMUNO TECHNIQUES** **9**
Structure of Bacteria and Virus, Microscopes : Binocular Light Microscope, Scanning Electron Microscope, Immunity, Immunological Techniques :Immuno Electrophoresis, ELISA.

UNIT-IV **PATHOLOGY - HEMODYNAMIC DERANGEMENTS AND DISORDERS** **8**
Hemodynamic derangement : Edema, Hypermia, Ischemia, Embolism, Infarction, Shock . Hemodynamic Disorders :Thrombosis, Disseminated Intravascular Coagulation,Chronic Venous Congestion .

UNIT-V **PATHOLOGY - CELL INJURY AND CELL DEATH** **8**
Cell Injury, Cellular Responses, Cellular adaptations, Neoplasia, Cell Death, Diagnostic methods for cell injury.

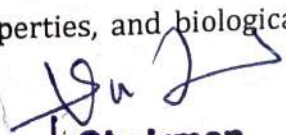
THEORY :45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- CO1:** Evaluate the structural characteristics, biochemical properties, and biological roles of essential cellular macromolecules.

SVHEC-R2023


Chairman
Bos/BME

- C02:** Diagnose nutritional deficiency disorders by correlating them with the physiological roles of vitamins and minerals.
- C03:** Utilize specialized microscopy and immunological techniques like ELISA to identify micro-organisms and biological samples.
- C04:** Explain the mechanics of hemodynamic derangements—such as edema, thrombosis, and shock—and their clinical manifestations.
- C05:** Differentiate between cellular adaptation, neoplastic transformations, and cell death pathways to predict tissue responses to injury.

TEXT BOOKS:

1. Satyanarayana U. and Chakrapani U. "Biochemistry" CBS Publishers & Distributors, 7th edition, 2026.
2. Sembulingam K. and Sembulingam P. "Essentials of Medical Physiology" Jaypee Brothers Medical Publishers Pvt. Ltd, 10th edition, 2025.
3. Kanungo R. "Ananthanarayan and Paniker's Textbook of Microbiology" Universities Press, 12th edition, 2022

REFERENCE BOOKS:

1. Lehninger, A. L. Nelson D. L. and Cox M.M. " Principles of Biochemistry", Freeman Publishers, New York, Eighth Edition, 2021.
2. Dubey R.C. and Maheshwari D.K. "A Textbook of Microbiology" S. Chand and Company Ltd, Revised Edition, 2022
3. Tamparo C.D. and Davis J.T. "Diseases of the Human Body" F.A. Davis Company, 7th edition, 2022..

E-RESOURCES:

1. <https://nptel.ac.in/courses/102106087>, Biochemistry - IITM, IIT Madras, Prof. Subramaniam K.
2. <https://nptel.ac.in/courses/109106198>, Host-Pathogen Interaction (Immunology), IISER Bhopal, Prof. Himanshu Kumar

CO's – PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C01	3	3	2	-	-	-	-	-	-	-	-	1	-	-
C02	3	3	2	-	-	-	-	-	-	-	-	1	-	-
C03	3	3	2	-	-	-	-	-	-	-	-	1	-	-
C04	3	3	3	-	-	-	-	-	-	-	-	1	-	-
C05	3	3	3	-	-	-	-	-	-	-	-	1	-	-
AVG	3	3	2	-	-	-	-	-	-	-	-	1	-	-

1 -low,2-medium,3-high,'-'-no correlation

25ECL31
SDG 4,9,12

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

(For B.E- ECE and BME)

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

To impart knowledge of

- The construction, operation, and characteristics of semiconductor devices such as PN junction diode, Zener diode, SCR, and MOSFET.
- Rectifier circuits, filter circuits, and Zener diode voltage regulator circuits.
- Transistor amplifier configurations (CB, CE, and CC) and their frequency response.
- Feedback amplifiers and oscillator circuits using BJTs.
- Electronic circuit simulation using LTspice software.

LIST OF EXPERIMENTS

1. Characteristics of PN Junction Diode and Zener diode.
2. Full Wave Rectifier with Filters.
3. Design of Zener diode Regulator.
4. Characteristics and analysis of SCR.
5. MOSFET Drain Characteristic and Transfer Characteristics.
6. Frequency response of CB, CE and CC Amplifier.
7. Design and analysis of Feedback Amplifier.
8. Design of RC Oscillators and LC Oscillators using BJT.
9. Design and analysis of amplifier circuits using Simulation Tools(LT Spice)
10. Design and analysis of Oscillator circuits using Simulation Tools(LT Spice)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- C01:** Measure and analyze the characteristics of PN junction diode, Zener diode, SCR, and MOSFET devices.
- C02:** Design and evaluate rectifier circuits, filter circuits, and Zener diode voltage regulators.
- C03:** Analyze the frequency response and performance characteristics of CB, CE, and CC amplifier configurations
- C04:** Design and implement feedback amplifiers and RC/LC oscillator circuits using electronic devices.
- C05:** Simulate and validate the performance of amplifier and oscillator circuits using LT Spice simulation tools.

REFERENCE BOOKS:

1. Manual prepared by the faculty of ECE Department, SVHEC

E-RESOURCES:

1. NPTEL-Online Courses and Video lectures: <https://nptel.ac.in/courses/108101091>

CO's - PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	-	-	-	-	-	-	3	1	1
CO2	3	3	2	3	2	-	-	-	-	-	-	3	2	1
CO3	3	3	2	3	2	-	-	-	1	1	-	2	2	1
CO4	3	3	3	3	2	-	1	-	1	1	-	2	3	2
CO5	3	2	3	2	3	-	1	-	1	1	1	2	2	3
AVG	3	3	2	3	2	-	1	-	1	1	1	2	2	2

1 -low,2-medium,3-high,'-'-nocorrelation


Chairman
BoS/ECE

25BML31
SDG No:3,4

**BIOSENSORS AND MEASUREMENTS
LABORATORY**

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

To impart knowledge of

- Provide practical knowledge on the operating principles, characteristics, calibration, and performance evaluation of biosensors and transducers used in biomedical and measurement systems.
- Measure the physical and physiological parameters such as temperature, displacement, pressure, blood flow, heart sounds, and optical signals using appropriate sensors and measurement techniques

LIST OF EXPERIMENTS

1. Characteristics of thermistor and thermocouple
2. Characteristics of Photo Diode and LDR
3. Characteristics of RTD
4. Characteristics of LVDT
5. Measurement of unknown Resistance using Kelvin Double Bridge and Wheatstone bridge
6. Measurement of unknown Capacitance using Schering Bridge
7. Characteristics of strain gauge
8. Characteristics of Piezoelectric Transducer
9. Characteristics of Hall Effect sensor
10. Blood flow measurement using Ultrasonic Sensor
11. Blood flow measurement using Pressure Sensor

TOTAL: 45 PERIODS

REFERENCE BOOKS:

1. Manual prepared by the faculty of BME Department, SVHEC.
2. John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.

COURSE OUTCOMES:

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

- C01:** Demonstrate the experiments using temperature, optical, displacement, and pressure sensors for biomedical measurements.
- C02:** Analyze the characteristics and performance parameters of thermistors, thermocouples, RTDs, LVDTs, strain gauges, piezoelectric sensors, Hall-effect sensors,
- C03:** Determine unknown electrical parameters such as resistance and capacitance using bridge-based measurement techniques.
- C04:** Understand the various read out and display devices.
- C05:** Design a measurement system for various applications.

CO's PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C01	3	2	1	2	-	-	-	-	1	2	-	3	2	1
C02	3	2	1	1	-	-	-	-	1	2	-	3	2	2
C03	3	2	1	1	-	-	-	-	1	2	-	3	3	2
C04	3	2	1	2	-	-	-	-	1	2	1	3	3	3
C05	3	2	1	1	-	-	-	-	1	2	1	3	3	3
Avg	3	2	1	1	-	-	-	-	1	2	1	3	3	2

1 -low,2-medium,3-high,'-'-nocorrelation

25BML32

SDG No:3,4

BIOSCIENCES LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

To impart knowledge of

- Precise chemical solution preparation, pH meter calibration, and spectrophotometric analysis.
- Qualitative testing methods used to identify and differentiate carbohydrates, proteins, and lipids.
- Phlebotomy protocols, blood sample processing, and quantitative estimation of glucose and hemoglobin.
- Advanced separation techniques for biomolecules using chromatography and gel electrophoresis.
- Microbiological Gram staining, histopathological tissue staining, and complete clinical examination of urine.

LIST OF EXPERIMENTS

- 1.Preparation of solutions: 1) percentage solutions, 2) molar solutions, 3) normal solutions.
- 2.Standardization of pH meter, preparation of Buffer
- 3.Spectroscopy: Determination of absorption maxima ($\lambda_{\max}$) of a given solution.
- 4.Qualitative analysis of carbohydrates, proteins and lipids.
5. Identification of Blood Collection Tubes and Phlebotomy equipment.
- 6.Preparation of serum and plasma from blood.
- 7.Quantitative Estimation of Hemoglobin by cyanmethemoglobin method (Single Standard).
8. Quantitative Estimation of blood glucose Using GOD-POD Method (Single Standard).
- 9.Separation of amino acids by thin layer chromatography.
10. Separation of proteins by SDS Gel Electrophoresis. (Demo)
- 11.Microbial Staining – Gram Staining.
- 12.Pathological staining – Hematoxylin and Eosin staining.
13. Urine complete analysis.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- CO1:** Accurately prepare laboratory reagents, standardize a pH meter, and operate a spectrophotometer.
- CO2:** Systematically identify and differentiate major biomolecules in unknown biological samples.

Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

- CO3:** Process blood samples and quantitatively measure diagnostic biomarkers like glucose and hemoglobin.
- CO4:** Apply chromatographic and electrophoretic separation methods to analyze amino acids and proteins.
- CO5:** Execute Gram staining, tissue staining, and perform routine clinical urinalysis independently.

TEXT BOOKS:

1. S. Shanmugam, Laboratory Handbook on Biochemistry, 1st Edition, Campus Books International, 2005.
2. Ramnik Sood, Modern Medical Laboratory Technology: methods and Interpretation, 7th Edition, Jaypee Brothers Medical Publishers, 2023.
3. Geetha Damodaran K., Practical Biochemistry, 3rd Edition, Jaypee Brothers Medical Publishers, 2021.

REFERENCE BOOKS:

1. Sawhney S. K. and Singh R., Introductory Practical Biochemistry, 2nd Edition, Alpha Science International Ltd, 2005.
2. Manual prepared by the faculty of BME Department, SVHEC

E-RESOURCES:

1. <https://vlab.amrita.edu/?sub=3&brch=63&sim=631&cnt=1>

CO's - PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	-	-	-	-	1	1	-	-
CO2	3	3	1	1	2	2	-	-	-	-	2	1	-	-
CO3	3	3	2	1	2	2	-	-	-	-	2	1	-	-
CO4	3	3	2	1	1	2	-	-	-	-	2	1	-	-
CO5	3	2	2	1	1	1	-	-	-	-	1	1	-	-
AVG	3	3	2	1	1	2	-	-	-	-	2	1	-	-

1 -low, 2-medium, 3-high, '-'-no correlation

COURSE OBJECTIVES:

- To impart knowledge on concepts related to disaster, disaster risk reduction, disaster management
- To acquaint with the skills for planning and organizing disaster response
- To develop disaster response skills by adopting relevant tools and technology
- To Enhance awareness of institutional processes for Disaster response in the country
- To Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity

UNIT-I**HAZRADS, VULNERABILITY AND DISASTER RISKS****9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, - Inter relations between Disasters and Sustainable development Goals

UNIT-II**DISASTER RISK REDUCTION (DRR)****9**

Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies.- Relevance of indigenous Knowledge, appropriate technology and Local resources.

UNIT-III**DISASTER MANAGEMENT****9**

Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level- (NDMA –SDMA-DDMA-NRDF- Civic Volunteers)

UNIT-IV**DISASTER MANAGEMENT TECHNOLOGIES****9**

Early Warning Systems; Disaster Relief – Water, Food, Sanitation, Shelter and Health; Disaster Mitigation, Preparedness, Response and Recovery; Role of GIS and Information Technology in Disaster Management; Disaster Risk and Damage Assessment; Climate Resilient Development; Standard Operating Procedure for Disaster Response.


Chairman
BoS / Civil

Landslide Hazard Zonation; Earthquake Vulnerability Assessment; Drought Assessment; Coastal Flooding and Storm Surge; Floods; Forest Fire; Man-Made Disasters; Space-Based Technology for Disaster Management; Field Work and Mock Drill.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

- CO1 :** To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR).
- CO2 :** To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction.
- CO3 :** To develop disaster response skills by adopting relevant tools and technology.
- CO4 :** Enhance awareness of institutional processes for Disaster response in the country.
- CO5 :** Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity.

TEXT BOOKS:

1. Taimpo (2016), Disaster Management and Preparedness, CRC Publications
2. Singh R (2017), Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications
3. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
4. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

REFERENCE BOOKS:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
2. Government of India, National Disaster Management Policy, 2009.
3. Shaw R (2016), Community based Disaster risk reduction, Oxford University Press

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/124/107/124107010/>
2. <https://nptel.ac.in/courses/124107010>


Chairman
BoS / Civil

CO's - PO's & PSO's MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
C01	3	3	2	3	-	-	2	2	-	-	2	2	-	1
C02	3	3	3	3	-	-	2	1	-	-	2	2		1
C03	3	3	3	3	-	-	2	2	-	-	-	2		1
C04	3	3	2	3	-	-	2	1	-	-	2	2		1
C05	3	3	2	3	-	-	2	2	-	-	2	3		1
Avg.	3	3	2.4	3	-	-	2	1.6	-	-	2	2.2	-	1

1 - low, 2 - medium, 3 - high, '-' - no correlation


Chairman
BoS / Civil