SOMAIYA
VIDYAVIHAR

K J Somaiya Institute of Engineering and Information Technology
An Autonomous Institute affiliated to University of Mumbai
Accredited by NAACand NBA, Approved by AICTE, New Delhi

Item no. 4.5
A.C Date:9/7/2022

Autonomy Syllabus Scheme-II (2022-23)

Bachelor of Technology

in

First Year Engineering

(Basic Sciences and Humanities department)

(with Effect from AY 2022-23)

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From the Principal's Desk:

The challenges and demands of the dynamic industry increasingly require technocrats to be skilled, adaptive, and innovative. The National Educational Policy 2020 (NEP 2020) framed by the Government of India intends to induce a paradigm shift by re-conceptualising the higher education. Recent academic reforms recommended by the AICTE and UGC have also effectually upscaled the higher education system in India. It is further the role of HEIs to offer high-quality educational opportunities and enable the next generation to succeed globally. Hence, to adhere to the status quo, and enhance the academic standards and quality of engineering education further, it is essential to assimilate innovation and recurrent revision in curriculum, teaching-learning methodology, examination, and assessment system.

In congruence with it, the University of Mumbai has adapted Outcome-Based Education (OBE) system and has revised the engineering curriculum thrice in the last decade — as Rev 2012, Rev 2016, and the recent Rev 2019, 'C' scheme focusing on cutting-edge technology courses.

K. J. Somaiya Institute of Engineering and Information Technology (KJSIEIT), being an autonomous institute possesses more flexibility in adapting newer approaches to reach higher levels of excellence in engineering education. The Syllabus Scheme – I implemented under the academic autonomy conferred to KJSIEIT w.e.f. A.Y. 2021-22 already comprises of state-of-the-art courses and laboratory sessions on emerging areas of technology. With an ideology that the root of innovation is 'interest', the curriculum offered a wide range of elective courses — grouped into core and inter-disciplinary domains. At par with international engineering education, it followed a learner-centric approach, where the students could choose to study courses concerning areas of their interests.

This curriculum introduces Skill-Based Learning (SBL), Activity-Based Learning (ABL), and Technology-Based Learning (TBL) as eXposure (SAT) courses — that assure X factor in all the students of the institute. The SAT courses were practiced across the first three years of engineering, focusing on graduate attributes like work responsibilities towards society, problem-solving ability, communication skills, motivation for life-long learning, leadership and teamwork, etc. that could not be copiously imbibed through regular engineering courses. The inclusion of induction program for the First Year students is deliberated as per the guidelines of AICTE and helps students belonging to diverse backgrounds to adjust in the new academic environment.

However, sustained initiatives are required to assure efficiency, academic excellence, and growth. Hence, KJSIEIT Syllabus Scheme – II introduces 03 newer dimensions to Scheme – I: Internship, SBL of Foreign and Indian Languages, and Honours Degree — that shall be implemented w.e.f. from A.Y. 2022-23 across all the branches and all 04 years of engineering.

1. **Internship:** Firstly, the redesigned Scheme – II incorporates 14 Credits for Internship (cumulative 600-700 Hours), which shall be mandatory for all the students and is to be pursued during all 04 years of graduation. Based on the AICTE Internship Policy, this initiative shall enable graduates to respond to the current needs of the industry and equip them with skills required at national and global level. The students shall gain practical understanding and training on cutting-edge technologies and industry practices in a suitable industry or organization. While innovation and entrepreneurship are emerging as fulcrums of higher education, the internship will also provide an exposure to innovation, entrepreneurial,

and incubation opportunities through various related activities, and instil a start-up spirit in the students.

Further, the students of KJSIEIT already have an exposure to the work culture and trends in industries through live / collaborative projects / product developments, etc. and they often contribute significantly to the society through various projects. Under autonomy too, through the component of Project-Based Learning included in the syllabus, the students develop Mini, Minor, and Major projects in Second, Third, and Last Year respectively concerning healthcare, agriculture, societal / industrial need-based problems, etc. Through duality of Major Project development and newly introduced activities / components as a part of Internship, the students shall learn about research methodology, IP and IPR — resulting into generation of quality research articles, copyrights, and patents.

2. **Honours Program**: Another major initiative through the Scheme – II is the introduction of B.Tech. with Honours program for students who are desirous of pursuing focused interest in 06 emerging areas of technology recognized by AICTE: Internet of Things, Artificial Intelligence & Machine Learning, Cyber Security, Virtual and Augmented Reality, Data Science, and Blockchain. This Honours program is of high-end industry standards and shall offer multi-fold opportunities for the learners such as additional credits, specialization in the chosen domain, job-ready skills, multidisciplinary knowledge, etc.
3. **Foreign and Indian Languages**: As another initiative, the Skill-Based Learning (SBL) in Scheme – II shall also comprise of developing verbal and written communication skills in Foreign and Indian Languages, which is a blooming trend and future necessity for various career prospects. The students shall acquire these skills through MOOC courses, giving them opportunities to learn the target language from beginners to advanced level. These SBL and the TBL courses shall acquaint students with skills of digital age learning from online platforms, along with time management ability, ethics, and professionalism.

Through joint efforts of all stakeholders, newer initiatives, strategic planning, and efficient execution of neoteric educational practices with hi-tech wizardry, KJSIEIT is endeavouring to become a role model for all autonomous institutes across the nation.

Dr. S. K. Ukarande
Principal and Chairman - Academic Council

Preamble by Member Secretary, Academic Council :

K J Somaiya Institute of Engineering and Information Technology (KJSIEIT) has been granted academic autonomy by University Grants Commission (UGC) from Academic Year 2021-22 for 10 years.

UGC states the benefits of granting academic autonomy to higher education institutes as 'the freedom to modernize curricula, making it globally competent, locally relevant and skill oriented to promote employability'.

We, autonomous KJSIEITs Board of Studies in Computer Engineering (CE), , Artificial Intelligence and Data Science (AI-DS), Electronics and Telecommunication (ET) and Information Technology (IT) had prepared Autonomy Scheme-I curricula from Academic Year 2021-22 for 4 years undergraduate (UG) and 2 years of post-graduation (PG) in Engineering and Technology disciplines, exercising academic freedom, meeting the needs of Industry 4.0, addressing the world wide challenges and providing globally required exposure to our UG and PG learners, focusing sound theoretical background supported by practical experiences in the relevant areas of engineering and technology.

Industry 4.0 demands modern and industry-oriented education, up-to-date knowledge of analysis, interpretation, designing, implementation, validation, and documentation of not only computer software and systems but also electronics and communication systems, hardware devices and tools, trained professionals, ability to work in teams on multidisciplinary projects, etc from engineering graduates. KJSIEITs autonomy Scheme-I syllabus was framed looking at the overall demands of Industry 4.0 and society to successfully acquaint learners with life-long experiential learning, professional ethics with universal human values, needed skill sets, in line with the objectives of higher and technical education, AICTE, UGC and various accreditation and ranking agencies, by keeping an eye on the technological developments and innovations.

It provides unique learning experiences to learners through extracurricular activities, innovations, and research with the introduction of Skill Based, Activity Based, Technology based and Project Based learning, showcasing learners' creativity, interest and talent by developing additional skill sets, social involvement and contributions through activities, case studies, field visits, internships, creative learning, innovative mini, minor and major project developments. This helped in strengthening learners' profile with increased chances of employability and avenues for start-ups. It is also provided with Value addition learning through MOOCs platforms such as IBM-ICE, Coursera, NPTEL, SWAYAM, Spoken Tutorial, Udemy etc.

We are happy to present the additional exposure to our learners under the Autonomy Academic Scheme-II, implemented w.e.f academic year 2022-23 for developing the intellectual climate of our country, bringing academic excellence in higher education system with the introduction of additional credit and audit courses for

1. Internships,
2. Skill Based Learning and
3. Honours Degree Programs in 6 emerging areas of technologies.

These additions are targeted for promoting academic, professional and personal development of learners through hands-on working experience under internships, exposure to foreign and Indian Regional Languages through MOOCs and award of specialisation through Honours Degree Program. Internships will channelize learners' working experience with Industries, Government Sectors, NGO, MSMEs, Long term Rural Developments, and Research, Innovation, IPRs and Entrepreneurial setup. Two innovative courses on skill based implementing NEP 2020 guidelines and Honours Degree Program along with Regular B.Tech degree will boost the knowledge of graduating engineers in emerging areas of technologies contributing largely for

industrial and personal automation, cyber, digitization, digital currency, security and artificial intelligence sector.

We are sure that with Scheme-I in academic year 2021-22 and Scheme-II from Academic Year 2022-23, the blend of innovative learning components in the curriculum shall strengthen the research and entrepreneurial culture of the institute benefitting the graduating engineers immensely.

We would like to place on record our gratitude to the faculty, alumni, students, industry experts, academicians and stakeholders, helping continuously strengthen the academics, making KJSIEIT as one of best engineering colleges across nation and top most choice of engineering aspirants.

Dr. Sunita R Patil

Member Secretary, Academic Council and Vice Principal, KJSIEIT, Sion

From BS BoS Chairman's Desk: -

Dear Students, Teachers & Stakeholders,

The Department of Basic Sciences & Humanities (BS) of KJ Somaiya Institute of Engineering and Information Technology, with the Board of Studies Members, as an 'Autonomous' Institute are committed for the all-inclusive careerist goals of at the First-Year students. The autonomous status has accorded the BS department the academic freedom to float its own syllabus and customize it as per the cutting-edge global technical trends. With credit-based scheme, we embark on a fresher vision to be competent with prime focus on 'employment-centric' syllabus with dynamic reformations in the syllabus. The core engineering undergraduate branches encompass—Computer Technology (CE), Information Technology (IT), Artificial Intelligence and Data Science (AI-DS) & Electronics and Telecommunication (ET).

The major shift in the First-Year syllabus has been set on the quality benchmark—a solid foundation on the core fundaments—the pre-requisite engineering holistic skills viz. the Applied Math, Sciences and Humanities curriculum with multiple prospects as per the industry requirements.

A significant highlight of the BS department syllabus is as below:

- The design of SAT courses – Activity based learning SAT I & Activity based learning SAT II, is to seamlessly incorporate ethical values along with an interdisciplinary approaches. It endeavors a perfect balance of practical training and a curriculum module being logically outlined to meet the entrepreneurial skills with dynamic trends of job market.
- Physics & Nanotechnology, Material Chemistry, the syllabus is floated as per latest and relevant technologies with dedicated laboratories and a focus on experiential learning for the learners.
- Apart from regular trades practices in workshop, a new trade "Electro mechanical workshop" has been introduced in workshop-I syllabus. This will aid students to design & develop models on their own.
- The Induction Training as per the directives of AICTE centers on imparting exclusively subject domain skills with experts from various industries, experienced academicians from reputed institutes to offer guidance on community service, extension activities, projects for the benefit of the society at large with the scope of providing internships in Industries in the direction of campus placements.

As a First Year Engineering Department, the syllabus strives to make a positive difference in the society through the education for quality engineers, innovators, leaders and contributing citizens we produce. The autonomy initiative has been a great teamwork and involvement of all faculty and staff members in various activities during the process. We wish to thank the Management, Governing Body, Faculties, Staff, Students, Alumni and all the stakeholders for their contribution to create a national impact through a progressive education.

Dr. Harsha Mishra
Chairperson, BoS, BS Department
KJSIEIT, Sion

Structure for Student Induction Program

New students enter an institution with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.

The Induction Program is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

Transition from school to university/college life is one of the most challenging events in student's life. Therefore, it should be taken seriously, and as something more than the mere orientation program.

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it.

New students be informed that the Induction is mandatory non-credit course for which a certificate will be issued by the institution.

At the start of the induction, the incumbents learn about the institutional policies, processes, practices, culture and values, and their mentor groups are formed. The different activities are:

1. **Orientation**: In the first session of Induction program learners and parents to be oriented about institute policies, processes, practices, culture and values. In addition to this, learners will be educated for 1st year academic program information in terms of academic calendar, Assessment plan, grading information, university ordinances, rules and regulations related to academics.

2. **Mentoring**: Mentoring and connecting the students with faculty members is the most important part of student induction. Mentoring process shall be carried out in small groups, group of 10 students to be formed and allocate one senior student from 3rd year of same program in which new students have taken admission, students mentor will continue for two years, till student mentors graduate from the institute. For two (2) such groups one faculty mentor to be allocated from the same department/program, who will remain the mentor till those students graduates from the institute. In the second session of Induction program, groups for mentoring to be formed and student mentors and faculty mentors to be introduced to newly inducted students. Introduction of mentoring system to

be given to new students. Minimum one meeting to be conducted every month during semesters with students group by faculty mentors. For record keeping appropriate formats to be developed and information to be updated regularly by faculty mentors.

3. **Universal Human Values**: Universal Human Values gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer pressure and take decisions with courage, be aware ofrelationships and be sensitive to others, understand the role of money in life and experience the feeling of prosperity. Need for character building has been underlined by many thinkers, universal human values provide the base. Methodology of teaching this content is extremely important. It must not be through do'sand dont's, but by getting the students to explore and think by engaging them in a dialogue. It is best taughtthrough group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

4. **Proficiency Modules**: The induction program period can be used to overcome some critical lacunas that students might have, for example, English, Mathematics, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome thelacunas substantially.

   A diagnostic test should be conducted on Day 2 itself. Before the test, the students should be informed thatthe test would not affect their grades, branch change, or any aspect of their admission, placement, study, etc. Purpose of the test is to provide help to those students who need help in English, Mathematics, Computer proficiency etc. Students having more than 80% marks in their qualifying examination in respective subjects need not take the diagnostic test. For those below this cut-off, writing the test is mandatory. Students with weak performance in the test, must attend a non-credit course in Basic English, Basic Mathematics, and Basic Computer Operation etc. Their attending the course is mandatory. There would be no separate fee payable for the course. The classes of Basic courses must start from Day 4 at the latest. Students those who are excluded from basic courses, for them some activity in the domain of creative arts, cultural and literature to be organised.

5. **Physical Activity**: Fitness session, yoga classes, lecture(s) on facing world with sportsman spirit, making young students aware that there is nothing like being failure in the world. The world gives opportunities toall.

   The incoming students must be divided into batches of 50 students maximum, and a qualified coach in physical education/ faculty member should be attached to each batch. The list of available games, sport, or physical activities should be announced in orientation program on Day 1. They should be asked to fill their choice with three preferences, and the game or sport be allotted to them as per their

preference. The physical activity should start from Day 3 onwards, wherein the student learns and plays his assigned game during the induction program. It is also important that along with his assigned game the student also practises yoga.

6. **Creative Arts, Cultural and Literary Activity**: Qualified instructors for arts may be hired on contract basis and be paid honorarium as per norms of the institute. Daily 90 to 120 minute sessions may be arranged. The list of available art forms, such as vocal music, instrumental music, folk music, painting, sketching, dance, group dance, clay modelling, pottery, dramatics, etc. should be announced. They should be asked to fill their choice with three preferences, and the art form be allotted to them as per their preference. There should be sufficient number of teachers for each art form. The ratio may be kept as 1 teacher for every 25 students.

   A faculty member interested in literary activity should be assigned for organizing the activity. A list of books which are interesting and educational should be prepared beforehand. Books in Indian languages must be included and even given priority. Students are losing connection with languages in general and their own language, in particular. Students should be assigned a book or other smaller reading material. They should be asked to read and write a critical summary. They should present their summary in front of their group. A literary group may consist of around 30-40 students. Similarly, debating and public speakingactivity could also be undertaken. If the college can arrange for a drama workshop where a group of studentslearn and enact a play it would be very good. Not all the incoming students would do this, but those who wish may be provided the opportunity. Help may be taken from senior students engaged in such extra- curricular activities in the college.

7. **Familiarisation with Institute and Department**: The students admitted in a branch would visit their allotted department or branch. The Head of the department and other associated faculty should address the new student's right on Day 2 or so. Arrangements should be made about the meeting/gathering. The parents of the students should also be welcomed if they accompany their ward. It would be helpful if an alumnus of the Dept. relates his professional experience related to the field of the study to the incoming students.

8. **Lectures /Workshops by Eminent People**: Eminent people from all walks of life may be invited to deliver lectures, namely, from industry, academia, social science (authors, historians), social work, civil society, alumni etc. be identified and invited to come and address the new students. Motivational lectures about life, meditation, etc. by Ramakrishna Mission, Art of Living, S-VYASA university, Vivekanand Kendras, etc. may be organized. Workshops which rejuvenate or bring relief to students would also be welcome, such as, Art of Living workshops.

9. **Extra-Curricular Activity**: Every college has extra-curricular activities. Most of them are student driven. They are organized by student councils and clubs. The extra-curricular activities going on in the college should be presented to the new students under the guidance of faculty advisors for such activity. The new students should be informed about how they can join the activities. Related facilities should be described to them. Presentation on the activities by the student council should be made.

10. **Feedback and Report on the Program**: A formal feedback at the end of the program should be collected from students by their filling a form in writing or online. Besides the above, each group (of 20 students) should write a report on the Induction Program towards the end of the semester. They would also have to make a presentation of their report. They should be encouraged to use slides while making a presentation. Presentation of the report should be made in the language they are comfortable with, without any insistence that it should be in English. It is more important that they feel comfortable and confident. Each group may make the presentation through 4-5 of its group members or more. In case, the number of new students in a college is large, the presentation should be made by each group in front of 4 other groups besides their own, thus there would be about 100 students (in 5 groups) in the audience in a session. Several such sessions could run in parallel or serially. In each session, their faculty mentors and student guides, if any, should also be in the audience. These sessions would tell you how well the program ran, and what the students are feeling at the end of the program. This would also serve as a grand closure to the program.

A certificate shall be awarded to all the students, upon successful completion of the induction program based on their report and presentation.

Tentative schedule of 1st Week Induction Program:

Day 1	Session 1	Orientation program
	Session 2	Mentoring (group formation and introduction)
Day 2	Session 3	Diagnostic test (basic English, maths and computer operation)
	Session 4	Familiarisation of Department and Institute (Visits to department, laboratory, Library, Examination cell, office etc)
Day 3	Session 5	Physical Activity (Yoga, sports etc)
	Session 6	Universal human values session
Day 4	Session 7	Proficiency Modules (Short courses on basic maths, English and computer operation etc. for identified students)
	Session 8	Physical Activity (Yoga, sports etc)
Day 5	Session 9	Proficiency Modules (Short courses on basic maths, English and computer operation etc. for identified students)

	Session 10	Creative Arts, Cultural and Literary Activity

A session may be conducted for around 2-3 hours each. Minimum 12 sessions to be conducted from the following 20 sessions, from 2nd week to last week of academics,throughout the semester.

Session 11	Physical Activity (Yoga, sports etc)- 1
Session 12	Extra-Curricular Activity- 1
Session 13	Physical Activity (Yoga, sports etc)-2
Session 14	Extra-Curricular Activity- 2
Session 15	Physical Activity (Yoga, sports etc)- 3
Session 16	Lectures /Workshops by Eminent People- 1
Session 17	Physical Activity (Yoga, sports etc)- 4
Session 18	Lectures /Workshops by Eminent People- 2
Session 19	Creative Arts, Cultural and Literary Activity- 1
Session 20	Lectures /Workshops by Eminent People- 3
Session 21	Creative Arts, Cultural and Literary Activity- 2
Session 22	Universal Human Values- 1(Group Discussion among students as per mentoring group on various aspects of life, values, ethics etc.)
Session 23	Creative Arts, Cultural and Literary Activity- 3
Session 24	Universal Human Values- 2 (Group Discussion among students as per mentoring group on various aspects of life, values, ethics etc.)
Session 25	Creative Arts, Cultural and Literary Activity- 4
Session 26	Universal Human Values- 3 (Group Discussion among students as per mentoring group on various aspects of life, values, ethics etc.)
Session 27	Creative Arts, Cultural and Literary Activity- 5
Session 28	Physical Activity (Yoga, sports etc)- 5
Session 29	Feedback and Report on the Program- 1
Session 30	Feedback and Report on the Program- 2

Program Structure for First Year UG CE/IT/AI/ET/EX Technology (Common for all branches)

Semester- II-Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total (Hrs.)	Credits Assigned TH – P – TUT	Total Credits	Course Category
BSC201	Engineering Mathematics II	3– 0 – 1	03	3 – 0 – 1	04	BS
BSC202	Physics and Nanotechnology	2 – 0 – 0	02	2 – 0 – 0	02	BS
BSC203	Materials Chemistry	2– 0 – 0	02	2 – 0 – 0	02	BS
BSC204	Engineering Graphics	2 – 0 –0	02	2 – 0 – 0	02	ES
BSC205	Computer Programming	3 – 0 – 0	03	3 – 0 – 0	03	ES
BSL202	Physics and Nanotechnology Laboratory	0 – 1 – 0	01	0 – 0.5 – 0	0.5	BS
BSL203	Material Chemistry Laboratory	0 – 1– 0	01	0 – 0.5– 0	0.5	BS
BSL204	Engineering Graphics Laboratory	0 – 4 – 0	04	0 – 2– 0	02	ES
BSL205	Computer Programming Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
BSL206	Professional Communication Skills	0 – 4**-0	04	0 – 2 – 0	02	BS
BSW207	Workshop II	0 – 2 – 0	02	0 – 1 – 0	01	ES
BSX(S/A/T)22	Activity Based Learning SAT - II	0 – 2* – 0	02	0 – 1 – 0	01	SAT
Total		**12-16-1**	**28**	**12- 8 –1**	**21**	--

***SAT Hours are under Practical head but can be taken as Theory or Practical or both as per the need.**

****2 hours class wise and 2 hours batch wise**

Semester- II-Examination Scheme

Course Code	Course Name	Examination Scheme							
		Marks							
		CA				ESE	TW	P	Total
		T-1	T-2	Average (T-1 & T-2)	IA				
BSC201	Engineering Mathematics II	30	30	30	10	60	25	--	125
BSC202	Physics and Nanotechnology	20	20	20	10	45	--	--	75
BSC203	Materials Chemistry	20	20	20	10	45	--	--	75
BSC204	Engineering Graphics	30	30	30	10	60	--	--	100
BSC205	Computer Programming	30	30	30	10	60	--	--	100
BSL202	Physics and Nanotechnology Laboratory	--	--	--	--	--	25	--	25
BSL203	Material Chemistry Laboratory	--	--	--	--	--	25	--	25
BSL204	Engineering Graphics Laboratory	--	--	--	--	--	25	25	50
BSL205	Computer Programming Laboratory	--	--	--	--	--	25	25	50
BSL206	Professional Communication Skills	--	--	--	-	---	50*	--	50
BSW207	Workshop II	--	--	--	--	--	50	--	50
BSX(S/A/T)22	Activity Based Learning SAT - II	--	--	--	--	--	25	--	25
Total		**130**	**130**	**130**	**50**	**270**	**250**	**50**	**750**

*** Term work is based on Presentation/Group discussion/Case studies/Assignment/Technical writing etc.**

Course Code	Course Name	Credits (TH+P+TUT)
BSC201	Engineering Mathematics-II	3+ 0+ 0

Prerequisites:	1.Basics of trigonometry 2.Basics of Integral calculus 3.Basics of curve tracing
Course Objectives:	1. To classify and study first order and first degree differential equations 2. To explain the fundamental concepts of linear differential equations of higher order with constant coefficients 3. To analyse Beta and Gamma functions and rectification of curves 4. To introduce the theory of double integrals and its evaluation techniques 5. To apply double integrals for finding area and enumeration of triple integrals 6. To use numerical methods for solving differential equations and integrals
Couse Outcomes:	After taking this course learner will be able to.. 1. solve problems in the field of engineering using concepts of first order and first degree differential equations. 2. find the solution of engineering problems using the theory of higher order linear differential equations with constant coefficients. 3. determine the value of definite integrals using special functions called Beta and Gamma functions and DUIS techniques. 4. evaluate the double integrals in different coordinate systems. 5. apply double integration to find area and calculate triple integrals. 6. make use of numerical techniques to find the solution of first order differential equations and integrals.

Module No.	Sub Topics	CO mapped	Hrs/ Subtopic	Total Hrs/Module
i	**Prerequisite Concepts and Course outline**	--	2	2
1.	**Differential Equations of First Order and First Degree** 1.1 Exact differential Equations, Equations reducible to exact form by using integrating factors.	CO1	4	6
	1.2 Linear differential equations (Review), equation reducible to linear form, Bernoulli's equation # **Self-learning topics:** Simple application of differential equation of first order and first degree to electrical and Mechanical Engineering problem		2	

2.	**Linear Differential Equations with Constant Coefficients and Variable Coefficients of Higher Order** 2.1 Linear Differential Equation with constant coefficient, complementary function, particular integrals of differential equation of the type f(D)y=X where X is e^{ax},sin(ax+b), cos(ax+b), x^n, $e^{ax}V$,xV.	**CO2**	**4**	**6**
	2.2 Method of variation of parameters. **# Self-learning topics**: Cauchy's homogeneous linear differential equation and Legendre's differential equation, Applications of Higher order differential equation.		**2**	
3.	**Beta and Gamma Function, Differentiation under Integral sign and Rectification Pre-requisite: Tracing of curves** 3.1Beta and Gamma functions and its properties.	**CO3**	**4**	**8**
	3.2 Differentiation under integral sign with constant limits of integration.		**2**	
	3.3 Rectification of plane curves.(Cartesian and polar) **#Self-learning topics**: Rectification of curve in parametric co-ordinates.		**2**	
4.	**Multiple Integration-1** 4.1 Double integration -definition, Evaluation of Double Integrals.(Cartesian & Polar)	**CO4**	**2**	**7**
	4.2 Evaluation of double integrals by changing the order of integration.		**3**	
	4.3 Evaluation of integrals over the given region. (Cartesian & Polar) **#Self-learning topics:** Application of double integrals to compute Area, Mass.		**2**	
5.	**Multiple Integration-2** 5.1 Evaluation of double integrals by changing to polar coordinates.	**CO5**	**2**	**6**
	5.2 Application of double integrals to compute Area		**2**	

	5.3 Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates). **#Self-learning topics:** Application of triple integral to compute volume.		**2**	
6.	**Numerical solution of ordinary differential equations of first order and first degree, and, Numerical Integration** 6.1 Numerical solution of ordinary differential equation using (a) Euler'smethod (b) Modified Euler method, (c) Runge-Kutta fourth order method	**CO6**	**3**	**6**
	6.2 Numerical integration- by (a) Trapezoidal (b) Simpson's 1/3rd (c) Simpson's 3/8th rule (all with proof). **#Self-learning topics:** Numerical solution of ordinary differential equation using Taylor Series method.		**3**	
ii	**Course conclusion:** Recap of Modules, Outcomes, Applications, and Summarization.	**-**	**1**	**1**

Books:	
Text Books	1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication 2. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill 3. Elementary Linear Algebra with Application by Howard Anton and Christ Rorres. 6th edition. 4. John Wiley & Sons, INC.
Reference Books	1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9thEd. 2. Engineering Mathematics by Srimanta Pal and SubodhBhunia, Oxford University Press
Useful Links:	1.e-PGPathshala (inflibnet.ac.in) 2.https://nptel.ac.in/noc/courses/111/ 3.https://www.coursera.org/courses?query=mathematics 4. https://ndl.iitkgp.ac.in/

Continuous Assessment (CA):

The distribution of Continuous Assessment marks will be as follows –

1.	Test 1	30 marks
2.	Test 2	30 marks
3.	Internal Assessment	10 marks

Tests:

Two tests of 30 marks each should be conducted in a semester. The first test is to be conducted when approx. 40% syllabus is completed and second test when additional 40% syllabus (but excluding contents covered in Test I) is completed. Duration of each test shall be 1 hour 15 minutes and average of both tests will be considered as a head of passing.

Internal Assessment (IA):

Marks will be allotted as per designed rubrics.

Term Work (TW):

1. Term work should consist of a minimum of 6 class tutorials

2. Journal must include at least 2 assignments on content of theory of the course.

The distribution of term work marks will be as follows –

1.	Tutorials	20 marks
2.	Assignment	05 marks

End Semester Theory Examination:

End Semester Theory Examination will of 60-Marks and duration 2 hours 30 minutes.

Course Code	Course Name	Credits (TH+P+TUT)
BSC202	**Physics and Nano Technology**	**2 + 0 + 0**
Prerequisites:	1.Wave front and Huygens's principle, reflection and refraction, diffraction, Fresnel diffraction	

	and Fraunhofer diffraction 2.Absorption, recombination, energy bands of p-n junction, refractive index of a material, Snell's law 3.Electric Charges, Coulomb's law-force between two point charges, Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, Gauss's law, Faraday's law 4.Scattering of electrons, Tunneling effect, Electrostatic focusing, magneto static focusing
Course Objectives:	1. To give exposure to the basic concepts of optics and electrodynamics. 2. To provide fundamentals of nanotechnology encouraging engineering students to venture in research field
Couse Outcomes:	Learners will be able to... 1. identify the applications of diffraction grating in spectroscopy and monochromators. 2. describe the working of lasers and applications of lasers. 3. apply the foundation of fibre optics in development of modern communication technology 4. describe significance of Maxwell's equations. 5. assimilate the wide scope of nanotechnology in modern developments and its role in emerging innovating applications. 6. describe different techniques of Synthesis and Characterization.

Module No.	Sub Topics	CO mapped	Hrs/ Subtopic	Total Hrs/Module
i	**Prerequisite Concepts and Course outline**	**--**	**1**	**1**
1.	**DIFFRACTION** 1.1 Fraunhofer diffraction at single slit	**CO1**	**1**	**4**
	1.2 Diffraction Grating		**1**	
	1.3 Resolving power of a grating		**1**	
	1.4 Applications of diffraction grating in spectroscopy, monochromators, Determination of wavelength of light using plane transmission grating		**1**	
2.	**LASERS** 2.1 Laser: spontaneous emission and stimulated emission, metastable state, population inversion, types of pumping, resonant cavity,	**CO2**	**1**	**4**
	2.2 Three level lasers, Four level lasers, Helium Neon laser (gas laser), Nd:YAG laser (solid state laser), Semiconductor laser		**2**	
	2.3 Einstein's equations, Holography and other applications of laser		**1**	
3.	**FIBRE OPTICS** 3.1 Fibre optics: Total Internal Reflection, critical angle, types of optical fibres, angle of acceptance, Numerical Aperture for step index fibre	**CO3**	**1**	**3**
	3.2 V number; number of modes of propagation, Fibre optic communication system		**1**	

	3.3 Optical sensor: Photodiode, construction and use of photodiode as ambient light measurement and flux measurement, use of optical fibre in pressure sensing, temperature sensing, smoke sensing, water level sensing applications		**1**	
4.	**ELECTRODYNAMICS** 4.1Scalar and Vector field, Vector Algebra, Position vector, Displacement Vector	**CO4**	**1**	**6**
	4.2 Physical significance of gradient, divergence and curl in Cartesian co-ordinate system		**2**	
	4.3 Divergence theorem, Stokes theorem, Gauss's law for electrostatics, Gauss's law for magnetostatics, Faraday's Law and Ampere's circuital law		**1**	
	4.4 Maxwell's equations (Free space and time varying fields), significance of Maxwell's equations		**2**	
5.	**NANOTECHNOLOGY I: Basics and Types of Nanomaterials** 5.1 Introduction to Nanosystem, Size Dependent Phenomenon: Surface to volume ratio.	**CO5**	**1**	**4**
	5.2 Properties of Nanomaterials: Optical, electrical, magnetic, and mechanical		**1**	
	5.3 Types of Nanomaterials: Classification based on dimension, Morphology, Physical and Chemical properties		**1**	
	5.4 Applications of Nanomaterials		**1**	
6.	**NANOTECHNOLOGY II: Synthesis, Fabrication and Characterization Techniques** 6.1 Two main approaches in nanotechnology -Bottom up technique and Top down technique	**CO6**	**1**	**5**
	6.2 Chemical Synthesis, Physical Synthesis		**1**	
	6.3 Nanofabrication by Lithography		**1**	
	6.4 Characterization Techniques: XRD, SEM, AFM, TEM, XPS, SERS, RBS, UV-V Spectrometer		**2**	
ii	**Course conclusion: Recap of Modules, Outcomes, Applications, and Summarization.**	**-**	**1**	**1**

Books:

Text Books	1.A Text book of Engineering Physics -Dr. M. N. Avadhanulu,Dr. P. G. Kshirsagar, S. Chand, Revised Edition 2014 2.Modern Engineering Physics - A. S. Vasudeva, S. Chand, Revised Edition 2013 3.Engineering Physics D. K Bhattacharya,PoonamTandon, Oxford Higher Education, 1st Edition 2015 4.Engineering Physics -R. K. Gaur,S. L. Gupta, Dhanpat Rai Publications, 2012 5.Engineering Physics -V. Rajendran, McGraw Hill Educations, 2017

	6.A Textbook of Nanoscience and Nanotechnology, T. Pradeep Tata McGraw Hill Education Pvt. Ltd., 2012
Reference Books	1.Concepts of Modern Physics - ArtherBeiser, ShobhitMahajan, S. Choudhury, McGraw Hill, 7th Edition 2017 2. Fundamentals of optics - Francis A. Jenkins, Harvey E. White, McGraw Hill Publication, India, 4th Edition 3.Fundamentals of Physics, Halliday and Resnick, Wiley publication 4.Introduction to Electrodynamics, D. J. Griffiths, Pearson Publication 5.Nano: The essentials, understanding Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill` 6.Nanomaterials: Synthesis, Properties and Applications, A. S. Edelstein and R. C. Cammarata, Institute of Physics Pub., 2001

Useful Links:

1.NPTEL :: Physics - NOC: Introduction to LASER

2.NPTEL :: Nanotechnology - Nanostructures and Nanomaterials: Characterization and Properties

3.NPTEL :: Physics - Electrodynamics

4.https://nptel.ac.in/courses/115/107/115107095/

Assessment

Continuous Assessment (CA) : 30 Marks

Continuous Assessment will be done on the following basis-

Weightage	Assessment Method	Time of Conduction	Process
20 Marks	Test 1 (T1)	Will be conducted after completing approx. 40% syllabus	Duration of each test shall be 1 hour and average of both tests will be considered as a head of passing.
20 Marks	Test 2 (T2)	Will be conducted when additional 35% syllabus is completed	
10 Marks	Internal Assessment	Throughout the semester as and when a module is completed	Marks will be allotted as per designed rubrics.

End Semester Examination:

End Semester Theory Examination will of 45-Marks and duration 2 hours.

Course Code	Course Name	Credits (TH+P+TUT)
BSC203	**Material Chemistry**	**2+ 0 + 0**

Prerequisites:	1. Classification and crystallinity of polymers 2. Metals and metallurgical operations 3. Principles of spectroscopy 4. Fundamentals of thermodynamics
Course Objectives:	1.To recognize the types, properties and applications of polymers, composite materials, alloys and ceramics 2. To apply phase rule on one and two component systems 3.To describe fabrication of polymers, composite materials, alloys & ceramics 4.To interpret the techniques of spectroscopic analysis
Course Outcomes	Learners will be able to… 1. identify different types of chemical materials and use the right material for specific engineering applications . 2. interpret various phase transformations using thermodynamics. 3. be familiar with various manufacturing techniques to obtain simple/complex shapes of materials. 4. apply basic concepts of spectroscopy in characterizing chemical materials using FTIR and NMR

Module	**Detailed Contents**	**CO Mapped**	**Hr/ Subtopic**	**Total Hrs**
i	Prerequisite Concepts and Course outline	**--**	**1**	**1**
1.	**Polymers-** **1.1** Introduction, Thermoplastic and Thermosetting polymers. Molecular weight (Number average and Weight average), Numerical problems on molecular weight, Effect of heat on polymers (glass transition temperature), Viscoelasticity.	**CO1, CO3**	**2**	**5**
	1.2 Polymer Blends, Polymer Alloys, Engineering & Specialty Polymers, Biomedical Polymers, Liquid crystal polymers, Conducting Polymers, Biopolymers, Intelligent (Smart) Polymers .Compounding of plastics, Fabrication of plastics- Compression, Transfer, Injection and Extrusion moulding, Blown Film Extrusion Moulding.		**3**	
2	**Composite materials-** 2.1 Introduction, Constitution- i) Matrix phase ii) Dispersed phase. Characteristic properties of composite materials. Classification- (A) Particle - reinforced composites- i) Large – particle reinforced composites ii) Dispersion – strengthened	**CO1, CO3**	**2**	**4**

	composites. (B) Fiber – reinforced composites- i) Continuous – aligned ii) Discontinuous – aligned (short)- (a) aligned (b) randomly oriented (C) Structural Composites- i) Laminates (ii) Sandwich Panels, Fibre reinforced composites			
	2.2 Important Fibre Reinforced Composites, Processing of Fibre reinforced composites, Applications of composite materials.		**2**	
3	**Alloys and Ceramics** **3.1 Alloy**-Introduction to alloy, purpose of making alloys, Ferrous Alloys, plain carbon steel, heat resisting steels, stainless steels (corrosion resistant steels), effect of the alloying element, Ni, Cr, Co, Mg, Mo, W, and V. Non-Ferrous Alloys- Alloys of Al – i) Duralumin ii) Magnalumin. Alloys of Cu-Brasses – i) Commercial brass ii) German Silver. Bronzes – i) Gun metal ii) High – phosphorus bronze. Alloys of Pb– i) Wood's metal. ii) Tinman's solders. Their composition, properties & uses. Shape memory alloy.	**CO1**	**3**	**5**
	3.2 Ceramics -Introduction to ceramic powde**r,** Classification of ceramics, Application of ceramics. General methods to produce ceramic powder, Manufacture of some important oxide and non oxide ceramic powders.		**2**	
4	**Powder Metallurgy and its industrial applications** **4.1 Powder Metallurgy and its industrial applications-** Introduction, methods of metal powder formation (1) (a) Mechanical pulverization (b) Atomization (c) Chemical reduction (d) Electrolytic process (e) Decomposition. (2) Mixing & blending (3) Sintering. (4) Compacting, Various methods of compacting and shaping such as i) cold pressing. ii) Powder injection moulding. iii) Hot compaction. •	**CO3**	**3**	**3**
5	**Phase Rule** **5.1 – Gibb's Phase Rule-**Statement of Gibb's Phase Rule, Terms involved with examples, Application of Phase rule to	**CO2**	**2**	**4**
	5.2 Reduced Phase Rule, Application of Phase rule to Two Component System (Pb- Ag), Advantages and Limitations of Phase Rule. Numerical problems on Phase Rule		**2**	
6	**Material characterization techniques** **6.1 -**IR spectroscopy: Principle, instrumentation, fingerprint region and Application with simple Numerical problems	**CO4**	**2**	**5**
	6.2 NMR Spectroscopy: Principle, instrumentation, Chemical		**3**	

	Shift and Application with simple Numerical problems			
ii	**Course conclusion:** Recap of Modules, Outcomes, Applications, and Summarization.	**-**	**1**	**1**

Books:

Text Books	1.Engineering Chemistry - Jain & Jain (DhanpatRai) 2. Engineering Chemistry – Dara&Dara (S Chand) 3. Engineering Chemistry - Wiley India (ISBN – 9788126519880) 4. A Text Book of Engineering Chemistry – ShashiChawla (DhanpatRai) 5. Engineering Chemistry – Payal Joshi &Shashank Deep (Oxford University Press) 6. Engineering Chemistry-OG Palanna (McGraw Hill Education)
Reference Books	1.W.D. Kingery, Introduction to Ceramics, 2nd ed., John Wiley & Sons, 1999. 2.W.D. Callister, D.G. Rethwisch, Materials science and Engineering: An Introduction, 8th ed., Wiley, 2010. 3.Principles of Instrumental Analysis,7th Edition, Douglas A.Skoog/F.James Holler/Stanley R.Crouch. 4.Fundamentals of Analytical Chemistry ,8th Edition.

Useful Links:

https://onlinecourses.nptel.ac.in /noc20_cy08/preview

https://www.chemguide.co.uk/

https://nptel.ac.in/courses/112/104/112104221/

https://onlinecourses.nptel.ac.in/noc21_me59/preview

Continuous Assessment (CA):

The distribution of Continuous Assessment marks will be as follows –

1	**Test 1**	20 marks
2	**Test 2**	20 marks
3	**Internal Assessment**	10 marks

Tests: Two tests of 20 marks each should be conducted in a semester. The first test is to be conducted when approx. 35-40% syllabus is completed and second test when additional 35-40% syllabus (but excluding contents covered in Test I) is completed. Duration of each test shall be 1 hour and average of both tests will be considered as a head of passing.

Internal Assessment (IA): Marks will be allotted as per designed rubrics.

End Semester Theory Examination:

End Semester Theory Examination will of 45-Marks and duration 2 hours.

Course Code	Course Name	Credits (TH+P+TUT)
BSC204	**Engineering Graphics**	**2+0+0**

Prerequisites:	1. Prior knowledge of geometrical concepts—basic shapes, types of symmetry (reflectional, rotational, translational), scaling, unit measurement system etc 2. Computer competency 3. Visualization details of spatial awareness, objects in three dimensions before actualization of the task
Course Objectives:	1. To develop manual and computerized graphical skills 2. To impart skills in reading and interpretation of engineering drawing 3. To enhance visualization skills 4. To articulate graphical skills, concepts, ideas and design of engineering products through technical drawings 5. To model basic forms of projections as a prerequisite for future engineering tasks 6. To comprehend the diverse visualization dimensions
Course Outcomes	*Learners will be able to: -* 1. draw basic views of diverse projections of engineering drawing—lines and planes. 2. discern the concepts of projection of solids with acquisition of graphical skills. 3. apply the visualisation skills viz. concepts of sections and development of lateral surface in practical application. 4. sketch technical drawings—two-dimensional orthographic drawing without section from the three-dimensional pictorial view. 5. demonstrate the basic principles of projections in converting 3D view to 2D drawing with section. 6. imagine the three-dimensional solid from two-dimensional pictures.

Module	Detailed Contents	CO Mapped	Hr/ Subtopic	Total Hrs
i	**Prerequisite Concepts and Course outline**	**--**	**1**	**1**
01.	**1.1 Introduction to Engineering Graphics:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, Types of Lines, Dimensioning Systems as per IS conventions.		**1**	**5**

	1.2 Projection of Points and Lines: Projection of points in multiple quadrants. Lines inclined to both the reference planes in multiple quadrants. (Excluding Traces of lines).	**CO1**	**3**	
	@1.3 Projection of Planes: Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular planes inclined to either HP or VP only. (Exclude composite planes).		**1**	
02	**Projection of Solids:** (Prism, Pyramid, Cylinder, Cone only) Solid projection with the axis inclined to both HP and VP. (Exclude Spheres, Composite, Hollow solids and frustum of solids). Use change of position or Auxiliary plane method	**CO2**	**6**	**6**
03	**3.1 Section of Solids:** Section of Prism, Pyramid, Cylinder, & Cone cut by plane perpendicular to at least one reference plane. (Exclude Curved Section Plane). Use change of position or Auxiliary plane method	**CO3**	**4**	**6**
	3.2 Development of the lateral surface: Developing only the lateral surface (not the base) of the solid which is left out after a solid is being cut by a plane. (Exclude development of a solid with a hole in it and reverse development)		**2**	
04	**Orthographic Projections:** Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method recommended by I.S.	**CO4**	**3**	**3**
05	**Sectional Orthographic Projections:** Basic concept and significance of sectional orthographic projections. Full sectional view of simple machine parts. (Excluding half section)	**CO5**	**3**	**3**
06	**Isometric Views:** Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere).	**CO6**	**3**	**3**
ii	**Course conclusion: Recap of Modules, Outcomes, Applications, and Summarization.**	**-**	**1**	**1**

- **@ only in Term Work (i.e; Questions will not be asked for any examination.)**
- **Maximum coverage of module 04, 05 and 06 should be during the Practical sessions**

Books:	
Text Books	1.N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd. 2.N.D. Bhatt & V.M. Panchal, "Machine Drawing", 3.Charotar Publishing House Pvt. Ltd.
Reference Books	1.Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publisher. 2.Prof. Sham Tickoo (Purdue University) & GauravVerma, "(CAD Soft Technologies): Auto CAD 2012 (For engineers and Designers)", Dreamtech Press NewDelhi. 3.Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill. 4.K. Venugopal, “Engineering Drawing and Graphics”, New Age International.
Useful Links:	
https://youtu.be/cQHDAfrptUc	
https://nptel.ac.in/courses/112/103/112103019/#	
https://nptel.ac.in/courses/112/104/112104172/	

Assessment

Continuous Assessment (CA): (40 Marks)

Continuous Assessment will be done on the following basis-

Weightage	Assessment Method	Time of Conduction	Process
30 Marks	Test 1 (T1)	Will be conducted after completing approximately 35% to 40% syllabus.	Test 1 will be conducted for 30 marks. **(Conventional/Manual Drafting)**
30 Marks	Test 2 (T2)	Will be conducted when additional 40% syllabus is completed	Test 2 will be conducted for 30 marks. **(Drafting on AutoCAD software)**
10 Marks	Internal Assessment (IA)	Throughout the semester as and when a module is completed	Marks will be allotted as per designed rubrics.

Duration of each test shall be 1 hour 30 minutes and average of both tests will be considered as a head of passing.

End Semester Theory Examination:

End Semester Theory Examination will of 60-Marks and duration 3 hours.

Course Code	Course Name	Credits (TH+P+TUT)
BSC205	**Computer Programming**	**3+0+0**

Prerequisite:	Competency in 'Computer Programming' terminologies.
Course Objectives:	1. To provide exposure in developing algorithm, flowchart and thereby writing efficient codes for user defined problem. 2. To familiarize the logic of structured programming approach. 3. To emphasize on the development of applications of a program using function. 4. To introduce the types and structure of computer language 5. To create awareness on the role of pointers 6. To discern the types and concept of files
Couse Outcomes:	Learner will be able to… 1. formulate simple algorithms for arithmetic, logical problems and translate them to programs in C language. 2. implement, test and execute programs comprising of control structures. 3. decompose a problem into functions and synthesize a complete program. 4. demonstrate the use of arrays, strings and structures in C language. 5. apply the acquired conceptual knowledge of pointers. 6. identify the task of types of files to solve the task effectively.

Module No	Sub Topics	CO mapped	Hrs/ Subtopic	Total Hrs/Module
i.	**Prerequisite Concepts and Course outline**	**--**	**2**	**2**
1.	**Introduction, Fundamentals of C Programming** Introduction to components of a Computer System. Introduction to structure programming approach, Introduction to Algorithm and Flowchart	**CO1**	**2**	**7**
	• Keywords, Identifiers, Constants and Variables • Data types in C, Operators in C • Basic Input and Output Operations • Expressions and Precedence of Operators • In-built Functions, Pre-processor Directives, library, Header Files	**CO1**	**5**	
2.	**Control Structures, Branching and looping structures** Introduction to Control Structures	**CO2**	**1**	**8**
	• If statement, If-else statement, Nested if-else, else-if Ladder • Switch statement • For loop, While loop, Do while loop • Break, continue and go to statements	**CO2**	**6**	
3.	**Functions** • Introduction to functions	**CO3**	**6**	**6**

	• Function prototype, Function definition, Accessing a function and parameter passing: Call by Value and Call by reference • Recursive functions • Storages Classes: Auto, extern, Static and Register			
4	**Arrays and Strings** • Introduction to Arrays • Declaration and initialization of one dimensional and two-dimensional arrays. • Definition and initialization of String • String functions	**CO4**	**6**	**6**
5	**Structure and Union** • Concept of Structure and Union • Declaration and Initialization of structure and union • Nested structures • Array of Structures • Passing structure to functions	**CO5**	**5**	**5**
6	**Pointers and Files** • Fundamentals of pointers • Declaration, initialization and dereferencing of pointers • Operations on Pointers • Concept of dynamic memory allocation • Types of File, File operation- Opening, Closing, Creating, Reading, Processing File	**CO6**	**7**	**7**
ii	**Course conclusion:** Recap of Modules, Outcomes, Applications, and Summarization.	**-**	**1**	**1**

Books:

Text Books	**1.** E. Balaguruswamy, Programming in ANSI C, McGraw-Hill **2.** Kernighan, Ritchie, "The C Programming Language", Prentice Hall of India **3.** Sumitabha Das, Computer Fundamentals and C Programming, McGraw-Hill **4.** Pradeep Day and ManasGosh ,"Programming in C", Oxford University Press.
Reference Books	**1.** Byron Gottfried, "Programing with C", McGraw Hill (Schaum"s outline series) **2.** Venugopal K.R, Prasad Sudeep, "Mastering C", McGraw-Hill **3.** KanetkarYashwant," "Let Us C", BPB Publication.

Useful Links:

1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
2. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
3. https://onlinecourses.swayam2.ac.in/cec20_cs02/preview
4. https://www.coursera.org/specializations/c-programming
5. https://www.udemy.com/course/c-programming-for-beginners-/

Continuous Assessment (CA):

1	**Test 1**	30 marks
2	**Test 2**	30 marks
3	**Internal Assessment**	10 marks

Test:
Assessment consists of two tests of 30 marks each. The first test is to be conducted when approx. 40% syllabus is completed and second test when additional 35% syllabus is completed. Duration of each test shall be 1 hour 15 minutes and average of both tests will be considered as a head of passing.

Internal Assessment (IA):

Marks will be allotted as per designed rubrics.

End Semester Theory Examination:

End Semester Theory Examination will of 60-Marks and duration 2 hours 30 minutes.

Lab Code	Lab Name	Credits (P+TUT)
BSL202	**Physics and Nano Technology Laboratory**	**0.5 +0**

Lab Prerequisites:	1. Interference in thin films 2. Crystallography basics 3. Semiconductor Physics
Lab Objectives:	1. To improve the knowledge about the theory concepts of Physics learned in the class 2. To improve ability to analyse experimental result and write laboratory report
Lab Outcomes (LOs):	Learners will be able to... 1. perform experiment on diffraction and determine width of the slit / wavelength of light / grating element. 2. determine parameters like numerical aperture of an optical fibre / divergence of laser beam. 3. plot I V characteristics of a photo diode. 4. synthesize Nanomaterials and perform experiments of Nanotechnology experiment using virtual lab / Simulation. 5. determine properties of nanoparticles.

Lab No.	Experiment Title	LO mapped	Hrs/Lab
i	**Lab Prerequisites**	**--**	**2**
1.	Determination of width of a slit using single slit diffraction experiment (laser source)	**1**	**1**
2.	Determination of wavelength of light (laser source) using Diffraction grating.	**1**	**1**
3.	Determination of wavelength of light (ordinary source) using Diffraction grating.	**1**	**1**
4.	Determination of grating element of grating using LASER Source.	**1**	**1**
5.	Study of divergence of laser beam	**2**	**1**
6.	Determination of Numerical Aperture of an optical fibre.	**2**	**1**
7.	Study of I-V characteristics of Photo diode.	**3**	**1**
8.	Synthesis of Nanomaterials (demonstration)	**4**	**1**
9.	Synthesis carbon nanotubes. (demonstration)	**4**	**1**
10.	Determination of Crystallite Size and Micro strain of Nanomaterial Using XRD data.	**5**	**1**
11.	Determination of particle size and optical band gap of nanomaterial using UV-V Spectrometer	**5**	**1**
12.	Any other experiment based on syllabus may be included, which would help the learner to understand concept. Virtual lab may be developed and used for performing the experiments.	**--**	**1**

Virtual Lab Links:
1.https://vlab.amrita.edu/?sub=1
Term work: 1. Term work should consist of a minimum of 8 experiments 2. Journal must include at least 2 assignments on content of theory and practical of the course. 3. The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work. 4.Total 25 Marks (Experiments: 20-marks, Assignments: 05-marks)

Lab Code	Lab Name	Credits (P+TUT)
BSL203	Material Chemistry Laboratory	0.5+0

Lab Prerequisites:	1. Knowledge of volumetric analysis 2. Knowhow of gravimetric analysis 3. Principles of Spectroscopy
Lab Objectives:	1. To enhance knowledge about the theory learned in the class 2. To analyse experimental results and write laboratory report
Lab Outcomes (LOs):	After experimentation, the learners will be able to: 1.determine metal ion concentration using colorimeter, spectrophotometer and flame photometer. 2. synthesize a polymer and discern its physical properties like molecular weight, melting point. 3. make use of analytical techniques (complexometric, redox and iodometric titrations) to find the composition of alloys. 4. analyse chemical materials by different characterization techniques like FTIR and NMR.

Lab No	Experiment Title	LO mapped	Hrs/Lab
i	**Lab Prerequisites**	**--**	**2**
1.	Determination of Na/K by Flame photometry.	**LO1**	**1**
2.	To determine metal ion concentration using colorimeter/	**LO1**	**1**
3.	Instrumentation and Working Principles of Infra-Red(IR) Spectroscopy Using Salt Plates.	**LO4**	**1**
4	Nuclear magnetic resonance spectroscopy and evaluation of simple 1HNMR spectra of select organic compounds using virtual lab.	**LO4**	**1**
5	Synthesis of biodegradable polymer using corn starch or potato	**LO2**	**1**
6	Molecular weight determination of polymers by Oswald	**LO2**	**1**

7	To determine melting point and /or glass transition temperature of a polymer	**LO2**	**1**
8	Estimation of Zn in brass by Complexometric titration	**LO3**	**1**
9	Estimation of Ni in an alloy by Complexometric titration.	**LO3**	**1**
10	Estimation of Sn in Solder by iodometrically	**LO3**	**1**
11	Estimation of Fe from plain carbon steel by redox titration.	**LO3**	**1**
12	Estimation of Cu in brass by Iodometric titration	**LO3**	**1**

Virtual Lab Links:

1 https://vlab.amrita.edu/

2 http://vlabs.iitb.ac.in/vlab/labscs.html

Term work:

1.Term work should consist of a minimum of 8 experiments

2. Journal must include at least 2 assignments on content of theory and practical of the course.

3. The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.

4.Total 25 Marks (Experiments: 20-marks, Assignments: 05-marks)

Lab Code	Lab Name	Credits (P+TUT)
BSL204	**Engineering Graphics Laboratory**	**2+0**

Lab Prerequisites:	1. Knowledge of geometry such as basic shapes, different types of symmetry (reflectional, rotational, translational), scaling, unit measurement system etc 2. Computer know – how, navigating menus and dialogs, operating mouse and keyboard, managing files and directories 3. A keen eye for detail and good spatial awareness
Lab Objectives:	1. To inculcate the skill of drawing with the basic concepts 2. To Use AutoCAD for engineering drafting 3. To teach basic utility of Computer Aided drafting (CAD) tool
Lab Outcomes (LOs):	Learners will be able to… 1. visualize, draw and learn basic drafting skills by using standard drawing instruments in a conventional way. 2. create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features. 3. apply basic AutoCAD skills to draw different views of a 3D object. 4. apply basic AutoCAD skills to draw the isometric view from the given two views.

Lab No	Experiment Title	LO mapped	Hrs. Lab
i	**Lab Prerequisites**	**--**	**4**
01	Term Sheet 01: Orthographic Projections without section	**LO1**	**4**
02	AutoCAD sheet 01: Redraw sheet for acquainting the AutoCAD software	**LO2**	**6**
03	Term Sheet 02: Projection of Solids	**LO1**	**6**
04	AutoCAD sheet 02: Orthographic Projections without Section	**LO2 and LO3**	**6**
05	Term Sheet 03: Sectional Orthographic Projections	**LO1**	**6**
06	AutoCAD sheet 03:	**LO2 and LO3**	**8**

	Sectional Orthographic Projections		
07	Term sheet 04: Isometric Views	**LO1**	**6**
08	AutoCAD sheet 05: Isometric Views	**LO2 and LO4**	**6**
09	Term sheet 05: Section of Solids with DLS	**LO1**	**4**

Term work:

Term work comprises of three components:

<u>Component-01: Term Sheet (Use half Imperial Drawing Sheet)</u>

Term Sheet 01: Orthographic Projections without section (2 Problems)

Term Sheet 02: Projection of Solids (3 Problems)

Term Sheet 03: Sectional Orthographic Projections (2 Problems)

Term Sheet 04: Isometric Views (2 Problems)

Term Sheet 05: Section of Solids with DLS (2 Problems)

<u>Component-2: Assignments (Use A3 size Drawing sketch book)</u>

Assignment 01: Orthographic Projections without section (2 Problems)

Assignment 02: Projection of Lines and Projection of Planes (2 Problems each)

Assignment 03: Projection of Solids (2 Problems)

Assignment 04: Sectional Orthographic Projections (2 Problems)

Assignment 05: Isometric Views (2 Problems)

Assignment 06: Section of solids with DLS (2 problems)

<u>Component-3: CAD Assignments (Submit Print outs on A4 size paper)</u>

CAD Assignment 01: Redraw sheet for acquainting the AutoCAD software (1 Problem)

CAD Assignment 02: Orthographic Projections without Section (2 Problems)

CAD Assignment 03: Sectional Orthographic Projections (1 Problem)

CAD Assignment 04: Isometric Views (2 Problems)

Term Work Marks:

Component-1 : 09Marks

Component-2 : 07 Marks

Component-3 : 09 Marks

Total Marks : 25 Marks

Note: Satisfactory submission of all 3 components is mandatory to fulfil the Term.

Topic for the End Semester Practical Examination (Auto CAD) (2 hours/25 Marks):

1. Isometric drawing. (1 problem) (10 Marks)
2. Orthographic Projection. (3 views with at least one view sectional) (1 problem) (15 Marks)

Note: Knowledge of AutoCAD software, concepts of Engineering Graphics related to specified problem and accuracy of drawing should be considered during evaluation.

Lab Code	Lab Name	Credits Assigned(TH – P – TUT)
BSL205	**Computer Programming Laboratory**	**0 – 1 – 0**

Lab Prerequisite:	**B**asic understanding of Computer Programming terminologies.
Lab Objectives:	1. To familiarize the logic of structured programming approach 2. To provide exposure in developing algorithm, flowchart and thereby writing efficient codes for user defined problem 3. To emphasize on the development of applications of a program 4. To introduce the types and structure of computer language 5. To create awareness on the role of pointers 6. To discern the types and concept of files
Lab Outcomes (LOs):	Learner will be able to… 1. translate given algorithms to a program. 2. correct syntax and logical errors. 3. write iterative as well as recursive programs. 4. represent data in arrays, strings and structures and manipulate them through a program. 5. declare pointers and demonstrate call by reference concept. 6. create File and demonstrate File concept.

Lab No	Experiment Title	LO mapped	Hrs. Lab
1.	Write Simple Program on C.	**LO1**	**2**
2.	Write a program to accept the temperature in Celsius and to convert and display it in Fahrenheit.	**LO1,LO2**	**2**
3.	Write a program to accept three numbers and display largest of three using a nested if else statement	**LO1,LO2**	
4.	Write a program to find all the roots of a quadratic equation using if-else ladder.	**LO1,LO2**	**2**
5.	Write a program to implement an arithmetic calculator for addition, subtraction, multiplication, division and modulo operation using switch case.	**LO1,LO2**	
6.	Write a program to check whether an entered number is prime number or not using for-loop.	**LO2,LO3**	**2**
7.	Write a program to generate the following pattern using nested for loop.	**LO2,LO3**	
8.	Write a program to check whether the given number is Armstrong number or not using while loop.	**LO2,LO3**	**2**

9.	Write a program to find binary equivalent of a given decimal number using as while loop.	**LO2,LO3**	
10	Write a program to find largest and second largest element of array.	**LO2,LO4**	**2**
11.	Write a program for multiplication of two (M*N) matrices.	**LO2,LO4**	
12.	Study for passing simple parameters to function.	**LO2,LO3**	**2**
13.	Write a program to find out GCD and LCM of two given numbers, using recursive function.	**LO2,LO3**	
14.	Write a program to check whether entered string is palindrome or not.	**LO2,LO4**	**2**
15.	1. Write a program to accept N elements of an array and to sort and display them in ascending order using function. 2. Write a program to calculate and display sum of all the elements except diagonal elements of the matrix using function.	**LO2,LO4**	**2**
16.	Write a program to concatenate first, middle and last name using function.	**LO2,LO4**	**2**
17.	Write a program to swap two numbers using call by address.	**LO2,LO4**	
18.	Write a program using pointers to display the contents of an array in reverse order.	**LO2,LO5**	**2**
19	Define a structure called Player with data members: Player name, team name, batting average. Create array of objects, store information about players, sort and display information of players in descending order of batting average.	**LO2,LO5**	**2**
20.	Write a program to copy the contents of one file to another file.	**LO2,LO6**	**2**
21	Write a program to create and count the number of characters present in the file.	**LO2,LO6**	**2**

Virtual Lab Links:

1. http://cse02-iiith.vlabs.ac.in/
2. https://onlinecourses.nptel.ac.in/noc19_cs42/preview
3. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
4. https://onlinecourses.swayam2.ac.in/cec20_cs02/preview
5. https://www.coursera.org/specializations/c-programming
6. https://www.udemy.com/course/c-programming-for-beginners-/
7. https://onlinecourses.nptel.ac.in/noc19_cs42/preview

Term work:

Term Work: Experiments (20 Programs) and Assignments (2 Assignments) should be completed by students on the given time duration

1. Experiments: 20 Marks

2. Assignment: 05 Marks
   Total: 25 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Practical:

Practical Exam should be conducted for the Lab, on Computer Programming in C subject for given list of experiments.

1. Implementation: :15 Marks
2. Oral based on practical:10 Marks

Total: 25 Marks

Lab Code	Lab Name	Credits (TH+P+TUT)
BSL206	**Professional Communication Skills**	**0 – 2 – 0**

Prerequisites:	1. Fundamental linguistic skills (LSRW) 2. Grammatical proficiency 3. Technical competency for presentation skills
Lab Objectives:	1. To demonstrate the fundamental concepts of interpersonal and professional communication. 2. To encourage active listening with focus on content, purpose, ideas and tone. 3. To facilitate fluent speaking skills in social, academic and professional situations. 4. To train in reading strategies for comprehending academic and business correspondence. 5. To promote effective writing skills in business, technology and academic arenas. 6. To inculcate confident personality traits along with grooming and social etiquettes.
Lab Outcomes:	At the end of the course, the students will be able to…. 1. eliminate barriers and use verbal/non-verbal cues at social and workplace situations. 2. employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation. 3. prepare effectively for speaking at social, academic and business situations. 4. use reading strategies for faster comprehension, summarization and evaluation of texts. 5. acquire effective writing skills for drafting academic, business and technical documents. 6. successfully interact in all kinds of settings, displaying refined grooming and social skills.

Module	Detailed Contents	LO Mapped	Hr/ Subtopic	Total Hrs
i.	**Prerequisite Concepts and Lab outline**	**--**	**1**	**1**
1	**FUNDAMENTALS OF COMMUNICATION** **1.1 Introduction to Theory of Communication:** Definition**,** Objectives**,** Process of Communication, Organizational Communication-Formal (Upward, Downward and Horizontal) Informal (Grapevine)	**LO 1,2,3**	**4**	**12**
	1.2 Methods of Communication: Verbal (Oral & Written)**,** Non-verbal-Non-verbal cues perceived through the five senses: (Visual, Auditory, Tactile, Olfactory and Gustatory cues) **&**Non-verbal cues transmitted through the use of: (The Body, Voice, Space, Time and Silence)		**4**	
	1.3 Barriers to Communication: Mechanical/External**,** Physical/Internal**,** Semantic & Linguistic**,** Socio-Psychological**,** Cultural		**2**	

	1.4 Communication at the Workplace • Listening Tasks with Recordings and Activity Sheets • Short Speeches as Monologues • Informative Speeches that Center on People, Events, Processes, Places, or Things • Persuasive Speeches to Persuade, Motivate or Take Action • Special Occasion Speeches for Ceremonial, Commemorative, or Epideictic purposes		**2**	
2	**VERBAL APTITUDE FOR EMPLOYMENT** **2.1. Vocabulary Building:** Word Formation: Prefixes, Bases and Suffixes (Derivational & Inflectional),Synonyms & Antonyms**,** One Word Substitutes, Words Often Confused-Pairs of words, Standard Abbreviations	**LO 3,4**	**1**	**2**
	2.2. Grammar: Error Analysis, Subject - Verb Agreement**,** Misplace Modifiers Articles**,** Prepositions**,** Tautologies**,** Idioms, Cliches		**1**	
3	**DEVELOPING READING AND WRITING SKILLS**. **3.1. Reading Comprehension:** Long Passages**,** Short Passages**,** MCQs on Inferential Questions	**LO 4,5**	**1**	**2**
	3.2. Summarization of reading passages, reports, chapters, books • Graphic Organizers for Summaries (Radial Diagrams like Mind Maps, Flow Charts, Tree Diagrams, Cyclic Diagrams, Linear Diagrams like Timelines, Pyramids, Venn Diagrams) • Point-form Summaries • One-sentence Summaries of Central Idea		**1**	
	3.3. Paraphrasing • Understanding Copyrights • Generating Plagiarism Reports			
4	**BUSINESS CORRESPONDENCE** **4.1. Seven Cs of Business Correspondence:** Clarity**,** Completeness**,** Conciseness**,** Consideration**,** Concreteness**,** Courtesy **&** Correctness	**LO4**	**1**	**6**
	4.2. Parts of a Formal Letter and Formats • Parts/Elements of a Formal Letter (Letterheads and/or Sender's Address, Dateline, Inside Address, Reference Line (Optional), Attention Line (Optional), Salutation, Subject Line, Body, Complimentary Close, Signature Block, Enclosures/Attachments), Identification Marks • Complete Block/Modified/Semi Block Format		**1**	
	4.3. Emails • Format of Emails • Features of Effective Emails		**2**	

	• Language and style of Emails			
	4.4. Types of Letters in Both Formal Letter Format and Emails • Claim & Adjustment Letters • Request/Permission Letters • Sales Letters		**2**	
5	**BASIC TECHNICAL WRITING** **5.1. Introduction** • Definition, Importance and Principles of Technical Writing • Difference between Technical Writing & Literary Writing • Difference between Technical Description & Instructions	**LO5**	**1**	**2**
	5.2. Description of a Technical Object Definition, Diagram, Discussion of Parts/Characteristics & Working			
	5.3. Writing User Instructions User Instructions with Special Notices (Note, Warning, Caution and Danger)		**1**	
	5.4. Description of a Technical / Scientific Process Definition, Diagram, Tools/ Apparatus/Software/ Hardware Used, Working			
6	**PERSONALITY DEVELOPMENT AND SOCIAL ETIQUETTES** **6.1. Personality Development** Introducing Self and/or a Classmate, Formal Dress Code	**LO6**	**1**	**2**
	6.2. Social Étiquettes • Formal Dining Etiquettes • Cubicle Etiquettes • Mobiquette (Mobile Phone Etiquette)		**1**	
ii	**Lab conclusion:** Recap of Modules, Outcomes, Applications, and Summarization.	**-**	**1**	**1**
Books				
Text Books	1. Raman, M., & Sharma, S. (2016). Technical Communication: Principles and practice. New Delhi: Oxford University Press. 2. Rizvi, A. M. (2010). Effective Technical Communication: A guide for Scientists and Engineers. New Delhi: Tata McGraw Hill. 3. Sanjay Kumar & PushpLata (2018). Communication Skills with CD. New Delhi: Oxford University Press.			
Reference	1. Hemphill, P.D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with writing improvement exercises. Upper Saddle River, NJ: Prentice Hall.			

Books	2. Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills. Place of publication not identified: Mcgraw-hill. 3. Murphy, H. (1999). Effective Business Communication. Place of publication not identified: Mcgraw-Hill. 4. Kaul, A. (2015). Effective Business Communication. Place of publication not identified: Prentice-Hall of India. 5. Lewis, N. (2014). Word power made easy. Random House USA.

Useful Links:

https://www.mindtools.com/pages/article/newCS_99.htm

https://corporatefinanceinstitute.com/resources/careers/soft-skills/communication/

List of Activities/ Assignments:

Activity No.	Activities /Assignments	Hrs/Lab
1.	Prerequisites Discussion/ Quiz	02
2.	Written record of listening activities	02
3.	Transcription of the practice public speech along with a plagiarism	02
4.	Transcription of the final public speech along with a plagiarism report	02
5.	Written assignment on fundamentals of communication	02
6.	Summarization through graphic organizers (1. Text to graphic	02
7.	Written record of reading activities/Comprehension	02
8.	Aptitude test on vocabulary and grammar	02
9.	2 types of letters in complete/modified/semi block format	02
10.	Written assignment on technical writing	02
11.	Documentation on case studies based on Module 6	02
12.	Documentation on role plays based on Module 6	02
13	Introducing Self and/or a Classmate	02
14.	Lab Conclusion Recap of Modules Applications	02

Term Work (50 Marks):

Assignments	: 20 Marks
Speech Test:	: 15 Marks
Writing Ability Evaluation	: 15 Marks

*Public speech on general topics (Maximum 3 mins. per student)

*Writing Ability Evaluation will be based on theory and application exercises as mentioned in the syllabus (Descriptive/MCQ)

Note:

The final certification and acceptance of term work will be subject to satisfactory performance/ submission of activities/ assignments and upon fulfilling minimum passing criteria in the term work.

Lab Code	Lab Name	Credits (P+TUT)
BSW207	**Workshop - II**	**1 + 0**

Lab Prerequisites:	1. Knowledge of basic measuring tools 2. Awareness of Electrical terminology, Circuit diagram 3. Knowledge of Ohm's law and Kirchhoff's law 4. Knowledge of computer fundamentals
Lab Objectives:	1. To impart training to develop engineering skill sets 2. To get exposure of assembling of PC and networking. 3. To get exposure to interdisciplinary engineering domain
Lab Outcomes (LOs):	Learner will be able to: 1. install an operating system and configuration of hardware. 2. identify the network components and perform basic networking and crimping. 3. develop the technical skills by making a job as per drawing using sheet metal. 4. understand the safe practices to be adopted in the electrical environment. 5. demonstrate the wiring practices for the connection of simple electrical load/ equipment. 6. understand the process of PCB making.

Lab No	Experiment Title	LO Mapped	Hrs/Lab
i	**Lab Prerequisites**	**--**	**2**
1.	**Hardware and Networking** 1.1 Assembling of personal computer (PC), installation of operating system and device drivers, boot-up sequence. Installation of software.	**LO1**	**8**
	1.2 Dismantling of a PC, identification of components of a PC such as power supply, motherboard (chipset, on board devices), processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc.	**LO1**	
	1.3 Identification of network components: LAN card, wireless card and wifi module, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables). Basic networking and crimping.	**LO2**	

2.	**Sheet metal working and Joining** 2.1 Demonstrate, use and setting of hand tools like scissor, mallet, plier, snipper.	**LO3**	**10**
	2.2 Develop a sheet metal job using tools for cutting etc, and equipments for bending, spot welding.		
3.	**Basic Electrical work shop** 3.1 Electrical safety in the work place. Protective equipment's and tools	**LO4**	**10**
	3.2 Familiarization of single phase and three phase wiring, protection switchgears and their ratings (fuse, MCB, ELCB).	**LO4**	
	3.3 Different wiring methods: Godown wiring, Staircase wiring, House wiring, switch and plug connection, ceiling fan connection, tube light connection	**LO5**	
	3.4 PCB – Introduction: material, classification, layers etc., schematic design of PCB using software, demonstration of PCB making on related machines.	**LO6**	

Recommended Books

Text Books:	1. Elements of Workshop Technology, Vol. I & II, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy, 16th Edition, 2015, Media Promoters, India 2. A Course in Workshop Technology, Vol. I &II, Raghuwanshi B.S., 10th Edition, 2012 Reprint 2017, DhanpatRai and Co. India 3. Printed Circuit Boards: Design, Fabrication, assembly and testing, R.S. Khandpur, 1st Edition, 2005, Tata McGraw Hill
Reference Book:	1. Electrical Workshop: Safety, Commissioning, maintenance and testing of electrical equipment, R.P. Singh, 3rd Edition 2012, IK International Publishing House Pvt. Ltd.
Useful Links:	1. https://www.youtube.com/watch?v=nRxdBfR2quk 2. https://www.youtube.com/watch?v=PtbIy_nW2BQ 3. https://www.youtube.com/watch?v=m2B8t8vzeUE 4. https://www.youtube.com/watch?v=m2B8t8vzeUE 5. https://www.youtube.com/watch?v=ZOgRyhKsgYk

Term work

Term work marks: 50

The distribution of term work marks is given below:

1. Hardware and networking (group) – 15 marks
2. A sheet metal job (group) – 15 marks
3. Electrical wiring (group) – 15 marks
4. Journal – 5 marks

Activity Based Learning Code	Activity Based Learning SAT - II	Credits (TH+P+TUT)
BSX(S/A/T)22	1. Waste Segregation Surveys (Residential, hospital, Educational institute……) 2. Mentoring of School Children/ NSS activities and camp	**0+1+0**

Prerequisite:	Knowledge of Problems and Issues of the National, Global, Societal and Environmental Issues that need attention.
ABL Objectives:	1. Identify and describe various social, Environmental, Economic, Political, educational, Agricultural, Governance related issues and problems. 2. To plan and prepare a structured or unstructured survey or study methodology to have an in-depth analysis of the issues and problems to carry out the activity. 3. To compare and contrast social, ethical, environmental and legal issues surrounding the subject of study. 4. To analyse and suggest solutions to the existing issues, modify and improve the existing problems.
ABL Outcomes:	1. Define the areas of problems and issues by forming specific statements. 2. Decision on instruments and methodology to study the problem. 3. Analyse the collected data to propose solutions to solve the issues. 4. Document the learning and experiences from the activities.

Guidelines for Activity Based Learning:

1. Students shall form a group of 2 to 3 students, while forming a group shall not be allowed lessthan 2 or more than 3 students, as it is a group activity.
2. Students can select any One activity/Topic from the given activity list.
3. Students should do surveys and collect information on the given problems/topics in the activity head.
4. Faculty supervisor is allotted to a group of 20 to 25 students (based on number of students enrolled for one activity) to and supervisor may give inputs students during activity; however, focus shall be on self-learning.
5. The faculty supervisor will monitor the activities and documentation of the students assigned to them.
6. Students in a group shall discuss the problems effectively and propose multiple solutions for selected problem.
7. Professional Committee will arrange Two to Three Guest lecture based on the problem/Topic in the activity head so that student will get more idea about the Topic selected.
8. The marks will be assigned by the faculty supervisor according to the Assessment Rubrics.
9. The marks are to be submitted to the respective Departments and the Departments will submitthem to the Exam Section.

ActivityNo	Activity Title	Activity Outcome Mapped	Hrs
1	Guest lecture to introduce Topic selected in Activity-Based learning	1	02
2	Guest Lecture	1	02
3	Selection of any Two Problems	2,6	02
4	Group Discussion with other students	2,4,6	02
5	Presentation	2,4,6	02
6	Presentation	2,4,6	02
7	Presentation	3,6	02
8	Find out solution for selected problem	3,6	02
9	Group Discussion with other students	2,4,6	02
10	Presentation	3,4,6	02
11	Presentation	3,4,6	02
12	Presentation	3,4,6	02
13	Report submission	5,6	02
14	Recap of learning, Outcome and summarization		02
		Total	**28**

Term Work (25 Marks):

Marks will be awarded based on designed Assessment Rubrics which includes the following;

1 Identification of problem and solution
2 Submission of Report/demo/act etc.
3 Presentation of Surveys/Case study