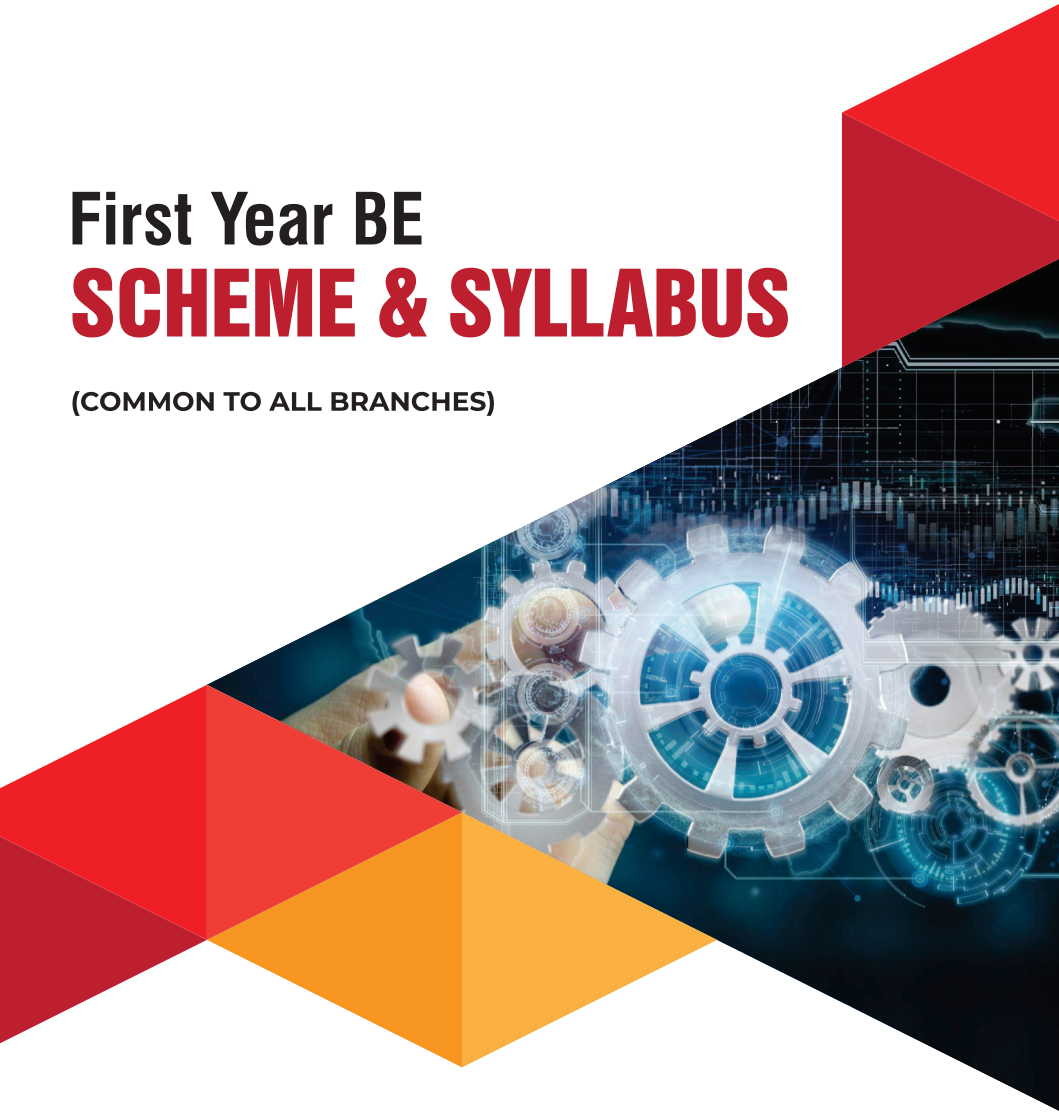
First Year BE
SCHEME & SYLLABUS

(COMMON TO ALL BRANCHES)



ST JOSEPH ENGINEERING COLLEGE

AN AUTONOMOUS INSTITUTION

Vamanjoor, Mangaluru - 575028

MOTTO

Service and Excellence

VISION

To be a global premier Institution of professional education and research

MISSION

- Provide opportunities to deserving students of all communities, the Christian students in particular, for quality professional education
- Design and deliver curricula to meet the national and global changing needs through student-centric learning methodologies
- Attract, nurture and retain the best faculty and technical manpower
- Consolidate the state-of-art infrastructure and equipment for teaching and research activities
- Promote all-round personality development of the students through interaction with alumni, academia and industry
- Strengthen the Educational Social Responsibilities (ESR) of the Institution

ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution
Vamanjoor, Mangaluru- 575028

Affiliated to VTU-Belgaum & Recognized by AICTE
NBA-Accredited: B.E. (CSE, ECE, EEE, ME, CIV) & MBA
NAAC – Accredited with grade A+

I - BE
SCHEME & SYLLABUS

COMMON TO ALL BRANCHES

Choice Based Credit System (CBCS) and
Outcome Based Education (OBE)

AUTONOMY AND ACCREDITATION

St Joseph Engineering College (SJEC) is an Autonomous Institute under Visvesvaraya Technological University (VTU), Belagavi, Karnataka State, and is recognized by the All-India Council for Technical Education (AICTE), New Delhi. SJEC is registered under the trust "Diocese of Mangalore, Social Action Department".

The SJEC has been conferred Fresh Autonomous Status from the Academic Year 2021-22. The college was granted autonomy by the University Grants Commission (UGC) under the UGC Scheme for Autonomous Colleges 2018 and conferred by VTU. The UGC Expert Team had visited the college on 28-29 November 2021 and rigorously assessed the college on multiple parameters. The fact that only a handful of engineering colleges in the state have attained Autonomous Status adds to the college's credibility that has been on a constant upswing. Autonomy will make it convenient for the college to design curricula by recognizing the needs of the industry, offering elective courses of choice and conducting the continuous assessment of its students.

At SJEC, the Outcome-Based Education (OBE) system has been implemented since 2011. Owing to OBE practised at the college, SJEC has already been accredited by the National Board of Accreditation (NBA). Five of the UG programs, namely Computer Science & Engineering, Mechanical Engineering, Electronics and Communication Engineering, Electrical & Electronics Engineering and Civil Engineering and MBA programs, have accreditation from the NBA.

Also, SJEC has been awarded the prestigious A+ grade by the National Assessment and Accreditation Council (NAAC) for five years. With a Cumulative Grade Point Average (CGPA) of 3.39 on a 4-point scale, SJEC has joined the elite list of colleges accredited with an A+ grade by NAAC in its first cycle. The fact that only 5 per cent of the Higher Education Institutions in India have bagged A+ or higher grades by NAAC adds to the college's credibility that has been on a constant upswing.

The college is committed to offering quality education to all its students, and the accreditation by NAAC and NBA reassures this fact. True to its motto of "Service and Excellence", the college's hard work has resulted in getting this recognition, which has endorsed the academic framework and policies that the college has been practising since its inception. The college has been leveraging a flexible choice-based academic model that gives students the freedom to undergo learning in respective disciplines and a transparent and continuous evaluation process that helps in their holistic development.

CONTENTS

UG Credit Distribution and Scheme

Sl. No.	Course Area	I	II	III	IV	V	VI	VII	VIII	Total
1.	BSC	8	8	3	3					**22**
2.	ESC	10	10							**20**
3.	PCC			12	12	11	10	3		**48**
4.	HSMC	1	1	1	3	5	1			**12**
5.	UHV			1	1					**02**
6.	PEC						3	6		**09**
7.	OEC						3	3		**06**
8	SDC	1	1	1	1	1	3	6	7	**21**
9.	INT			2		3			15	**20**
Total		**20**	**20**	**20**	**20**	**20**	**20**	**18**	**22**	**160**

I Semester B.E. (Physics Group)													
SI. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	21MAT101	Engineering Mathematics - I	MAT	MAT	3		2	03	50	50	100	4
2	BSC	21PHY102	Engineering Physics	PHY	PHY	2	1	1	03	50	50	100	3
3	ESC	21BEE103	Basic Electrical Engineering	EEE	EEE	2	2	0	03	50	50	100	3
4	ESC	21CIV104	Elements of Civil Engineering and Mechanics	CIV	CIV	2	2	0	03	50	50	100	3
5	ESC	21EGD105	Engineering Graphics	MEC	MEC	2	-	2	03	50	50	100	3
6	BSC	21PHL106	Engineering Physics Laboratory	PHY	PHY	-	-	2	03	50	50	100	1
7	ESC	21BEL107	Basic Electrical Engineering Laboratory	EEE	EEE	-	-	2	03	50	50	100	1
8	HSMC	21ENG108	Business Communication - I	HUM	HUM	-	1	1	02	50	50	100	1
9	SDC	21AEC109	Ability Enhancement Course - I	COM	-	-	-	2	02	50	50	100	1
10	SDC	21ITM110	Industry Oriented Training – I (Mathematical Aptitude Skills)	COM	-	-	2	-	02	50	-	50	-
					Total	**11**	**8**	**12**	**27**	**500**	**450**	**950**	**20**

I Semester B.E. (Chemistry Group)													
Sl. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	21MAT101	Engineering Mathematics - I	MAT	MAT	3		2	03	50	50	100	4
2	BSC	21CHE102	Engineering Chemistry	CHE	CHE	2	1	1	03	50	50	100	3
3	ESC	21CPS103	C-Programming for Problem Solving	CSE	CSE	2	1	1	03	50	50	100	3
4	ESC	21ELN104	Basic Electronics	ECE	ECE	2	1	1	03	50	50	100	3
5	ESC	21EME105	Elements of Mechanical Engineering	MEC	MEC	2	1	1	03	50	50	100	3
6	BSC	21CHL106	Engineering Chemistry Laboratory	CHE	CHE	-	-	2	03	50	50	100	1
7	ESC	21CPL107	C Programming Laboratory	CSE	CSE	-	-	2	03	50	50	100	1
8	HSMC	21ENG108	Business Communication - I	HUM	HUM	-	1	1	02	50	50	100	1
9	SDC	21AEC109	Ability Enhancement Course - I	COM	-	-	-	2	02	50	50	100	1
10	SDC	21ITP110	Industry Oriented Training – I (Problem solving skills)	COM	-	-	2	-	02	50	-	50	-
					Total	**11**	**7**	**13**	**27**	**500**	**450**	**950**	**20**

II Semester B.E. (Physics Group)														
Sl. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	21MAT201	Engineering Mathematics - II	MAT	MAT	3		2	03	50	50	100	4
2	BSC	21CHE202	Engineering Chemistry	CHE	CHE	2	1	1	03	50	50	100	3
3	ESC	21CPS203	C-Programming for Problem Solving	CSE	CSE	2	1	1	03	50	50	100	3
4	ESC	21ELN204	Basic Electronics	ECE	ECE	2	1	1	03	50	50	100	3
5	ESC	21EME205	Elements of Mechanical Engineering	MEC	MEC	2	1	1	03	50	50	100	3
6	BSC	21CHL206	Engineering Chemistry Laboratory	CHE	CHE	-	-	2	03	50	50	100	1
7	ESC	21CPL207	C Programming Laboratory	CSE	CSE	-	-	2	03	50	50	100	1
8	HSMC	21ENG208	Business Communication - II	HUM	HUM	-	1	1	02	50	50	100	1
9	SDC	21AEC209	Ability Enhancement Course – II	COM	-	-	-	2	02	50	50	100	1
10	SDC	21ITP210	Industry Oriented Training – II (Problem solving skills)	COM	-	-	2	-	02	50	-	50	-
					Total	**11**	**7**	**13**	**27**	**500**	**450**	**950**	**20**

Summer Internship - I: All the students admitted shall have to undergo a mandatory summer internship of minimum 03 weeks during II and III semester vacation. Summer Internship shall include Inter / Intra Institutional activities. Internship examination shall be conducted during III semesters and the prescribed credit shall be included in III semesters. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements

II Semester B.E. (Chemistry Group)													
SI. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT201	Engineering Mathematics - II	MAT	MAT	3		2	03	50	50	100	4
2	BSC	21PHY202	Engineering Physics	PHY	PHY	2	1	1	03	50	50	100	3
3	ESC	21BEE203	Basic Electrical Engineering	EEE	EEE	2	2	0	03	50	50	100	3
4	ESC	21CIV204	Elements of Civil Engineering and Mechanics	CIV	CIV	2	2	0	03	50	50	100	3
5	ESC	21EGD205	Engineering Graphics	MEC	MEC	2	-	2	03	50	50	100	3
6	BSC	21PHL206	Engineering Physics Laboratory	PHY	PHY	-	-	2	03	50	50	100	1
7	ESC	21BEL207	Basic Electrical Engineering Laboratory	EEE	EEE	-	-	2	03	50	50	100	1
8	HSMC	21ENG208	Business Communication- II	HUM	HUM	-	2	-	02	50	50	100	1
9	SDC	21AEC209	Ability Enhancement Course – II	COM	-	-	-	2	02	50	50	100	1
10	SDC	21ITM210	Industry Oriented Training – II (Mathematical Aptitude Skills)	COM	-	-	2	-	02	50	-	50	-
					Total	**11**	**9**	**11**	**27**	**500**	**450**	**950**	**20**

Summer Internship - I: All the students admitted shall have to undergo a mandatory summer internship of minimum 03 weeks during II and III semester vacation. Summer Internship shall include Inter / Intra Institutional activities. Internship examination shall be conducted during III semesters and the prescribed credit shall be included in III semesters. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent

III Semester (B.E. - XX Engineering)													
Sl. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	21MAT301	Engineering Mathematics - III	MAT	MAT	2	2		03	50	50	100	3
2	PCC	21XXX302	Professional Core Course (Integrated)			3		2	03	50	50	100	4
3	PCC	21XXX303	Professional Core Course (Integrated)			3		2	03	50	50	100	4
4	PCC	21XXX304	Professional Core Course			2	2		03	50	50	100	3
5	PCC	21XXL305	Professional Core Lab			-	-	2	03	50	50	100	1
6	UHV	21UHV306	Universal Human Values - I			-	2		02	50	50	100	1
7	INT	21INT307	Summer Internship - I						03	50	50	100	2
8	SDC	21AEC308	Ability Enhancement course - III	COM		-	-	2	02	50	50	100	1
9	HSMC	21KVK309	Balake Kannada (Kannada for communication)/			--	2	--	02	50	50	100	1
		21KAK309	Saamskrutika Kannada (Kannada for Administration)										
		21CPC309	Constitution of India, Professional Ethics and Cyber Law			1	--	--					
10	SDC	21IOT310	Industry Oriented Training – III			-		2		50	-	50	-
					Total	10 **OR** **11**	8 **OR** **6**	10	24	**500**	**450**	**950**	**20**
11	MNCC	21ADM311	Additional Mathematics- I	MAT	MAT	2	1		03	50	50	100	-
12	HSMC	21ENG312	Business Communication	ENG			2		02	50	50	100	-

IV Semester (B.E. - XX Engineering)													
Sl. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/Drawi**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	21MAT401	Engineering Mathematics - IV	MAT	MAT	2	2		03	50	50	100	3
2	PCC	21XXX402	Professional Core Course (Integrated)			3		2	03	50	50	100	4
3	PCC	21XXX403	Professional Core Course (Integrated)			3		2	03	50	50	100	4
4	PCC	21XXX404	Professional Core Course			2	2		03	50	50	100	3
5	PCC	21XXX405	Professional Core Lab					2	03	50	50	100	1
6	UHV	21UHV406	Universal Human Values – II	COM			2		02	50	50	100	1
7	HSMC	21BFE407	Biology for Engineers			2	-	-	03	50	50	100	2
8	SDC	21AEC408	Ability Enhancement Course - IV	COM				2	02	50	50	100	1
9	HSMC	21KVK409	Balake Kannada (Kannada for communication)/			--	2	--	02	50	50	100	1
		21KAK409	Saamskrutika Kannada (Kannada for Administration)										
		21CPC409	Constitution of India, Professional Ethics and Cyber Law			1	--	--					
10	SDC	21IOT410	Industry Oriented Training – IV	COM		-		2		50	-	50	-
					Total	12 OR **13**	8 OR **6**	10	25	**500**	**450**	**950**	**20**
11	MNCC	21ADM411	Additional Mathematics- II	MAT	MAT	2	1		03	50	50	100	-

Summer Internship-II: All the students admitted shall have to undergo mandatory internship of minimum 04 weeks during the IV and V semester vacation. Summer Internship shall be Carried Out – based on industrial/ Govt./NGO /MSME/ Rural Internship /Innovation/Entrepreneurship, Credited in V Semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements.

V Semester (B.E. - XX Engineering)														
Sl. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	HSMC	21XXX501	Construction Management & Entrepreneurship (CIV) or Management and Economics (MECH) or Management and Entrepreneurship for IT Industry (CSE/AIML) or Technological Innovation Management and Entrepreneurship (ECE)or Management and Entrepreneurship (EEE)			3	-	--	03	50	50	100	3
2	PCC	21XXX502	Professional Core Course (Integrated)			3		2	03	50	50	100	4
3	PCC	21XXX503	Professional Core Course			2	2		03	50	50	100	3
4	PEC	21XXX504	Professional Core Course			2	2	-	03	50	50	100	3
5	PCC	21XXL505	Professional Core Lab					2	03	50	50	100	1
6	HSMC	21XXX506	Research Methodology and Intellectual Property Rights			1	2		03	50	50	100	2
7	INT	21INT507	Summer Internship - II						03	50	50	100	3
8	SDC	21AEC508	Ability Enhancement Course - V	COM		-	-	2	02	50	50	100	1
9	SDC	21IOT509	Industry Oriented Training – V	COM		-	2	-	02	50	-	50	-
					Total	**11**	**8**	**6**	**25**	**450**	**400**	**850**	**20**

VI Semester (B.E. - XX Engineering)													
Sl. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	PCC	21XXX601	Professional Core Course (Integrated)			3		2	03	50	50	100	4
2	PCC	21XXX602	Professional Core Course			2	2		03	50	50	100	3
3	PEC	21XX603X	Professional Elective -1			2	2		03	50	50	100	3
4	OEC	21XX604X	Open Elective -1			2	2		03	50	50	100	3
5	HSMC	21CIV605	Environmental Studies	CIV	CIV	1	--	--	02	50	50	100	1
6	PCC	21XXL606	Professional Core Lab				-	2	03	50	50	100	1
7	PCC	21XXX607	Program specific course on program Solving			2	-	-	03	50	50	100	2
8	SDC	21XXX608	Mini-Project/ Extensive Survey Project			--			03	50	50	100	2
9	SDC	21AEC609	Ability Enhancement Course - VI	COM		-	-	2	02	50	50	100	1
10	SDC	21OT610	Industry Oriented Training – VI	COM		-		2	02	50	-	50	-
Total						**12**	**06**	**8**	**27**	**500**	**450**	**950**	**20**

VII Semester (B.E. - XX Engineering)														
SI. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical /Drawin	Duration in hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	PCC	21XXX701	Professional Core course			2	2		03	50	50	100	3
2	PEC	21XX702X	Professional Elective - 2			2	2		03	50	50	100	3
3	PEC	21XX703X	Professional Elective - 3			2	2		03	50	50	100	3
4	OEC	21XX704X	Open Elective - 2			2	2		03	50	50	100	3
5	SDC	21XXS705	Technical Seminar			--	--	-		100	--	100	1
6	SDC	21XXP706	Final Project (Phase I & II)					12		50	50	100	5
7	SDC	--	Research / Industry Internship	During the vacation									
Total						**8**	**8**	**12**	**12**	**350**	**250**	**600**	**18**

Research/Industrial Internship - All the students admitted shall have to undergo a mandatory internship of minimum 24 weeks during the VII or VIII semester. Viva-Voce examination shall be conducted during VIII semester and the prescribed credit shall be included. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements.

Research internship Students have to take up research internships at Centers of Excellence (CoE) / Study Centers established in the same institute and /or out of the institute at reputed research organizations / Institutes. A research internship is intended to give you the flavour of current research going on a particular topic/s. The internships serve this purpose. They help students get familiarized with the field, the skill needed the effort amount and kind of effort required for carrying out research in that field.

VIII Semester (B.E. - XX Engineering)													
Sl. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	SDC	21AEC801	MOOC	Any MOOC topic (Choices are given by respective department) with minimum 8 weeks to be completed between III Sem to VII Sem								100	2
2	SDC	21XXP802	Project Work (Final presentation and report submission)			--	--	-	03	50	50	100	5
3	INT	21INT803	Research / Industry Internship						03	50	50	100	15
					Total		--		**06**	**100**	**100**	**200**	**22**

Note: BSC: Basic Science Courses; ESC: Engineering Science Courses; HSMC: Humanity, Social Science and Management Courses; MNCC = Mandatory Non-Credit Course. INT: Internship	PCC: Professional Core Course; PEC = Professional Elective Course; OEC = Open Elective Course; UHV: Universal Human Values SDC: Ability Enhancement (Skill Development) Course
Credit Definition	One-hour Lecture (L) per week per semester = 1 Credit Two-hour Tutorial (T) per week per semester = 1 Credit Two-hour Practical/Laboratory/Drawing (P) per week per semester = 1 Credit Four hours of Self-study = 1 Credit

Note:

21KVK309/409 Balake Kannada (Kannada for communication) is prescribed for students who have not studied Kannada at any level of schooling (State/Central-CBSC/ICSE) and are not able to speak, write, read and understand Kannada.

21KAK309/409 Saamskrutika Kannada (Kannada for Administration) is prescribed for students who satisfy any one of the following.

i. Studied 1 – 10th standard in Kannada medium
ii. Studied Kannada as first or second language during high school and cleared SSLC examination
iii. Studied Kannada at any level of schooling and are able to speak, write and read Kannada.
iv. Passed diploma or certificate course in Kannada conducted by a university established by law in India
v. Passed Kava, Jana and Rathna examinations conducted by Kannada Sahithya Parishat
vi. Passed the SSLC examination or any other examination declared as equivalent thereto by the state government or any examinations higher than SSLC examination a) in which the question papers on different subjects are answered in Kannada language of b) in which Kannada was the main or second language or an optional subject but not one of the subjects in a composite paper

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

(a)The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B.Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfil the requirements during subsequent semester/s to appear for SEE.

(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree

Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs

Lateral entrant students from B.Sc. Stream, shall clear the Mandatory non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE Activity Points to be earned by students admitted to BE/B.Tech/B. Plan day college programme (For more details refer to Chapter6, AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, every student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to fifth semester are required to earn 50 Activity Points from the year of entry. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours' requirement should be fulfilled. Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

Open Electives 1 & 2

Students can select any one of the open electives offered by other Departments except those that are offered by the parent Department (Please refer to the list of open electives).

Selection of an open elective shall not be allowed if,

The candidate has studied the same course during the previous semesters of the program.

The syllabus content of open elective is similar to that of the Departmental core courses or professional electives.

A similar course, under any category, is prescribed in the higher semesters of the program.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Advisor/Mentor.

Open Elective –1							
Course code	**CSE**	**AIML**	**CSBS**	**ECE**	**EEE**	**Mech**	**Civil**
21XX6041	Introduction to Database	Neural Networks	Introduction to Business Communication and Value Science	Basics of Analog Circuits	Renewable Energy Sources	Automobile Engineering	Remote sensing and GIS applications
21XX6042	Programming in Java	Introduction to AI & ML	Introduction to Statistical Software (MATLAB and SPSS)	Fundamentals of Digital System Design	PLC & SCADA	3D modelling	Numerical methods and applications
21XX6043	Dot Net Programming	Computer Vision	Introduction to Web Technology	Microcontroller	Industrial Servo Control Systems	Entrepreneurship Development	Sustainability concepts in Engineering
21XX6044	Business Intelligence	Predictive Analytics	Mobile Computing	Programming & Interfacing with Arduino	Control Systems	Total Quality Management	Occupational health and safety
21XX6045	Introduction to Data Structures	System Modeling Simulation	Software Engineering	Communication Theory	Battery Management System	Non-Destructive Testing	

Open Elective –2							
Course code	**CSE**	**AIML**	**CSBS**	**ECE**	**EEE**	**Mech**	**Civil**
21XX7041	Application Development Using Python	Deep Learning	User Interface Design	Internet of Things	Electric Vehicle Technology	Industrial Safety	Finite Elemental methods
21XX7042	Introduction to Data Science	Robotics Process Automation	Introduction to Cloud Computing	Sensors and Signal Conditioning	Energy conservation & Audit	Energy Auditing	Intelligent transportation Engineering
21XX7043	Web Application Development	Soft Computing	Python Programming	Real Time System	Electrical Power Quality	Maintenance Engineering	Environmental protection and management
21XX7044	Introduction to Big Data	Natural Language Process	Big Data Analytics	Signal Processing	Industrial Electrical Systems	Advance Machining Process	Water resource management
21XX7045	Introduction to Cyber Security	Internet of Things	Artificial Intelligence	ARM Embedded Systems	Disasters Management	Nanoscience and technology	

Professional Electives: Students can select any one of the professional electives offered by the Departments.
(Please refer to the list of open electives).

Professional Elective - 1							
Course code	**CSE**	**AIML**	**CSBS**	**ECE**	**EEE**	**Mech**	**Civil**
21XX6031	Discrete Mathematical Structures	Discrete Mathematical Structures	Human Resource Management	Control Systems	Electrical & Electronics Instrumentation	Tribology	Solid Waste Management
21XX6032	Data Mining and Data Warehousing	Advanced Java	Introduction to Innovation IP Management and Entrepreneurship	Object Oriented Programming Using C++	Embedded System	Refrigeration and Air-Conditioning	Ground Improvement Techniques
21XX6033	Advanced Java	Blockchain Technology	Business Strategy	Verilog HDL	Sensors & Transducers	Theory of Elasticity	Basics of offshore Engineering
21XX6034	Blockchain Technology	Dot Net Programming	Expert System and Decision support system	Microwave and Antennas	High Voltage Engineering	Fuel cell and its Application	Design concepts of Building services
21XX6035	Agile Technology		Soft and Evolutionary Computing	Power Electronics	Electrical Machine Design	Composite Materials Technology	Advanced RCC

Professional Elective - 2							
Course code	**CSE**	**AIML**	**CSBS**	**ECE**	**EEE**	**Mech**	**Civil**
21XX7021	Software Testing	Software Testing	Marketing Research and Marketing Management	Digital Image Processing	HVDC & FACTS	Design for Manufacturing	Municipal wastewater Engineering
21XX7022	Parallel Computing	High Performance Computing	Computational Finance & Modelling	Machine Learning	Electric Vehicle Design	Automation and Robotics	Alternative Building Materials
21XX7023	NO SQL database	NOSQL database	Web and Mobile Application development + Lab	Computer Communication Networks	Renewable Energy Sources	Artificial Intelligence for Mechanical Engineers	Railway, Harbour, Tunnel and Airports
21XX7024	Computer Vision	Computer Vision	Dot net framework for Application Development	Optical Communication Networks	Power System and Operation Control	Theory of Plasticity	Matrix Method of Analysis
21XX7025	Semantic Web and Social Networks	Semantic Web and Social Networks	Enterprise systems	Advanced Digital System Design	Reactive Power Control in Electric Power Systems	Operations Research	Ground water hydraulics

Professional Elective - 3							
Course code	**CSE**	**AIML**	**CSBS**	**ECE**	**EEE**	**Mech**	**Civil**
21XX7031	Advanced Web Technology	Advanced Web Technology	Usability Design of Software + Lab	IOT & Wireless Sensor Networks	Industrial Drives & Applications	Additive Manufacturing	Design of Prestressed concrete structures
21XX7032	Augmented and Virtual Reality	Business Analytics	Cryptography and Network Security	Data Structures using C++	Micro and Nano Scale Sensors & Transducers	Project Management	Urban Transport Planning
21XX7033	Deep learning	Soft Computing	Data Mining and Data Warehousing	Cyber Security	Computer Aided Electrical Drawing	Mechatronics	Earthquake Engineering
21XX7034	Soft Computing	Natural Language Processing	Behavioral Economics	Biomedical Signal Processing	ANN with applications to Power Systems	Fluid Power Engineering	Bridge Engineering
21XX7035	Natural Language Processing		Web and Cyber Security	ARM Embedded Systems	Big Data Analytics in Power Systems	Product Life Cycle Management	Pavement Design

Project work:

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Project Work Phase - 1:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work phase -1, shall be based on the evaluation of the project work phase -1 Report (covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the Project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable.

The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report (covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

CIE procedure for Project Work Phase - 2:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded fortheprojectworkphase-2, shallbebasedontheevaluationofprojectworkphase-2Report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE for Project Work Phase - 2:

(i) Single discipline: Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department.

(ii) Interdisciplinary: Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belongs to.

Internship: Those, who have not pursued /completed the internship, shall be declared as fail and have to complete during subsequent examination after satisfying the internship requirements.

Engineering Mathematics - I

Course Code	**21MAT101**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(3:0:2)**	**SEE Marks**	**50**
Credits	**04**	**Exam Hours**	**03**

Course Learning Objectives:

1. To familiarize the techniques of calculus, vector analysis and linear algebra to engineering students.
2. To equip the students with standard concepts and tools that will help them in solving advanced levels of problems in their discipline of engineering.

Module-1

Differential Calculus: Polar curves, angle between the radius vector and the tangent, angle of intersection, length of the perpendicular from the pole to the tangent, pedal equation.

Partial Differentiation: Partial derivatives, Euler's theorem. Total derivative, differentiation of composite and implicit functions. Experiential learning using MATLAB.

Self-Study: Jacobians. Tracing of Polar curves **10 Hours**

Module-2

Linear Algebra: Rank of matrices -Rank of a matrix by Echelon form, consistency of system of linear equations-homogeneous and non-homogeneous equations, Gauss–Jordan and Gauss -Seidel methods. Eigenvalues and Eigenvectors-properties, largest Eigenvalue by Rayleigh's power method. Diagonalization of a square matrix of order two. Experiential learning using MATLAB.

Self-Study: Diagonalization of square matrix of order three **10 Hours**

Module-3

Vector differentiation: Vector functions of a single variable, derivative of a vector function, velocity and acceleration, unit tangent. Scalar and vector functions, gradient of a scalar field, directional derivative, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, scalar potential. Physical interpretation of divergence, physical interpretation of curl. Experiential learning using MATLAB.

Self-Study: Vector identities (for a vector field A and a scalar field ϕ) - div(ϕA), curl (ϕA), curl (grad ϕ), div (curl A). **10 Hours**

Module-4
Calculus: Rolle's Theorem (without proof), Mean Value Theorems (Lagrange's & Cauchy's), Taylor's and Maclaurin's theorems with remainders, indeterminate forms and L'Hospital's rule (Exponential form only). Experiential learning using MATLAB. **Self Study:** Maxima and minima for function of two variables**.** **10 Hours**
Module-5
First order ordinary differential equations: Exact and reducible to exact, Bernoulli's equations, Application of ODE's - orthogonal trajectories, Newton's law cooling **Nonlinear differential equations of first order**: Equations solvable for p and Clairaut's equation. Experiential learning using MATLAB. **Self Study**: Application of DE to LR circuits. **10 Hours**

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

21MAT101.1	Plot polar curve and find pedal equation for a polar curve.
21MAT101.2	Apply the knowledge of calculus to find partial derivative of different types of functions.
21MAT101.3	Compare the analytical method and iterative numerical methods of solving the system of equations.
21MAT101.4	Differentiate between solenoidal and irrotational vectors.
21MAT101.5	Compute Taylor's, Maclaurin's series expansion for function of single variable.
21MAT101.6	Classify the given first order differential equations and apply it to find orthogonal trajectories.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Higher Engineering Mathematics	Dr B.S. Grewal	Khanna Publishers	44th Edition, ISBN No.:978-81-933284-9-1
2	Advanced Engineering Mathematics	H. C. Taneja	I.K. International Publishing House Pvt. Ltd.	ISBN No.:978-93-82332-64-0

Reference Books				
1	Advanced Engineering Mathematics – Volume I	E. Kreyszig John Wiley & Sons	Wiley Precise Textbook Series	ISBN No.: 978-81-265-5120-0
2	Advanced Engineering Mathematics – Volume II	E. Kreyszig John Wiley & Sons	Wiley Precise Textbook Series	ISBN No.: 978-81-265-5121-7
3	"Higher Engineering Mathematics"	B.V.Ramana 11th Edition	Tata McGraw-Hill, 2010	ISBN No.: 978-0-07-063419-0
4	Calculus and Analytic Geometry	G.B Thomas and R. L. Finney, 9th edition	Pearson education	ISBN No.: 81-7808-160-1
5	Advanced Engineering Mathematics	Peter V. O'Neil	International student edition	ISBN No.: 978-81-315-0310-2

Web links/Video Lectures/MOOCs

1. https://www.youtube.com/watch?v=6tQTRlbkbc8 - Module I
2. https://www.youtube.com/watch?v=0woWVGcedZ4 - Module II
3. https://www.youtube.com/watch?v=ma1QmE1SH3I - Module III
4. https://youtu.be/3d6DsjIBzJ4-Module IV
5. https://youtu.be/_Ob7BW7Mo-A - Module V

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
21MAT101.1	3	-	1		2							
21MAT101.2	-	3			2							
21MAT101.3	3	-	1		2							
21MAT101.4	-	3			2							
21MAT101.5	3	-			2							
21MAT101.6	-	3	1		2							

1: Low 2: Medium 3: High

Engineering Mathematics-II

Course Code	21MAT201	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	04	Exam Hours	03

Course Learning Objectives:

1. To familiarize the techniques of calculus, differential equations to analyze the engineering problems.
2. To apply the knowledge of numerical methods and Laplace transforms to solve problems in engineering.

Module-1

Linear Ordinary Differential Equations of Higher Order: Standard form of higher order linear differential equation with constant coefficients, Concept of different types of solutions. Solution of homogeneous equations.

Non homogeneous equations- Concept of Inverse differential operator (P.I restricted to $R(x) = e^{ax}$, $sinax$ or $cosax$, x^m for $f(D)y = R(x)$) method of variation of parameters. Experiential learning using MATLAB.

Self-Study: Cauchy and Legendre differential equations and its solutions. **10 Hours**

Module-2

Partial differential equations: Introduction, Formation of PDE, Solution of PDE by direct integration method, Solution of PDE involving derivatives with respect to one independent variable only, and variable separable method. Solution of One dimensional heat and One dimensional wave equation by using variable separable method. Experiential learning using MATLAB.

Self Study: Derivation of One dimensional heat and One dimensional wave equation **10 Hours**

Module-3

Integral Calculus: Evaluation of Double and Triple integrals, Change of Order of Integration, Change to polar Coordinates.

Beta - Gamma Functions: Definition, Relation between Beta and Gamma Functions, Duplication Formula (without proof), Simple Problems. Experiential learning using MATLAB.

Self-study: Applications of double integrals to find area and volume

10 Hours

Module-4

Laplace Transform: Definition and Existence conditions. Laplace transforms of elementary functions, Linearity and Shifting properties (statements only). Properties: s-shifting, differentiation, and Integration of transform (statements only). Transforms of Derivatives and Integrals (statements only). Laplace transforms unit – step function – problems.

Inverse Laplace Transform: Definition and problems [completing the square, Partial Fraction]. Solution of linear differential equations using Laplace transforms. Experiential learning using MATLAB.

Self-Study: Convolution theorem to find the inverse Laplace transforms

10 Hours

Module-5

Numerical Methods: Solution of Algebraic and Transcendental equations – Roots of equations, intermediate value property, Regula- Falsi Method, Newton – Raphson method.

Numerical solution of first order ordinary differential equations: Modified Euler's method, Adams Bashforth predictor – corrector method**.** Experiential learning using MATLAB.

Self-Study: 4th order Runge – Kutta method **10 Hours**

Course Outcomes:

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

21MAT201.1	Classify higher order linear differential equations as linear homogeneous, linear non homogeneous, with constant & variable coefficients and solve them.
21MAT201.2	Categorize and solve partial differential equations.
21MAT201.3	Recognize heat and wave equations and solve them.

21MAT201.4	Apply the method of change of order, change of variables, Beta & Gamma functions to evaluate multiple integrals.
21MAT201.5	Relate the concept of Laplace Transforms with differential equations.
21MAT201.6	Apply the knowledge of numerical methods to solve first and second order differential equations arising in engineering problems.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	Dr B.S. Grewal – 44th Edition	Khanna Publishers	ISBN No.:978-81-933284-9-1
2	Advanced Engineering Mathematics	H. C. Taneja	I.K. International Publishing House Pvt. Ltd.	ISBN No.:978-93-82332-64-0
Reference Books				
1	Advanced Engineering Mathematics - Volume I	E. Kreyszig John Wiley & Sons	Wiley Precise Textbook Series	ISBN No.: 978-81-265-5120-0
2	Advanced Engineering Mathematics – Volume II	E. Kreyszig John Wiley & Sons	Wiley Precise Textbook Series	ISBN No.: 978-81-265-5121-7
3	"Higher Engineering Mathematics"	Tata McGraw-Hill, 2010	B.V.Ramana 11th Edition	ISBN No.: 978-0-07-063419-0
4	Calculus and Analytic Geometry	G.B Thomas and R. L. Finney, 9th edition	Pearson education	ISBN No.: 81-7808-160-1
5	Advanced Engineering Mathematics	Peter V. O'Neil	International student edition	ISBN No.: 978-81-315-0310-2

Web links/Video Lectures/MOOCs

1. https://www.youtube.com/watch?v=OBhZvyhc8JQ – Module I
2. https://www.youtube.com/playlist?list=PLhSp9OSVmeyJoNnAqghUK-Lit3qBgfa6o-Module II
2. https://www.youtube.com/watch?v=UubU3U2C8 WM – Module III
3. https://youtu.be/iM-NM__HSdY – Module IV
5. https://www.youtube.com/watch?v=f_EqOpgRwRM – Module V

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
21MAT201.1	-	3	-	-	2	-	-	-	-	-	-	-
21MAT201.2	3	-	1	-	-	-	-	-	-	-	-	-
21MAT201.3	-	-	-	-	2	-	-	-	-	-	-	-
21MAT201.4	3	-	-	-	2	-	-	-	-	-	-	-
21MAT201.5	-	3	1	-		-	-	-	-	-	-	-
21MAT201.6	3	-	-	-	2	-	-	-	-	-	-	-

1: Low 2: Medium 3: High

ENGINEERING PHYSICS

Course Code	21PHY102/202	CIE Marks	50
Teaching hours/Week (L:T:P)	2:1:1	SEE Marks	50
Credits	03	Exam hours	03

COURSE OBJECTIVES:

The objectives of this course is to

1. Demonstrate competency and understanding of the basic concepts in Physics.
2. Develop problem solving skills and implementation in technology.

Module 1: Quantum Mechanics and Lasers

Quantum Mechanics: Introduction to black body and dual nature of matter. Introduction to Quantum mechanics. Heisenberg's uncertainty principle and its application (Non-confinement of electron in the nucleus). Wave function. One dimensional time independent Schrodinger wave equation. Significance of wave function, normalization. Particle in a box, energy eigen values of a particle in a box and probability densities.

Lasers: Review of spontaneous and stimulated processes. Einstein's coefficients (expression for energy density). Requisites of a Laser system. Condition for laser action. Principle, construction and working of CO_2 laser. Applications of Laser in engineering (data storage). Numerical problems.

Self-study: Semiconductor Laser **8 Hours**

Module 2 : Material Science

Quantum free electron theory of metals: Review of Classical free electron theory-mention of failures. Assumptions of Quantum free electron theory. Mention of expression for density of states, Fermi–Dirac Statistics (qualitative), Fermi factor, Fermi level. Derivation of the expression for Fermi energy at 0 K, Success of QFET

Semiconductor Physics: Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band and holes in valence band, Relation between fermi energy and energy gap of intrinsic semiconductor, Expression for electrical conductivity of semiconductors.

Superconductors:

Characteristic properties, Effect of magnetic field (Meissner effect). Classification of superconductors, Applications of superconductors – Superconducting magnets, Maglev vehicles, lossless power transmission. Numerical problems.

Self Study: Dielectrics and its applications

8 Hours

Module 3: Oscillations and Waves

Free oscillations: Definition of simple harmonic motion (SHM), derivation of equation for SHM. Mechanical simple harmonic oscillators (mass suspended to spring oscillator). Equation of motion for free oscillations, natural frequency of oscillations.

Damped and forced oscillations: Theory of damped oscillations: over damping, critical & under damping. Theory of forced oscillations and resonance.

Shock waves: Mach number, distinctions between- acoustic, ultrasonic, subsonic and supersonic waves. Properties of shock waves. Construction and working of Reddy shock tube, Applications of shock waves. Numerical Problems

Self Study: Applications of forced and damped oscillations **8 Hours**

Module 4: Elastic Properties of Materials

Elasticity: Concept of elasticity, plasticity, Hooke's law, different elastic moduli, Poisson's ratio. Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (η) in terms of α and β. Relations between Y, η and K. Limits of Poisson's ratio.

Bending of beams(Qualitative): Neutral surface and neutral plane, derivation of expression for bending moment. Bending moment of a beam with circular and rectangular cross sections. Single cantilever.

Torsion of cylinder: Expression for couple per unit twist of a solid cylinder (derivation). Torsion pendulum–expression for period of oscillation. Numerical problems.

Self-study: Factors affecting elasticity and applications of elastic materials engineering **8 Hours**

Module 5: Maxwell's Equations and Optical Fibers

Maxwell's equations: Fundamentals of vector calculus, Divergence and Curl of electric field and magnetic field (static), Gauss' divergence theorem, Stokes' theorem, Description of laws of electrostatics, magnetism, Faraday's laws of EMI. Current density and equation of continuity, displacement current. Maxwell's equations in static and time varying fields.

Optical Fibers: Propagation mechanism in optical fibers. Angle of acceptance, numerical aperture. Types of optical fibers and modes of propagation. Attenuation - causes of attenuation, attenuation coefficient, Applications - Block diagram discussion of point to point communication. Merits and demerits. Numerical problems.

Self-Study: EM waves and types of polarizations **8 Hours**

Experiential Learning:
Verification of Stefan's law
Determination of Fermi Energy
Determination of spring constant in series and parallel combinations
Determination of M.I. and Rigidity modulus using Torsional pendulum.
Determination of Numerical aperture

Course Outcomes: After the completion of the course, the student will be able to	
21PHY102.1	Describe wave particle dualism using Time independent 1-D Schrodinger's wave equation, construction and working of different types of lasers and its applications in different fields.
21PHY102.2	Evaluate various electrical and thermal properties of materials like conductors, semiconductors and superconductors using different theoretical models
21PHY102.3	Explain various types of waves and oscillations and their implications
21PHY102.4	Interpret the various elastic properties of materials for engineering applications.
21PHY102.5	Realize the interrelation between time varying electric field and magnetic field
21PHY102.6	Enumerate the properties, types and applications of optical fibers

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition & Year
Textbooks				
1	A Text Book of Engineering Physics	M N Avadhanulu and PGK shirsagar	S Chand & Company Ltd, New Delhi	10th Revised Ed
2	A Detailed Text Book of Engineering Physics	S P Basavaraju	Subhas Stores, Bangalore,	2018
3	Engineering Physics	Gaur and Gupta	Dhanpat Rai Publications	2017
Reference Books				
1	Solid State Physics	S O Pillai	New Age International Publishers	8th Ed: 2018

2	Shock waves made simple	Chintoo S Kumar,K Takayama and K P J Reddy	Willey India Pvt. Ltd., New Delhi	2014
3	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill Edu Pvt Ltd, New Delhi,	6th Ed, 2006
4	Introduction to Mechanics	MK Verma,	University Press (India) Pvt Ltd, Hyderabad,	2nd Ed, 2009
5	Introduction to Electrodynamics	David Griffiths	Cambridge University Press,	4th Ed, 2017
6	Lasers and Non Linear Optics	B B Laud	New Age International Publishers,	3rd Ed, 2011

Web links/Video Lectures/MOOCs

1. https://www.youtube.com/watch?v=2Oswmij538Q
2. https://www.youtube.com/watch?v=1LmcUaWuYao&t=72s
3. https://www.youtube.com/watch?v=_JOchLyNO_w
4. https://www.youtube.com/watch?v=ST0QlbytnBQ
5. https://www.youtube.com/watch?v=qxSP7kv1JCQ
6. https://www.youtube.com/watch?v=yAIb3T9DPyE
7. https://www.youtube.com/watch?v=zc3b6LdDFtY&t=221s
8. https://www.youtube.com/watch?v=6Nj2oqayIYc
9. https://www.youtube.com/watch?v=8YkfEft4p-w

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21PHY102.1	2		-	-	-	-	-	-	-	-	-	1	-	-
21PHY102.2	2		-	-	-	-	-	-	-	-	-	1	-	-
21PHY102.3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
21PHY102.4	2	1	-	-	-	-	-	-	-	-	-	1	-	-
21PHY102.5	1		-	-	-	-	-	-	-	-	-	1	-	-
21PHY102.6	1	2	-	-	-	-	-	-	-	-	-	1	-	-

1: Low 2: Medium 3: High

ENGINEERING CHEMISTRY

Course Code	**21CHE102/202**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(2:1:1)**	**SEE Marks**	**50**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives: This course (21CHE102/202) will enable students to

1. Master the basic knowledge of engineering chemistry for building technical competence in industries, research and development.
2. To develop knowledge in the fields of electrochemistry and energy storage systems, corrosion and metal finishing.
3. To understand the importance of energy systems, environmental pollution, waste management, water chemistry, polymers and nanomaterials.

Module-1

Electrochemistry and energy storage systems:

Introduction, EMF of the cell, Free Energy, Single electrode Potential-Derivation of Nernst equation, Numerical problems based on Nernst Equation. Concentration cells and Numerical problems.

Reference Electrodes: Introduction, construction, working and applications of calomel electrode, ion- selective Electrodes-Glass electrode, determination of pH using a Glass electrode.

Energy Storage Systems: Introduction, Classification of batteries (primary, secondary, and reserved batteries). Construction, working, and applications of Sodium ion and Li-ion batteries. Advantages of Li- ion battery as an electrochemical energy system for electric vehicles. Recycling of Lithium-ion batteries including green methods of recycling (Hydro metallurgical, Pyro metallurgical and Direct methods)

(RBT Levels: L2, L3, L4) **8 Hours**

Teaching-Learning Process	Electrochemistry and energy systems-chalk and talk method, PowerPoint presentation, Practical topic: Determination of pKa value of weak acid using a glass electrode. Energy storage Systems-Power point presentation, YouTube videos for Li-ion battery construction and working. **Self-study material:** Construction and working of Lead-acid battery, Leclanche cell and Silver-silver chloride electrode. Solar Energy and Fuel cells-you tube videos, chalk, and talk method.
Module-2	
Corrosion and its control: Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of the medium – pH, conductivity and temperature. Types of corrosion - Differential metal and differential aeration (pitting and waterline). Corrosion control: Anodizing – Anodizing of aluminum, Cathodic protection – a sacrificial anode and impressed current methods, Metal coatings – galvanization and tinning, Organic coating. Galvanization and tinning. Corrosion Penetration Rate (CPR), numerical problems on CPR. **Metal finishing:** Introduction, Technological importance. Electroplating: Introduction, principles governing Electroplating-Polarization, decomposition potential, and overvoltage. Electroplating of chromium (hard and decorative). Electroless plating: Introduction, the distinction between electroplating and electroless plating processes. Electroless plating of copper. **(RBT Levels: L3, L4)** **8 Hours**	
Teaching-Learning Process	Chalk and talk method and PowerPoint presentation - Electrochemical theory of corrosion, Factors affecting the rate of corrosion, Types of corrosion and corrosion control. Technological importance. Electroplating: Introduction, principles governing electro-plating-Polarization, decomposition potential, and overvoltage. **Videos:** Electroplating of chromium, electroless plating of nickel & copper **Self-learning material:** Anodic and cathodic inhibitors

Module-3

Green Chemistry and alternative energy resources

Introduction, definition, Major environmental pollutants, Basic twelve principles of green chemistry. Various green chemical approaches – Microwave synthesis, Bio catalyzed reactions, Phase transfer catalysis. Supercritical conditions for solvent-free reactions. Synthesis of typical organic compounds by conventional and green route; i) Adipic acid ii) Paracetamol

Atom economy – Synthesis of Ethylene oxide & Methyl Methacrylate. Industrial applications of green chemistry, Numerical problems on Atom economy.

Green fuel: Hydrogen-production (Photo electro-catalytic and photocatalytic water splitting), storage and applications in hydrogen fuel cells. Construction, working and applications of Methanol-Oxygen fuel cell (H_2SO_4 as electrolyte).

Solar Energy: Introduction, construction, working, and applications of a photovoltaic cell. Brief introduction of organic solar cells.

(RBT Levels: L3) **8 Hours**

Teaching-Learning Process	Chalk and talk/PowerPoint presentation - Basic principles of green chemistry, Hydrogen-production and applications in hydrogen fuel cells, Solar Energy. **Videos:** Various green chemical approaches, working of Methanol-Oxygen fuel cell, working of PV cell. **Self-study material:** Sono-chemical synthesis and Sold-phase synthesis.

Module-4

Environmental Pollution: Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and sulphur, hydrocarbons, Particulate matter, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion.

Waste Management: Solid waste, e-waste & biomedical waste: Sources, characteristics & disposal methods (Scientific land filling, composting, recycling and reuse).

Water Chemistry: Introduction**,** sources and impurities of water; boiler feed water, boiler troubles with disadvantages -scale and sludge formation, boiler corrosion (due to dissolved O_2, CO_2 and $MgCl_2$). Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry). Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of seawater by reverse osmosis.

(RBT Levels: L3, L4) **8 Hours**

Teaching-Learning Process	Chalk and talk/PowerPoint presentation – Air pollutants – Primary pollutants and Secondary pollutants its sources, effects and control. Segregation steps of Waste management, Water chemistry and its treatment. **Videos:** Various methods of control of pollutants and its approaches, Waste management techniques and treatment of water. **Self-study material:** Green House effect, Electrodialysis, composting using bio-enzymes.

Module-5

Polymers: Introduction, types of polymers: addition and condensation. Glass transition temperature (T_g), Structure property relationship: crystallinity, tensile strength, elasticity & chemical resistivity.

Synthesis, properties and applications of PMMA (plexi glass), Polyurethane and polycarbonate.

Elastomers: Introduction, synthesis, properties and applications of Silicone rubber. **Adhesives:** Introduction, synthesis, properties and applications of epoxy resin. **Polymer Composites:** Introduction, synthesis, properties and applications of Kevlar.

Conducting polymers: Introduction, mechanism of conduction in Polyaniline and applications of conducting polyaniline.

Nanomaterials: Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: Top down and bottom up approaches,

Synthesis by Sol-gel and precipitation, Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications.

(RBT Levels: L3) **8 Hours**

Teaching-Learning Process	Chalk and talk/PowerPoint presentation - Basic principles of synthesis of polymers, size dependent properties of nanomaterials. Nanoscale materials. **Videos:** Various methods of synthesis for polymers, Synthesis of nanomaterials: Top-down and bottom-up approaches, Synthesis by Sol-gel, precipitation and chemical vapor deposition. **Self-study material:** Classification of polymers, Advantage of synthetic rubber over natural rubber.

Course Outcomes: At the end of the course the student will be able to:	
21CHE102.1	Analyse Electrochemical Cells, Classical batteries, modern batteries and Fuel Cells.
21CHE102.2	Explain the causes, effects and control of corrosion and modify the surface properties of metal by different metal finishing techniques.
21CHE102.3	Illustrate the principles of green chemistry, analyse properties and application of alternate fuels.
21CHE102.4	Analyse different water quality parameters, Environmental pollution and waste management.
21CHE102.5	Design the industrial materials by polymers for various applications.
21CHE102.6	Interpret the properties, types and synthesis applications of nano-materials.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Chemistry for Engineering Students	B.S.Jai Prakash, R.Venugopal, Sivakumaraiah& Pushpa Iyengar	Subhash Publications, Bangalore.	2017
2	Engineering Chemistry	R.V.Gadag & A. Nityananda Shetty	I K International Publishing House Priv.Ltd. N. Delhi.	3rd Edition 2018

3	Engineering Chemistry	P. C. Jain & Monica Jain	Dhanpat Rai Publications, New Delhi.	2016
Reference Books				
1	Engineering Chemistry	O.G.Palanna	Tata McGraw Hill Education Pvt. Ltd. New Delhi	Fourth Reprint
2	Nanochemistry A Chemical Approach to Nanomaterials	G.A.Ozin & A.C. Arsenault	RSC publishing	2005
3	Wiley Engineering Chemistry	Wiley India	Wiley India Pvt. Ltd. New Delhi	Second Edition
4	Polymer Science	V.R.Gowariker, N.V. Viswanathan & J.Sreedhar	Wiley-Eastern Ltd	2010
5	Corrosion Engineering	M. G. Fontana	Tata McGraw Hill Publishing	2018

Web links/Video Lectures/MOOCs

1. https://www.vturesource.com/post/1602/QB/VTU-Engineering-Chemistry-CBCS-Question-Bank.html
2. https://www.youtube.com/c/Vturesource

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21CHE102.1	3	-	-	3	-	-	3	-	-	-	-	-	-	-
21CHE102.2	3	-	-	3	-	-	3	-	-	-	-	-	-	-
21CHE102.3	3	-	-	3	-	-	3	-	-	-	-	-	-	-
21CHE102.4	3	-	-	3	-	-	3	-	-	-	-	-	-	-
21CHE102.5	3	-	-	3	-	-	3	-	-	-	-	-	-	-
21CHE102.6	3	-	-	3	-	-	3	-	-	-	-	-	-	-

1: Low 2: Medium 3: High

BASIC ELECTRICAL ENGINEERING

Course Code	21BEE103/203	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. To apply Ohm's law and Kirchhoff's laws used for the analysis of DC circuits.
2. To apply fundamentals of R, L and C and their combinations in AC circuits.
3. To discuss three phase balanced circuits.
4. To illustrate the principle of operation, construction and performance of electrical machines such as single phase transformer, DC machines, synchronous generator and three phase induction motor.
5. To demonstrate concepts of electrical wiring, circuit protecting devices and earthing.

Module-1

D.C. Circuits: Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy, Simulation of basic DC circuits

A.C. Fundamentals: Generation of sinusoidal voltage, frequency of generated voltage, definition and numerical values of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities.

08 Hours

Module-2

Single Phase Circuits: Analysis, with phasor diagram, of circuits with R, L, C, R-L, RC, R-L-C for series and parallel configurations. Real power, reactive power, apparent power and power factor. Simulation of basic AC circuits

Three Phase circuits: Advantages of 3-phase power, Generation of 3-phase power, Three-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of three phase power using two wattmeter method.

08 Hours

Module-3
Single Phase Transformers: Necessity of transformer, Construction and Principle of operation, emf equation, losses, variation of losses with respect to load, efficiency, Construction of three phase transformer and applications of transformers **Three Phase Induction Motors**: Principle of operation, Generation of rotating magnetic field, Construction and working of three-phase induction motor, Slip and its significance. Necessity of starter, star-delta starter. Introduction to single phase induction motor and applications **08 Hours**
Module-4
DC Machines: Principle of operation as generator and motor, Construction of D.C. Machine. Expression for induced emf. in generator, torque equation in motor, Applications **Three Phase Synchronous Generators**: Principle of operation, Constructional details, Synchronous speed, Frequency of generated voltage, emf equation, Applications **08 Hours**
Module-5
Measurement and Protection: Elementary discussion on circuit protective devices such as fuse, MCB and ELCB, electric shock, precautions against shock, Earthing, Elementary discussion on energy meter and two part tariff, Calculation of energy in terms of units. **Overview of Power System:** Structure, components of power system, Different generation methods (only classification and introduction). **08 Hours**

Course Outcomes: At the end of the course the student will be able to:	
21BEE103.1	Design solutions for fundamental engineering problems using the concepts of AC and DC circuits with appropriate consideration of public health and safety.

21BEE103.2	Design solutions for fundamental engineering problems using the concepts of electrical machines with appropriate consideration for societal needs.
21BEE103.3	Select appropriate resources of earthing methods and modern protective devices to ensure electrical safety with an understanding of limitations.
21BEE103.4	Select appropriate modern domestic wiring techniques to ensure reliable power supply with an understanding of limitations.
21BEE103.5	Demonstrate knowledge on engineering concepts of single phase and three phase ac circuits to work in a team for executing multidisciplinary projects.
21BEE103.6	Demonstrate knowledge on engineering concepts of motor and generators to work in a team for executing multidisciplinary projects.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Basic Electrical Engineering	D C Kulshreshtha	McGraw Hill	Revised First Edition
2	Principles of Electrical Engineering & Electronics	V.K. Mehta, RohitMehta	S.Chand Publications	Revised third Edition
Reference Books				
1	Fundamentals of Electrical Engineering and Electronics	B. L. Theraja	S. Chand & Company Ltd	Reprint Edition 2013
2	Electrical Technology	E. Hughes	Pearson	International Students 9th Edition, 2005
3	Principle of Power System	V.K. Mehta, RohitMehta	S.Chand Publications	Revised Edition

Web links/Video Lectures/MOOCs

1. https://nptel.ac.in/courses/108/105/108105112/
2. https://nptel.ac.in/courses/117/106/117106108/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21BEE103.1	-	-	2	-	-	1	-	-	-	-	-	-	-	-
21BEE103.2	-	-	2	-	-	1	-	-	-	-	-	-	-	-
21BEE103.3	-	-	-	-	1	-	1	-	-	-	-	-	-	-
21BEE103.4	-	-	-	-	1	-	1	-	-	-	-	-	-	-
21BEE103.5	-	-	2	-	-	-	-	-	-	-	2	-	-	-
21BEE103.6	-	-	2	-	-	-	-	-	-	-	2	-	-	-

1: Low 2: Medium 3: High

C PROGRAMMING FOR PROBLEM SOLVING

Course Code	**21CPS103/203**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(2:1:1)**	**SEE Marks**	**50**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives:

1. Understand the basic concepts of Computer System and Principles of Problem Solving.
2. Gain knowledge of Algorithms and Flowchart.
3. Explain the basic concepts of C Programming Language Constructs.
4. Design and Develop Programming Skills.

Module-1

Introduction to Computer Systems and C Programming Language

Basic functional units of Computer, Introduction to Software, Classification of Software, Compilers, Interpreters, Operating System and Types of Operating system, Networks: Types of Networks, Servers.

Fundamentals of Problem Solving: The Basic model of Computation, Main programming structure, Algorithm, Flowchart.

Introduction to C Language: Basic concepts in a C program, Constants, Variables, Volatile, Declaration and Initialization of Variables, Data types, Assignment statements.

08 Hours

Module-2

Operators and Expressions, Decision Making Statements, Looping Statements

Operators and Expressions: Precedence and Associativity, Type conversions, Managing input/output functions, Programming examples and exercise.

Decision making: Decision making statements: if, if-else, nested if-else, cascaded if-else, switch statement, go to statement.

Looping statements: for, while, do-while, Branching statements: go to, break and continue, Programming examples and exercises.

08 Hours

Module-3
Array and Strings Arrays: Introduction, 1-D, 2-D array: declaration, initialization, basic Algorithms: Searching and Sorting (Binary Search, Linear Search, Bubble Sort, Selection Sort), Programming examples and exercises. Strings: Introduction to Strings, declaration and initialization, String handling functions. **08 Hours**
Module-4
Functions and Structures Functions: Introduction to Functions, types of functions, definition, elements of user defined functions. Category of user defined functions, Parameter passing mechanism, Recursion, Programming examples and exercise. Structures: Introduction, Definition, Declaration, Initialization, Accessing Structure Members, Programming Examples and Exercise. **08 Hours**
Module-5
Pointers & Files Pointers: Definition, Initialization of Pointer Variables, Accessing the Address of a Variable. Files: Defining and Opening a File, Closing a File, Input/output Operations on Files, Error Handling During I/O Operations. **08 Hours**

Course Outcomes: At the end of the course the student will be able to:	
21CPS103.1	Describe the basics of computer systems and C programming language.
21CPS103.2	Evaluate expressions using C operators and use looping concepts in programming.
21CPS103.3	Use arrays concepts in programming
21CPS103.4	Develop modular programs using C.
21CPS103.5	Implement programs using Structures and Pointers.
21CPS103.6	Perform operations on Files.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Programming in ANSI C	E. Balaguruswamy	Tata McGraw - Hill, India	7th Edition, 2017.
2	Computer Concepts and C Programming	Vikas Gupta	Dreamtech Press, Delhi	Revised Edition,2012.
Reference Books				
1	"Computer Science", A Structured programming approach using C.	Behrouz A. Forouzan	Cengage Learning	Third Edition.
2	"Programming with C", Schaum's Outlines.	Byron Gottfried Schaum's	Tata McGraw-Hill	Third Edition.

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/learn/c-for-everyone
2. https://nptel.ac.in/courses/106/105/106105171/#.
3. w3schoolscprogramming

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21CPS103.1	-	-	-	-	-	-	-	-	2	1	-	-	-	-
21CPS103.2	-	-	1	-	-	-	-	-	2	-	-	-	-	-
21CPS103.3	-	-	1	-	-	-	-	-	2	-	-	-	-	-
21CPS103.4	-	-	1	-	-	-	-	-	-	1	-	-	-	-
21CPS103.5	-	-	1	-	-	-	-	-	2	-	-	-	-	-
21CPS103.6	-	-	1	-	-	-	-	-	2	-	-	-	-	-

1: Low 2: Medium 3: High

ELEMENTS OF CIVIL ENGINEERING & ENGINEERING MECHANICS

Course Code	**21CIV104/204**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(2:2:0)**	**SEE Marks**	**50**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives:

1. Describe various fields of Civil Engineering and Building Materials.
2. Explain basic concepts of Engineering Mechanics and to Analyse given coplanar concurrent force system and to estimate resultant.
3. Analyze given coplanar non-concurrent force system and estimate resultant force.
4. Determine Support reactions for the loaded beams.
5. Locate the Centroid of regular and built-up sections and to calculate the moment of Inertia.

Module-1: Introduction to Civil Engineering

History of Civil Engineering, Importance and Scope of different fields of Civil Engineering; Surveying, Structural Engineering, Geotechnical Engineering, Construction Management & Technology, Environmental Engineering, Transportation Engineering, Hydraulics, Water Resources & Irrigation Engineering, and Geoinformatics. Role of Civil Engineers in the Infrastructural development, effect of infrastructural facilities on social-economic development of a country.

Building Materials: Conventional and Alternate Building Materials

8 Hours

Module-2: Analysis of Coplanar Concurrent forces

Introduction to Engineering Mechanics: Basic concepts of idealization-Particle, Continuum and Rigid Body. Force; Systems of Forces, Basic Principles – Physical Independence of forces, Superposition, Transmissibility, Newton's Laws of Motion, Resolution and Composition of forces, Law of the parallelogram of forces, Triangle law, Polygonal law

Resultant of Coplanar Concurrent forces: Numerical examples.

8 Hours

Module-3: Analysis of Coplanar Non-concurrent forces

Moment of a Forces, Couple, Equivalent-Force Couple, Varignon's theorem,

Resultant of Coplanar non-concurrent forces: Numerical examples

Support Reactions: Types of Loads and Supports, Statically Determinate and Indeterminate beams, Support Reaction in beams, Numerical examples on support reactions for statically determinate beams (Point load, uniformly distributed & uniformly varying loads and Moments)

8 Hours

Module-4: Equilibrium

Friction: Types of friction, Laws of dry Friction, Limiting friction, Concept of Static and Dynamic Friction: Numerical problems on motion of single & Connected bodies on planes, Rope and Pulley systems.

Equilibrium of Coplanar Concurrent forces: Free body diagrams, Equilibrium of concurrent and non-concurrent coplanar force systems, Equations of Equilibrium, Lami's theorem, Numerical examples.

8 Hours

Module-5: Centroid and Moment of Inertia

Centroid: Derivation of centroid of simple geometric sections (Rectangle, Triangle, Semi-circle and quarter-circle), Numerical examples on centroid of built-up sections.

Moment of Inertia: Second moment of area of plane sections from first principles, Parallel axes and perpendicular axes Theorems, Derivation of Moment of inertia of simple geometric sections (Rectangle, Triangle, Circle, Semi-circle and quarter-circle), Numerical examples on Moment of Inertia of built-up sections **8 Hours**

Course Outcomes: At the end of the course the student will be able to:	
21CIV 104.1	List the applications of various fields of Civil Engineering and Building Materials.
21CIV 104.2	Apply basic concepts of Engineering Mechanics and to Analyze given coplanar concurrent force system.
21CIV 104.3	Analyze given coplanar concurrent force system to calculate the resultant, member forces and support reactions.
21CIV 104.4	Make use of equations of equilibrium and Lamis theorem to solve the numerical examples related to coplanar concurrent force systems.

21CIV 104.5	Determine the coordinates of Centroid of built-up sections.
21CIV 104.6	Evaluate the Moment of Inertia of built-up sections about given reference axes

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Engineering Mechanics: Principles of Statics and Dynamics	R. C. Hibbler	Pearson Press	14th Edition 2016
2	Engineering Mechanics	Bansal R.K.	Laxmi Publications	6th Edition 2015
Reference Books				
1	Introduction to Statics and Dynamics	Andy Ruina and RudraPratap	Oxford University Press	
2	Engineering Mechanics	Reddy Vijaykumar K. and K. Suresh Kumar	Singer's Publications.	3rd Edition 2011
3	Mechanics for Engineers, Statics and Dynamics	F. P. Beer and E. R. Johnston	McGraw Hill	12th Edition 2019
4	Engineering Mechanics	Irving H. Shames	Prentice Hall	4th Edition 1996
5	Engineering Mechanics: Statics	J. L. Meriam. L. and G. Kraige.	Willey India	9th Edition 2018

Web links/Video Lectures/MOOCs

1. http://bit.ly/CIVILECE
2. https://bit.ly/ECEVIDEOS
3. https://nptel.ac.in/courses/112/106/112106286/
4. https://nptel.ac.in/courses/112/106/112106186/
5. https://www.coursera.org/learn/engineering-mechanics-statics
6. https://www.coursera.org/learn/engineering-mechanics-statics-2

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes (PO)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
21CIV104.1	3	-	-	-	-	-	-	-	-	2	-	-	-	-
21CIV104.2	-	3	-	-	-	-	-	-	2	-	-	-	-	-
21CIV104.3	-	3	-	-	-	-	-	-	2	-	-	-	-	-
21CIV104.4	-	3	-	-	-	-	-	-	2	-	-	-	-	-
21CIV104.5	-	3	-	-	-	-	-	-	2	-	-	-	-	-
21CIV104.6	-	3	-	-	-	-	-	-	2	-	-	-	-	-

1: Low 2: Medium 3: High

BASIC ELECTRONICS

Course Code	**21ELN104/204**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(2:1:1)**	**SEE Marks**	**50**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives: This Course will enable students to:

1. Visualize p-n Junction in a semiconductor diode and use them to perform Rectification and Regulation.
2. Explain the working of Transistors like BJT, JFET and MOSFET.
3. Understand the working of Operational Amplifiers and its Applications in the design of Electronic Circuits.
4. Understand the basics of Sensors and Transducers.
5. Understand basics of Digital Electronics and their use in the design of Digital Circuits like Gates, Adders, Flip-Flops and working of a basic Communication System.

Module-1

p-n junction diode, Characteristics and Parameters, Diode Approximations, DC Equivalent Circuit, DC Load Line Analysis, Temperature Effects, AC Equivalent Circuits, Zener Diodes.

Half-Wave Rectification (HWR), Full-Wave Rectification (FWR), Filter Circuits, Approximate Analysis of Capacitor Filter (only Qualitative Analysis), Power Supply Performance, Zener Diode Voltage Regulators.

Multisim based Simulation Experiments:

a) V-I Characteristics of Diode/ Zener Diode

b) Design of Rectifiers (HWR & FWR) and Role of Capacitors for Filtering

c) Power Supply Design

8 Hours

Module-2

Bipolar Junction Transistor - Operation, Transistor Voltages and Currents, Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics.

DC Load line and Bias Point, Base Bias Circuit, Collector-to-Base Bias, Voltage Divider Bias,Comparison of Basic Bias Circuits, Bias Circuit Design, BJT as an Amplifier and as a Switch.

Multisim based Simulation Experiments:

a) V-I Characteristics of a BJT

b) Turn On/Off LED using BJT as a Switch

8 Hours

Module-3

JFET: Introduction, Construction and Operation, JFET Drain Characteristics, JFET Transfer Characteristics, Square law expression for Input/Output, Input resistance.

MOSFET: Enhancement and Depletion MOSFET- Construction, Operation, Characteristics andSymbols.

Oscillators - Barkhaunsen's criteria, RC Phase-Shift Oscillator.

Self-Study: Wein Bridge Oscillator, Crystal Oscillator.

Multisim based Simulation Experiments:

a) V-I Characteristics of a JFET/MOSFET

b) Turn On/Off LED using JFET/MOSFET as a Switch

8 Hours

Module-4

Introduction to Op-Amp, Op-Amp Input Modes, Parameters of Ideal and Practical Op-Amps (μA741). Applications of Op-Amp: Inverting amplifier, Non-Inverting amplifier, Summer, Voltage Follower, Integrator, Differentiator, and Comparator.

Sensors & Transducers: Difference between Sensor and Transducers, Primary Measuring Elements - Selection and Characteristics.

Opto-Sensors – Photodiode, Photo Sensor, Photo Coupler.

Multisim based Simulation Experiments: Design of Inverting Amplifier, Non Inverting Amplifier,Summer and Comparator circuits.

8 Hours

Module-5
Digital Electronics: Introduction, Number Systems, Boolean Analysis of Logic Circuits, Boolean Algebra Theorems, Codes, Boolean Relations, Algebraic Simplifications, Digital Circuits, NAND and NOR Implementation – HalfAdder, Full Adder, Half Subtractor, Full Subtractor. Introduction to Sequential Circuits: Latches and Flip-Flops. Communication Engineering: Introduction, Elements of Communication Systems, Basics ofModulation. **Multisim based Simulation Experiments:** a) Realization of the Basic Gates and Universal Gates. b) Design of JK/SR/D/T Flip-Flops using Basic Gates/Universal Gates. **8 Hours**

Course Outcomes: At the end of the course the student will be able to:	
21ELN104.1	Demonstrate the working of a p-n Junction Diode and hence use them to design rectifiers, regulators
21ELN104.2	Discuss the working of a Bipolar Junction Transistor and build Amplifier configurations.
21ELN104.3	Illustrate and Analyze the working principles of Unipolar devices like JFETs and MOSFETs.
21ELN104.4	Outline the working principles of Op-Amps and Sensors in the design of various Electronic Circuits.
21ELN104.5	Illustrate and design basic building blocks of Digital Electronic System.
21ELN104.6	Describe the basic Wireless Communication System.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Electronic Devices and Circuits	David A Bell	Oxford University Press	5th Ed, 2008
2	Electronic Devices – Conventional Current Version	Thomas Floyd	Pearson	10th Ed, 2011
3.	Basic Electronics	D P Kothari & I J Nagrath	McGraw Hill Education (India)	2nd Ed, 2018.

4.	A Course in Electrical and Electronics Measurements and Instrumentation	A.K. Sawhney	Dhanpat Rai & Company Private Limited	18th Ed., 2007
5.	Sensors and Signal Conditioning	John G Webster & Ramon Pallas-Areny	John Wiley and Sons	2nd Ed, 2000
Reference Books				
1.	Microelectronic Circuits	Sedra & Smith	Oxford University Press	6th Ed (International Version), 2011.
2.	Electronic Devices and Circuits	Milman & Halkias	McGraw – Hill Edition	3rd Ed, 2005
3.	Digital Fundamentals	Thomas Floyd	Pearson	10th Ed, 2011
4.	Operational Amplifiers and Linear IC's	David A Bell	Oxford University Press	3rd Ed, 2011
5.	Electronic Communication System	George Kennedy	SIE	6th Ed, 2017

Web links/Video Lectures/MOOCs

1.https://nptel.ac.in/courses/108/101/108101091/

2.https://nptel.ac.in/courses/117/103/117103063/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21 ELN104.1	2	-	-	-	1	-	-	-	1	1	-	1	-	-
21 ELN104.2	2	-	-	-	1	-	-	-	-	-	-	-	-	-
21 ELN104.3	1	-	-	-	1	-	-	-	-	-	-	1	-	-
21 ELN104.4	1	-	-	-	1	1	-	-	1	1	-	1	-	-
21 ELN104.5	1	-	-	-	1	-	-	1	-	-	-	1	-	-
21 ELN104.6	1	-	-	-	1	-	-	-	-	1	-	1	-	-

1: Low 2: Medium 3: High

ENGINEERING GRAPHICS

Course Code	21EGD105/205	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	(2:0:2:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. To expose the students to standards and conventions followed in preparation of engineering drawings.
2. To make them understand the concepts of orthographic and isometric projections.
3. To develop the ability of conveying the engineering information through drawings.
4. To make them understand the relevance of engineering drawing to different engineering domains.
5. To develop the ability of producing engineering drawings using drawing instruments.
6. To enable them to use computer aided drafting tool for the generation of drawings.

Module-1

Introduction to Computer Aided Sketching:

Introduction, Drawing Instruments and their uses, relevant BIS conventions and standards. Lettering, line conventions, dimensioning, material conventions and free hand practising.

Computer screen, layout of the software, standard toolbar/menu and description of most commonly used toolbars and navigational tools.

Coordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale.

Commands and creation of Lines, coordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz., tangency, parallelism, inclination and perpendicularity. (Demo only)

04 Hours

Module-2

Introduction to orthographic projections, Definitions - Planes of projection, reference line and conventions employed. First angle and Third angle projection.

Projections of points in all the four quadrants. Projections of straight lines (located in first quadrant/first angle only), true and apparent lengths, true and apparent inclinations to reference planes (No application problems and midpoint problems).

Orthographic projections of plane surfaces (First angle projection only):

Projections of regular plane surfaces—triangle, square, rectangle, pentagon, hexagon and circle-in simple positions inclined to both the planes; planes in different positions by change of position method only. (No problems on punched plates and composite plates).

14 Hours

Module-3

Orthographic Projections of Solids:

Orthographic projection of right regular solids - prisms and pyramids (triangle, square, rectangle, pentagon, hexagon), cones, cubes, tetrahedron. (Solids resting on HP only and no problems on freely suspended solids.)

12 Hours

Module-4

Isometric Projection (using isometric scale only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. **10 Hours**

Module-5

Conversion of Pictorial views into orthographic views

Conversion of pictorial views of simple components to orthographic views. Illustrative examples.

Introduction to 3D Modelling – Introduction to extrude, cut, revolve and other basic commands of part drawing with the help of examples. Creating 3D models of various machine components or objects, Wiring and lighting diagrams using CAD software, Basic Building Drawing, Electronic Drawing- PCB Drawings (Demo Purpose only and Internal Evaluation).

10 Hours

Course Outcomes: At the end of the course the student will be able to:	
21EGD105.1	Prepare engineering drawings as per BIS conventions mentioned in the relevant codes.
21EGD105.2	Produce computer generated drawings using CAD software.
21EGD105.3	Apply the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings.
21EGD105.4	Develop isometric drawings of simple objects reading the orthographic projections of those objects.
21EGD105.5	Convert pictorial views to Orthographic views and visualize objects in 3D
21EGD105.6	Create 3D model of the given objects or simple machine components

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Engineering Drawing	N.D. Bhatt & V.M. Panchal	Charotar Publishing House, Gujarat.	50th edition 2010
2	Engineering Graphics	K.R. Gopalakrishna	Subash Publishers Bangalore	32nd edition, 2005
3	Computer Aided Engineering Drawing	Dr M H Annaiah, Dr C N Chandrappa and Dr. B Sudheer Premkumar	New Age International Publishers	5th Edition **2019**
Reference Books				
1	Computer Aided Engineering Drawing	S. Trymbaka Murthy	I.K. International Publishing House Pvt. Ltd., New Delhi	3rd revised edition-2006

2	Engineering Drawing	N.S. Parthasarathy & Vela Murali	Oxford University Press	2015
3	Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production	Luzadder Warren J., Duff John M	Prentice-Hall of India Pvt. Ltd., New Delhi	2005
4	Electrical Engineering Drawing	Bhattacharya S. K.	New Age International publishers	Second edition 1998, reprint 2005.

Web links/Video Lectures/MOOCs

1. https://nptel.ac.in/courses/112103019/
2. https://help.autodesk.com/view/fusion360/ENU/courses/ (Video tutorials by Autodesk)
3. https://www.coursera.org/learn/3d-model-creation-fusion-360 (A Coursera program)
4. http://caedsjec.blogspot.com/

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes (PO)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21EGD105.1	2	-	-	-	2	-	-	-	-	-	-	-	-	-
21EGD105.2	-	2	-	-	2	-	-	-	-	-	-	-	-	-
21EGD105.3	-	2	-	-	2	-	-	-	-	-	-	-	-	-
21EGD105.4	-	2	-	-	2	-	-	-	-	-	-	-	-	-
21EGD105.5	-	2	-	-	2	-	-	-	-	-	-	-	-	-
21EGD105.6	-	-	-	-	2	-	-	-	-	-	-	2	-	-

1: Low 2: Medium 3: High

ELEMENTS OF MECHANICAL ENGINEERING

Course Code:	21EME105/205	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. Acquire a fundamental understanding of Mechanical Engineering in the industry and society
2. Acquire a basic understanding of the formation of steam and its industrial application.
3. Acquire a basic knowledge of renewable energy resources and basic concepts of Hydraulic turbines.
4. Acquire knowledge of various engineering materials and metal joining techniques.
5. Acquire essential experience with heat transfer devices.
6. Acquire knowledge on automobile technology in transport application and basics of Refrigeration and Air-Conditioning.
7. Acquire essential experience on basic Power transmission systems, including mechanical linkages.
8. Acquire knowledge of basic concepts on manufacturing principles and machine tools and advancement

Module-1

Introduction to Mechanical Engineering (Overview only): Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors and contribute to the GDP.

Steam Formation and Application: Formation of steam and thermodynamic properties of steam (Simple Problems using Steam Tables), Applications of steam in industries namely, Sugar industry, Dairy industry, Paper industry, Food processing industry for Heating/Sterilization.

Energy Sources and Power Plants: Review of energy sources; Construction and working of Hydel power plant, Thermal power plant, nuclear power plant, Solar power plant, Tidal power plant, Wind power plant.

Introduction to basics of Hydraulic turbines and pumps: Principle and Operation of Hydraulic turbines, namely, Pelton Wheel, Francis Turbine, and Kaplan Turbine. Introduction to working of Centrifugal Pump.

08 Hours

Module-2

Properties, Composition, and Industrial Application of Engineering Materials:

Metals-Ferrous: Tool steels and stainless steels. Non-ferrous /metals: aluminium alloys. Ceramics, Glass, optical fibre glass, cermets. Composites-Fiber reinforced composites, Metal matrix Composites. Smart materials-Piezoelectric materials, shape memory alloys, semiconductors, and super-insulators.

Metal Joining Processes: Soldering, Brazing and Welding: Definitions. Classification and methods of soldering, brazing, and welding. Brief description of arc welding, Oxy-acetylene welding, Introduction to TIG welding and MIG welding.

08 Hours

Module-3

Fundamentals of IC Engines: Review of Internal Combustion Engines, 2-Strokes and 4-Strokes engines, Components and working principles, Application of IC Engines in Power Generation, Agriculture, Marine and Aircraft Propulsion, Automobile.

Insight into future mobility technology: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles, Drives and Transmission. Advantages and disadvantages of EVs and Hybrid vehicles.

Heat Transfer Applications: Review of modes of Heat Transfer; Automobile Radiators; Condensers and evaporators of refrigeration systems; Cooling of Electrical and Electronic Devices; Active, Passive, and Hybrid Cooling.

Refrigeration and Air-Conditioning: Principle of refrigeration, Refrigeration effect, Ton of Refrigeration, COP, Refrigerants and their desirable properties. Principles and Operation of Vapor Compression and Vapor absorption refrigeration. Domestic and Industrial Applications of Refrigerator. Working Principles of Air Conditioning, Classification, and Applications of Air Conditioners. Concept and operation of Centralized air conditioning system

08 Hours

Module-4

Mechanical Power Transmission:

Gear Drives: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, Gear Trains and their application: simple and compound Gear Trains, Simple numerical problems on Gear trains involving velocity ratios

Belt Drives: Components of belt drive and concept of velocity ratio; Types of belt drives, Flat- Belt Drive, V-Belt Drive and Application of Belt Drives. Simple numerical problems on Belt drives involving velocity ratios.

Fundamentals of Mechanical Linkages: Definitions of Machines and Mechanisms. Applications of linear motion, oscillatory motion, rotary motion, ratchet and latches, clamping, reverse motion, pause and hesitation, loading and unloading Mechanisms.

08 Hours

Module-5

Fundamentals of Machine Tools and Operations:

Fundamentals of Machining and machine tools, Construction and Working Principle of Lathe, Various Lathe Operations: Turning, Facing, Taper Turning and Knurling. Construction and Working of Milling Machines and applications. Construction and working of simple Drilling Machines and applications. (Sketches of layout need not be dealt with for all machine tools).

Introduction to Modern Manufacturing Tools and Techniques:

CNC: Introduction, components of CNC, advantages and applications of CNC, CNC Machining centres and Turning Centers, Concepts of Smart Manufacturing and Industrial IoT.

Introduction to Mechatronics & Robotics: Concept of open-loop and closed-loop systems, Examples of Mechatronic Systems and their working principle. Robot anatomy, Joints & links, common Robot configurations, Applications of Robotics in Material Handling, Processing, Assembly, and Inspection.

08Hours

Laboratory Exercises

Demonstration 1:

Lathe: Parts of a lathe, Principle of working of a centre lathe, Operations on the lathe -Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swivelling method, Specification of Lathe.

Milling Machine: Principle of milling, types of milling machines, working of horizontal and vertical milling machines.

(For Internal Assessment only –online quiz/viva)

Demonstration 2:

1. Working principle of Pelton wheel; Francis Turbine and Kaplan Turbines
2. Working principle of centrifugal pump and reciprocating pump
3. Working Principle of 4 Stroke Petrol and Diesel Engine

Course Outcomes:

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

21EME105.1	Apply basic concepts to determine the quality and properties of steam and understand the working principle of hydraulic machines.
21EME105.2	Access the mechanical behavior and properties of engineering materials and various joining processes.
21EME105.3	Analyze the working of I.C engine, Hybrid Vehicles, Refrigeration and Air Conditioning.
21EME105.4	Apply the concept of power transmission and understand the fundamentals of mechanical linkages.
21EME105.5	Comprehend the working of a lathe, milling machines, CNC machines, mechatronics, robotics and understand the different operations that can be carried out on these machines.
21EME105.6	Interpret the basic concepts of smart manufacturing, Robots and industrial IoT.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Elements of Mechanical Engineering	K R Gopalakrishna	Subhas Publications	38th Edition, 2018
2	Elements of Mechanical Engineering	Kestoor Praveen	Suggi Publications	1st Edition, 2018
3	Elements of Mechanical Engineering	S Trymbaka Murthy	MEDTECH (Scientific	Vol 1 & 2, 2001
Reference Books				
1	Elements of Mechanical Engineering	Dr. A. S. Ravindra	Thomson Press (India) Ltd	8th Edition, 2011
2	Introduction to Robotics: Mechanics and Control	Craig J. J	Pearson International Education	3rd Edition, 2005
3	Mechatronics-Principles Concepts and Applications	Nitaigour Premchand Mahalik	Tata McGraw Hill	1st Edition, 2003
4	Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing	Ian Gibson, David W. Rosen, Brent Stucker	Springer	2nd Ed. (2015)
5	Modern Electric, Hybrid Electric and FuelCell Vehicles.	MehrdadEhsani, Yimin Gao, Sebastien E. Gay and Li Emadi,	CRC Press LLC	1st Edition, 2005

Web links/Video Lectures/MOOCs

1. **MOOC:https://nptel.ac.in/courses/112/105/112105123/**
2. **MOOC:https://nptel.ac.in/courses/112/107/112107208/**
3. **MOOC:https://nptel.ac.in/courses/112/103/112103262/**
4. **NPTEL:https://www.youtube.com/watch?v=GQHCnWl2U6I**

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes (PO)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21EME105.1	-	-	-	-	-	-	-	-	2	2	-	2	-	-
21EME105.2	-	-	-	-	-	-	-	-	-	1	-	1	-	-
21EME105.3	-	-	-	-	-	-	-	-	-	1	-	1	-	-
21EME105.4	-	-	-	-	-	-	-	-	2	2	-	2	-	-
21EME105.5	-	-	-	-	-	-	-	-	-	1	-	1	-	-
21EME105.6	-	-	-	-	-	-	-	-	-	1	-	1	-	-

1: Low 2: Medium 3: High

ENGINEERING PHYSICS LAB

Course Code	**21PHL106/206**	**CIE Marks**	**50**
Teaching hours/Week (L:T:P)	**0:0:2**	**SEE Marks**	**50**
Credits	**01**	**Exam hours**	**03**

Course Learning Objectives:

1. Realize experimentally, the mechanical, electrical and thermal properties of materials, concept of waves and oscillations.
2. Design simple circuits and study the characteristics of semiconductor devices.

EXPERIMENTS:

1. Determination of Young's modulus of a beam by Single cantilever experiment
2. Study series LCR resonance and determine resonant frequency, self-inductance and quality factor
3. Measurement of velocity of ultrasonic waves using Ultrasonic interferometer.
4. Study of characteristics of a Transistor and calculation of output resistance and amplification factor
5. Study of characteristics of a Zener diode
6. Determination of Magnetic field intensity along the axis of a circular coil carrying current by Deflection method.
7. Helmholtz resonator to find out the unknown frequency of tuning forks
8. Calculation of Dielectric constant by RC charging and discharging method.
9. Study of I–V characteristics of a Photodiode in reverse bias and variation of photocurrent as a function of intensity
10. Calculate wavelength of Semiconductor laser using Diffraction grating.

Beyond the Syllabus Expts:

1. To study the spectral lines with the using Spectrometer and grating
2. Characterization of LED

Note:

All 10 experiments are to be conducted compulsorily.

Two experiments are to be performed by the students in the semester end examination

Course Outcomes: After the completion of the course, the student will be able to	
21PHL106.1	To apply knowledge on strength of materials and determine the different types of Elastic moduli
21PHL106.2	To interpret the principles of resonance
21PHL106.3	To realize the applications of stationary waves
21PHL106.4	To characterize the operations of semiconductor devices such as photo diode, zener diode and transistors
21PHL106.5	To make measurements using laboratory equipment and perform calculations that verify physical principles
21PHL106.6	To apply basic principles of optics in determination of physical properties of light

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	A Text book of Engineering Physics-	M.N. Avadhanulu and P.G. Kshirsagar	S. Chand & Company Ltd, New Delhi	10th revised Ed.
2	Engineering Physics	Gaur and Gupta	Dhanpat Rai Publications	2017
3	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill Edu Pvt Ltd- New Delhi	6th Ed; 2006
Reference Books				
1	Introduction to Mechanics	MK Verma	University Press(India) Pvt Ltd, Hyderabad	2nd Ed, 2009
2	Lasers and Non Linear Optics	BB laud	New Age International Publishers	3rd Ed, 2011
3	Solid State Physics-	S O Pillai,	New Age International Publishers	8th Ed., 2018

4	Shock waves made simple	Chintoo S Kumar, K Takayama and KPJ Reddy	Willey India Pvt. Ltd. New Delhi	2014
5	Introduction to	Electrodynamics- David Griffiths	Cambridge University Press	4th Ed, 2017

Web links/Video Lectures/MOOCs

a) Lab Manual

b) Virtual Lab- https://vlab.amrita.edu/?sub=1

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
21PHL106.1	3	-	-	2	-	-	-	-	2	-	-	-	-	-
21PHL106.2	3	-	-	2	-	-	-	-	2	-	-	-	-	-
21PHL106.3	3	-	-	2	-	-	-	-	2	-	-	-	-	-
21PHL106.4	3	-	-	2	-	-	-	-	2	-	-	-	-	-
21PHL106.5	3	-	-	2	-	-	-	-	2	-	-	-	-	-
21PHL106.6	3	-	-	2	-	-	-	-	2	-	-	-	-	-

1: Low2: Medium 3: High

ENGINEERING CHEMISTRY LAB

Course Code	21CHL106/206	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03

Course Learning Objectives:

To provide students with practical knowledge of

1. Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
2. Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

PART-A

Instrumental Experiments

1. Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.
2. Conductometric estimation of acid mixture.
3. Determination of Viscosity co-efficient of the given liquid using Ostwald's viscometer.
4. Colorimetric estimation of copper.
5. Determination of pKa of the given weak acid using pH meter.

PART-B

Volumetric Experiments

1. Estimation of Total hardness of water by EDTA complexometric method.
2. Estimation of CaO in cement solution by rapid EDTA method.
3. Determination of percentage of Copper in brass using standard sodium thiosulphate solution.
4. Determination of COD of waste water.
5. Estimation of Iron in haematite ore solution using standard $K_2Cr_2O_7$ solution by external indicator method.

Beyond the syllabus:

1. Flame photometric estimation of sodium and potassium.
2. Determination of Alkalinity of given water sample.

Course Outcomes: At the end of the course the student will be able to:	
21CHL106.1	Evaluate the concentration of material using different instruments accurate results.
21CHL106.2	Compare the viscous nature of any liquid with water
21CHL106.3	Analyse quantitatively the concerned elements by Instrumental techniques.
21CHL106.4	Analyse the water quality parameters like total hardness and chemical oxygen demand.
21CHL106.5	Perform different types of titrations for estimation of concerned materials.
21CHL106.6	Employ external indicators for volumetric analysis.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and year**
Textbooks				
1	Chemistry for Engineering Students	B.S.Jai Prakash, R.Venugopal, Sivakum-araiah & Pushpa Iyengar,	Subhash Publications, Bangalore.	2017
2	Engineering Chemistry	R.V.Gadag & A. Nityananda Shetty	I K International Publishing House Private Ltd. New Delhi.	2017
3.	Engineering Chemistry	P. C. Jain & Monica Jain	Dhanpat Rai Publications, New Delhi.	2016
Reference Books				
1	Vogel's Text Book of Quantitative Chemical Analysis	G.H. Jeffery, J. Bassett, J. Mendham and R.C.	Denney John Wiley & Sons Inc.	Fifth edition
2	Theory and Practice in Applied Chemistry	O.P. Vermani& Narula	New Age International Publishers.	Second edition
3	Analytical chem-istry	Gary D. Christian	Wiley India Pvt. Ltd.New Delhi.	Seventh edition

Link Video Lectures/MOOCs

1. https://www.youtube.com/c/Vturesource
2. https://www.youtube.com/channel/UCX3li6uZ9s24qAXuIk6byJg
3. http://vlab.amrita.edu/?sub=2&brch=190&sim=339&cnt=1
4. http://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=1
5. http://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=1

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21CHL106.1	-	3	-	3	-	-	-	-	3	-	-	-	-	-
21CHL106.2	-	3	-	3	-	-	-	-	3	-	-	-	-	-
21CHL106.3	-	3	-	3	-	-	-	-	3	-	-	-	-	-
21CHL106.4	-	3	-	3	-	-	-	-	3	-	-	-	-	-
21CHL106.5	-	3	-	3	-	-	-	-	3	-	-	-	-	-
21CHL106.6	-	3	-	3	-	-	-	-	3	-	-	-	-	-

1: Low 2: Medium 3: High

BASIC ELECTRICAL ENGINEERING LABORATORY

Course Code	21BEL107/207	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03

Course Learning Objectives:

1. To demonstrate common electrical components such as Resistors, capacitors and inductors, types of wires and measuring instruments.
2. To measure power and power factor of different types of lamps and three phase circuits.
3. To explain measurement of impedance for R-L and R-C circuits.
4. To determine power consumed in a 3 phase load.
5. To explain methods of controlling a lamp from different places.

List of Experiments

Sl.No.	Experiments
1	Verification of KCL and KVL for DC circuits using simulation and hardware circuit.
2	Measurement of energy, current, power and power factor of incandescent lamp, fluorescent lamp, and LED lamp.
3	Measurement of Resistance, inductance of choke coil.
4	Determination of phase and line quantities in three phase star and delta connected loads
5	Measurement of three phase power using two wattmeter method.
6	Two way and three way control of lamp and formation of truth table.
7	Study of fuse characteristics and demonstration of Miniature Circuit breakers
8	Demonstration of house wiring and Measurement of Earth Resistance
9	Measurement of efficiency of single phase transformer by load test
10	Study of Torque current characteristics of DC shunt motor

Course Outcomes: At the end of the course the student will be able to:	
21BEL107.1/207.1	Identify the common electrical components and measuring instruments used for conducting experiments in the electrical laboratory.
21BEL107.2/207.2	Compare power consumed by lamps and power factor of lamps.
21BEL107.3/207.3	Development of a circuit to Investigate the impedance of an electrical circuit and power consumed in a 3-phase load.
21BEL107.4/207.4	Develop and demonstrate two way and three-way control of lamps and by verifying the truth table.
21BEL107.5/207.5	Demonstrate the characteristics of choke coil and single-phase transformer using modern tools.
21BEL107.6/207.6	Develop and understand the characteristics of DC shunt motor

Sl. No.	**Title of the Book**	**Name of the Authors**	**Name of the Publiser**	**Edition and Year**
Textbooks				
1	Basic Electrical Engineering	D C Kulshreshtha	McGraw Hill	Revised First Edition
2	Principles of Electrical Engineering & Electronics	V.K. Mehta, RohitMehta	S.Chand Publications	Revised third Edition
Reference Books				
1	Fundamentals of Electrical Engineering and Electronics	B. L. Theraja	S. Chand & Company Ltd	Reprint Edition 2013
2	Electrical Technology	E. Hughes	Pearson	International Students 9th Edition, 2005

Web links/Video Lectures/MOOCs

1. http://vlab.amrita.edu/?sub=1&brch=75

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21BEL107.1	-	-	-	2	2	-	-	-	-	-	-	-	-	-
21BEL107.2	-	-	-	2	-	-	-	-	3	-	-	-	-	-
21BEL107.3	-	-	2	2	-	-	-	-	-	-	-	-	-	-
21BEL107.4	-	-	2	-	-	-	-	-	3	-	-	-	-	-
21BEL107.5	-	-	-	-	2	-	-	-	3	-	-	-	-	-
21BEL107.6	-	-	2	-	-	-	-	-	3	-	-	-	-	-

1: Low 2: Medium 3: High

C PROGRAMMING LABORATORY

Course Code	21CPL107/207	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03

Course Learning Objectives:

1) To practice developing flowcharts and algorithms.
2) Familiarize the use of C Compiler and constructs of C Programming.
3) To practise usage of various constructs such as branching and looping.
4) To be able to identify and rectify syntax and logical errors during coding.
5) To familiarize the processes of debugging and execution.

Practise Programs:

1. Familiarization with programming environment, concept of naming conventions, editing, compilation, execution and debugging of C Programs
2. Calculation of simple interest.
3. Check for the palindrome.
4. Finding the largest of given three positive integers using if- then- else structures.

Descriptions:

- The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problems given. Ensure that no built-in functions are used.
- Algorithm/Flowchart to be written for all experiments.
- Code should be traced using minimum two test cases which should be recorded in the manual.

Laboratory Programs:

PART- A

1	Write a C program to simulate a simple calculator that performs arithmetic operations like addition, subtraction, multiplication, and division only on integers. Error messages should be reported, if any attempt is made to divide by zero. (Using switch statement)
2	Write a C program to find and output all the roots of a given quadratic equation, for non-zero coefficients. (Using nested /if…else statement).
3	Write a C Program to print prime numbers in a given range.

4	Write a C program to input N real numbers in ascending order into a single dimension array. Conduct a binary search for a given key integer number and report success or failure in the form of a suitable message, also print the position.
5	Write C Program to read two matrices A (M x N) and B (P x Q) and compute product of A and B after checking compatibility for multiplication. Output the input matrices and the resultant matrix with suitable headings and format.
6	Write a C program to input N integer numbers into a single dimension array. Sort them in ascending order using bubble sort technique. Print both the given array and sorted array with suitable headings.
7	Write C functions to implement string operations such as string length, compare, concatenate and string copy with appropriate messages.
8	Implement structures to read, write, and compute the average- marks and the students scoring above and below the average marks for a class of N students.
9	a) Implement Recursive functions to generate Fibonacci sequence. b) Write a Recursive C function to find the factorial of a number.
10	a) Implement addition of array elements using Pointers. b) Write a C program to swap two variables using pointers.
PART- B-Problem based learning	
Case Study: Students are given real time applications (like Banking management, Railway/ Bus ticket reservation, Hotel management, Traffic signal generation, Employee management….etc) to study and provide solutions to the same.	

Course Outcomes:	
At the end of the course the student will be able to:	
21CPL107.1	Use vi editor to create, compile and execute programs by rectifying all types of errors.
21CPL107.2	Write algorithms, flow charts and programs using decision making/looping constructs.
21CPL107.3	Write programs to solve problems using recursive and iterative constructs
21CPL107.4	Write programs to solve problems using strings, arrays and functions constructs

21CPL107.5	Use structures and pointers constructs for finding the solutions to the problems.
21CPL107.6	Demonstrate concepts learnt to solve real-life problems, to communicate in verbal/written form and document the programs executed.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Programming in ANSI C	E. Balaguruswamy	Tata McGraw - Hill, India,	7th Edition, 2017.
2	Computer Concepts and C Programming	Vikas Gupta	Dreamtech Press, Delhi	Revised Edition, 2012.
Reference Books				
1	"Computer Science", A Structured programming approach using C.	Behrouz A. Forouzan	Cengage Learning	Third Edition.
2	"Programming with C", Schaum's Outlines.	Byron Gottfried Schaum's	Tata McGraw- Hill	Third Edition.

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/learn/c-for-everyone
2. https://nptel.ac.in/courses/106/105/106105171/#.
3. w3schools c programming

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21CPL107.1	-	-	2	-	1	-	-	-	-	-	-	-	-	-
21CPL107.2	-	-	-	3	1	-	-	-	-	-	-	-	-	-
21CPL107.3	-	-	2	3	-	-	-	-	-	-	-	1	-	-
21CPL107.4	-	-	2	-	1	-	-	-	-	-	-	-	-	-
21CPL107.5	-	-	-	-	1	-	-	-	-	-	-	2	-	-
21CPL107.6	-	-	-	-	-	2	-	-	2	2	-	-	-	-

1: Low 2: Medium 3: High

BUSINESS COMMUNICATION - I

Course Code	21ENG108	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:1:1)	SEE Marks	50
Credits	01	Exam Hours	02

Course Learning Objectives:

1. To enable the learner to communicate effectively in real life situations.
2. To review English grammar effectively for study purposes across the curriculum.
3. To enhance English vocabulary and language proficiency.
4. To achieve better writing and presentation skills.

Module-1

Fundamentals of communication skills, Barriers to effective communication, Types of communication, Interpersonal communication skills. **4 Hours**

Module-2

Subject Verb Agreement, Sequences of tenses, Active and Passive, Reported speech, Articles, Preposition.

4 Hours

Module-3

Vocabulary, One word substitutes, Confused words, Phrasal Verbs, Idioms and Phrases, Analogies. **4 Hours**

Module-4

Precis writing, Cloze test, Theme detection, Technical report writing, Sentence improvement, Common errors in writing and speaking,

4 Hours

Module-5

Group discussion, Extempore speaking, Presentation skills.

4 Hours

Course Outcomes: At the end of the course the student will be able to:	
21ENG108.1	To articulate the nature and style of communication skills
21ENG108.2	To illustrate the different ways in which grammar has been described.

21ENG108.3	To summarize English vocabulary and language proficiency.
21ENG108.4	To enhance sensible writing skills.
21ENG108.5	To be aware of their strengths and weakness as language learners
21ENG108.6	To enhance competence in the four modes of literacy : Writing, Reading, Speaking and listening.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Communication skills	Sanjay Kumar and Pushlatha	Oxford University Press	Second Edition, 2015
2	High School English Grammar and Composition	Wren and Martin	S Chand and Company Ltd	2015
Reference Books				
1	Practical English Usage	Michael Swan	Oxford University Press	2016
2	English Grammar In Use	Raymond Murphy		

Web links/Video Lectures/MOOCs

1.https://englishforeveryone.org

2.https://owl.purdue.edu

Course Articulation Matrix

Course Outcomes (CO)	**Program Outcomes (PO)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
21ENG108.1	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG108.2	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG108.3	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG108.4	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG108.5	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG108.6	2	-	-	-	-	-	-	-	-	-	3	-	-	-

1: Low 2: Medium 3: High

BUSINESS COMMUNICATION - II

Course Code	**21ENG208**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(0:1:1)**	**SEE Marks**	**50**
Credits	**01**	**Exam Hours**	**02**

Course Learning Objectives:

1. To enhance English grammar and the essentials of language skills.
2. To identify the nuances of phonetics and pronunciation skills.
3. To assess better formal writing and speaking skill

Module-1

Grammar skills: Sequences of tenses, Question tags, Exercises on Preposition Articles, Conjunction, Modal Auxiliary. **4 Hours**

Module-2

Introduction to phonetics, sounds mispronounced, word stress, silent and non-silent letters, Awareness of different accents, Errors of Indianism. **4 Hours**

Module-3

Technical vocabulary, Homophones, Homographs, Homonyms, Synonyms and Antonyms, common error in English language, Phrasal verbs. **4 Hours**

Module-4

Formal letter writing, Covering letter with Resume, Email Etiquette **4 Hours**

Module-5

Communication skills: Group discussion, Etiquette of job-interview, Dialogues in various situations, Telephonic conversation. **4 Hours**

Course Outcomes:

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

21ENG208.1	To understand the concepts of grammar and its usage
21ENG208.2	To identify the nuances of phonetics, intonation and flawless pronunciation
21ENG208.3	To implement English vocabulary and language proficiency.
21ENG208.4	To apply the forms of writing skills in professional level.

21ENG208.5	To improve speaking ability in terms of fluency and comprehensibility
21ENG208.6	To enhance competence in the four modes of literacy: Writing, Reading, Speaking and listening.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Communication skills	Sanjay Kumar and Pushlatha	Oxford University Press	Second Edition, 2015
2	High School English Grammar and Composition	Wren and Martin	S Chand and Company Ltd	2015
Reference Books				
1	Practical English Usage	Michael Swan	Oxford University Press	2016
2	English Grammar In Use	Raymond Murphy		Second Edition

Web links/Video Lectures/MOOCs

1. https://englishforeveryone.org
2. https://owl.purdue.edu
3. http://guidetogrammar.org

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes (PO)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
21ENG208.1	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG208.2	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG208.3	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG208.4	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG208.5	2	-	-	-	-	-	-	-	-	-	3	-	-	-
21ENG208.6	2	-	-	-	-	-	-	-	-	-	3	-	-	-

1: Low 2: Medium 3: High

ABILITY ENHANCEMENT COURSE - I

(SKILL AND ENTREPRENEURSHIP DEVELOPMENT COURSE 1)

Course Code:	**21AEC109**	**CIE Marks**	50
Teaching Hours/Week (L:T:P)	(0:0:2)	**SEE Marks**	50
Credits	**01**	**Exam Hours**	03

Course Learning Objectives:

1. Understand basic Manufacturing Processes used in the industry
2. Design electrical circuits and assembly of components
3. Understand importance of safety
4. Apply the knowledge of measurement and instrument devices in their project works
5. Understand the basics of Design Thinking

Mechanical Fab Lab:

Carpentry - hand tools & machines, Types of joints and Pattern making

Sheet Metal Practice - bending, punching and drawing various sheet metal joints, development of joints.

Joining - temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies

Safety in Workshop - Fire hazards, electric short circuit –causes and remedies, Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

6 Hours

Electrical and Electronics Fab Lab:

Electric power utilization, energy audit, Types of wiring - House wiring, stair case wiring, two-way switch wiring, Types of fuses and their uses, circuit breaker, three phase wiring for electrical motors, earthing, minor fault finding, Soldering and de-soldering

4 Hours

Advanced Fab Lab-I:

Partworks design, Rapid prototyping, 3D scanners, & Inkscape design and Laser cutting

6 Hours

Measurement and Instrumentation:

Introduction to measuring equipment used in Quality Control.

2 Hours

Design thinking -I:

Emotions - Experience & Expression - Understanding Emotions, Experience & Expression, Assessing Empathy, Application with Peers

Basics of Design Thinking - Definition of Design Thinking, need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

Being Ingenious & Fixing Problem - Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

6 Hours

Course Outcomes: At the end of the course the student will be able to:	
21AEC109.1	perform basic and advanced manufacturing operations used in the industry
21AEC109.2	design electrical circuits and assembly of components
21AEC109.3	use proper safety tools and equipment
21AEC109.4	use of measurement devices
21AEC109.5	apply design thinking to product development
21AEC109.6	inculcate the team work and communication skills

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Fab Lab: Revolution Field Manual	Massimo Menichinelli	Niggli Verlag	2017
2	Skill Development and Entrepreneurship in India	Ingram short title	Rameshwari Pandya	2016
3	101 Design Methods: A Structured Approach for Driving Innovation in Your Organization	Wiley	Vijay Kumar	2012

Web links/Video Lectures/MOOCs

1. https://fabacademy.org/
2. https://www.youtube.com/watch?v=gHGN6hs2gZY&t=33s
3. https://www.youtube.com/watch?v=4nTh3AP6knM

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
21AEC109.1	-	-	3		-	-	-	-	-	-	-	-	-	-
21AEC109.2	-	-		3	-	-	-	-	-	-	-	-	-	-
21AEC109.3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
21AEC109.4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
21AEC109.5	-	3	-	-	-	-	-	-	-	-	-	-	-	-
21AEC109.6	-	-	-	-	-	-	-	-	-	-	-	-	-	3

1: Low 2: Medium 3: High

ABILITY ENHANCEMENT COURSE - II

(SKILL AND ENTREPRENEURSHIP DEVELOPMENT COURSE – II)

Course Code:	**21AEC209**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(0:0:2)**	**SEE Marks**	**50**
Credits	**01**	**Exam Hours**	**03**

Course Learning Objectives:

1. Apply the advanced Manufacturing Processes in their Project work
2. Articulate embedded electronics and programming
3. Design the data acquisition and control strategies
4. Use of Internet of Things
5. Appraise the importance of design thinking, new ways of thinking and innovation cycle for creating innovative products

Advanced Fab Lab-II:

Computer controlled cutting and machining - CNC router, PCB design and fabrication, Vinyl Cutter, Power tools **8 Hours**

Embedded Electronics:

Electronics design, Embedded programming, Input/output devices, Interface and application programming, Networking and communication, experiments and testing of oscilloscope, spectrum and logic analyser, wave form generators and networking devices. **8 Hours**

Data Acquisition System and Internet of Things:

Demonstration to Data Acquisition System, working of sensors and controllers **2 Hours**

Design thinking -II:

Process of Product Design - Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design

Prototyping & Testing - What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample, Example, Test Group Marketing

Celebrating the Difference - Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

Design Thinking & Customer Centricity - Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design, Feedback loop

6 Hours

Course Outcomes: At the end of the course the student will be able to:	
21AEC209.1	Perform advanced manufacturing operations
21AEC209.2	Articulate embedded electronics and programming
21AEC209.3	Design the data acquisition and control strategies
21AEC209.4	Use of Internet of Things
21AEC209.5	Apply design thinking, new ways of thinking and innovation cycle for creating innovative products
21AEC209.6	Inculcate the team work and communication skills

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Reference Books				
1	Fab Lab: Revolution Field Manual	Massimo Menichinelli	Niggli Verlag	2017
2	Skill Development and Entrepreneurship in India	Ingram short title	Rameshwari Pandya	2016
3	101 Design Methods: A Structured Approach for Driving Innovation in Your Organization	Wiley	Vijay Kumar	2012

Web links/Video Lectures/MOOCs

1. https://fabacademy.org/
2. https://www.youtube.com/watch?v=gHGN6hs2gZY&t=33s
3. https://www.youtube.com/watch?v=4nTh3AP6knM

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
21AEC109.1	-	-	3	-	-	-	-	-	-	-	-	-	-	-
21AEC109.2	-	-	-	3	-	-	-	-	-	-	-	-	-	-
21AEC109.3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
21AEC109.4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
21AEC109.5	-	3	-	-	-	-	-	-	-	-	-	-	-	-
21AEC109.6	-	-	-	-	-	-	-	-	-	-	-	-	-	3

1: Low 2: Medium 3: High

INDUSTRY ORIENTED TRAINING – I

(MATHEMATICAL APTITUDE SKILLS)

Course Code	**21ITM110/210**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(0:2:0)**	**SEE Marks**	**-**
Credits	**-**	**Exam Hours**	**-**

Course Learning Objectives:

1. To equip the students with basic concepts and tools of Mathematics to solve placement aptitude papers.
2. To enhance the problem solving skills and improve the basic mathematical skills to help students preparing for competitive examinations.

Module-1

Number System: Various types of Numbers; Tests of Divisibility; HCF and LCM; Roots and Squares.
Algebra: Identities; BODMAS Rule; Logarithms; Indices; Number Series; Simple Interest and Compound Interest. **4 Hours**

Module-2

Time and Work: Facts and Formulae; Group work; Pipes and Cisterns.
Time and Distance: Basics of Time, Speed and Distance; Average journey speed; Relative Speeds; Boats and Streams. **4 Hours**

Module-3

Average, Percentage, Age problems: Average; Concept of percentage, Results on Population and Depreciation; Problems on ages.
Profit and Loss: Profit and Loss formulae; Percentage of profit and loss, Discount. **4 Hours**

Module-4

Permutations, Combinations, Probability: Factorial Notation; Permutations; Combinations; Random Experiment; Probability of Occurrence of events.
Ratio, Proportion, Partnership: Ratio; Ratio in terms of Percentage, Proportion, Mean Proportion; Variation; Partnership. **4 Hours**

Module-5

Geometry: Pythagoras theorem - Heights and Distances; Area; Volume; Surface Area.
Clock and Calendar: Problems related to clocks; Calendars; odd days; leap year; Day of the week related to Odd days. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
21ITM110/210.1	Apply the basic concepts of quantitative abilities related to Number system.
21ITM110/210.2	Evaluate time related problems by knowing the relationship between time/speed/distance or time/work.
21ITM110/210.3	Apply the concepts of average, percentage, appreciation and depreciation in real life problems
21ITM110/210.4	Solve application problems involving permutations and combinations.
21ITM110/210.5	Apply Ratio and Proportion concepts to solve the partnership problems where people share the ownership.
21ITM110/210.6	Apply the geometrical concepts in real- world applications.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
		Textbooks		
1	Quantitative Aptitude for Competitive Examinations	Dr R S Aggarwal	S. Chand & Company LTD	44th Edition
2	Quantitative Aptitude for Competitive Examination	R.K Tyagi	MTG Learning Media	

Course Articulation Matrix

Course Outcomes (CO)	**Program Outcomes (PO)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
21ITM110.1	-	-	-	-	-	2	-		3	-	-	1	-	-
21ITM110.2	-	-	-	-	-	-	-		2	-	-	1	-	-
21ITM110.3	-	-	-	-	-	2	-		3	-	-	-	-	-
21ITM110.4	-	-	-	-	-	1	-	`	2	-	-	-	-	-
21ITM110.5	-	-	-	-	-	2	-		2	-	-	-	-	-
21ITM110.6	-	-	-	-	-	-	-		3	-	-	1	-	-

1: Low 2: Medium 3: High

INDUSTRY ORIENTED TRAINING-II

(Problem Solving Skills)

Course Code	21ITP110/210	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	-
Credits	-	Exam Hours	-

Course Learning Objectives:

1. To apply rational thinking abilities in solving real life problems.
2. To understand the science behind picking up any skill quickly.
3. To develop the required skills to effectively interact with people and to articulate the ideas.
4. To discover one's strengths and weaknesses, and apply them effectively for career growth.
5. To recognize the dynamics of a team and achieve synergy.
6. To articulate leadership and problem-solving skills.

Module-1 **4 Hours**

How to pick up Skills faster? Knowledge v/s Skill, Skill introspection, Skill acquisition, Engineering Graduate v/s Engineer

Building Interpersonal & Intrapersonal Skills: Peer communication, Social interactions, Bonding Emotional Management, Moral, social & personal responsibilities.

Module-2 **4 Hours**

Professional Etiquettes: Workplace etiquette, Dining etiquettes, Telephone etiquettes, E-mail etiquettes.

Change Management: Tolerance of change and uncertainty, Joining the bandwagon, Adapting change for growth-overcoming inhibition, Adapt to changes**.**

Module-3 **4 Hours**

Self-Awareness & Goal Setting: Identifying your Unique Selling proposition, SWOT, Nurture strengths, Fixing weaknesses, Overcoming complacency, Building confidence, Ambition/SMART Goals, Managing Failures.

Leadership & Motivation: Types of leadership styles, Case studies, Motivation, Qualities of a leader.

Module-4	4 Hours
Team Building: Difference between team and group, Qualities of an effective team player, Stages of team building, Problem-solving among team members, Building winning teams.	
Module-5	**4 Hours**
Problem Solving: Styles of problem solvers, Effective problem solving, Case studies, Individual/teams. **Creative Thinking:** Examples of creative thinking, Tools of creativity, Creative/critical thinking.	

Course Outcomes: At the end of the course the student will be able to:	
21ITP110.1	Apply the basic concepts of quantitative abilities related to Number system.
21ITP110.2	Evaluate time related problems by knowing the relationship between time/speed/distance or time/work.
21ITP110.3	Apply the concepts of average, percentage, appreciation and depreciation in real life problems
21ITP110.4	Solve application problems involving permutations and combinations.
21ITP110.5	Apply Ratio and Proportion concepts to solve the partnership problems where people share the ownership.
21ITP110.6	Apply the geometrical concepts in real- world applications.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher
1	Stop Guessing: The 9 Behaviors of Great Problem Solvers	Nat Greene	Berrett-Koehler
2	Think Smarter: Critical Thinking to Improve Problem-Solving and Decision-Making Skills	Michael Kallet	Wiley
3	Problem Solving 101: A Simple Book for Smart People	Ken Watanabe	Penguin Group

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes (PO)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
21ITP110.1	-	3	-	-	-	2	-	-	-	3	-	-	-	-
21ITP110.2	-	2	-	-	-	2	-	-	-	-	-	-	-	-
21ITP110.3	-	-	-	-	-	2	-	-	3	3	-	-	-	-
21ITP110.4	-	-	-	-	-	-	-	1	3	-	-	-	-	-
21ITP110.5	-	-	-	-	-	2	-	1	3	3	-	-	-	-
21ITP110.6	-	-	-	-	-	2	-	1	3	3	-	-	-	-

1: Low 2: Medium 3: High

St Joseph Engineering College

AN AUTONOMOUS INSTITUTION

(Affiliated to VTU, Belagavi and recognised by the AICTE, New Delhi.
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