

Index

Sl. No.	Content	Page No
1	About the Institute	3
2	Message of the Founder Chairman, Managing Director, Director & Principal	4-8
3	Institutional Vision & Mission	9
4	Core Values & Quality Policy	10
5	BOG Members	11
6	Academic Council	12
7	Internal Quality Assurance Cell (IQAC)	13
8	Administrative Offices	14
9	About the Department	15
10	Departmental Vision and Mission	16
11	Program educational objective (PEOs)	16
12	Program Outcomes (POs)	17
13	Program Specific Outcomes (PSOs)	18
14	Bloom's Taxonomy of Learning Domains	18
15	Revised Bloom's Taxonomy of Learning Domains	19



16	Mapping Out Learning Outcomes and Assessment Levels with Revised Bloom's Taxonomy	20
17	Establish the correlation between the PEOs and Missions of the Department	21
18	Establish the correlation between the POs and the PEOs	22
19	Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences	23-24
20	Program Curriculum of B.Tech in Basic Science and Humanities	25-27
21	Syllabus with Course Outcomes	27-78
22	Mandatory Additional Requirement (MAR)	79-81
23	MOOCs	81-83
24	Code of Conducts of the Students	84-90

About the Institute

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (formerly known as Dr. Sudhir Chandra Sur Degree Engineering College) was established under the auspices of JIS Foundation under Section 2(f) of the UGC Act, 1956.

This Institute, which was founded in 2009, is now well-known for its innovative and rigorous curriculum, which has produced experts in a variety of businesses and sectors in India and beyond.

The Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex, which has been known for its research culture and excellence in imparting Engineering, Science, and Management education for the past 12 years and is located near the Dum Dum Metro Railway Station and International Airport, is known for its research culture and excellence in imparting Engineering, Science, and Management education.

The institute is a virtual paradise of pristine environment and beautiful beauty, nestled in a rural setting of lush green fields. The beautiful avenue of trees and flowers on campus, aptly titled "Green Field," attest to the importance of ecology and the environment. The atmosphere on campus is ideal for academic endeavours.

SurTech has taken a worldwide approach to research and teaching, focusing on foreign viewpoints and knowledge. The Institute is dedicated to greatness and strives for it constantly, accepting nothing less than the best. Its faculty, which includes intellectual giants from India and internationally, is the Institute's bedrock.

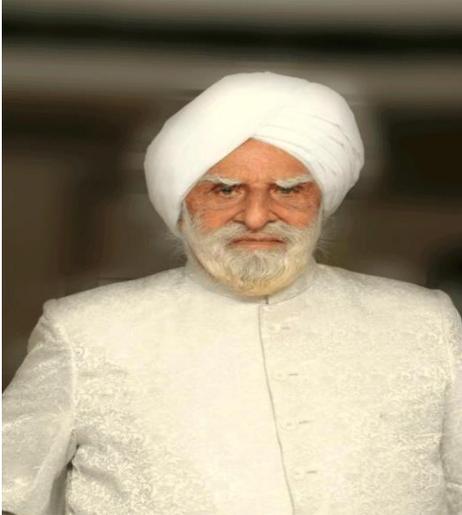
SurTech is in the forefront of using cutting-edge technology and preparing students for a globalised economy while also promoting holistic learning, unbiased knowledge, industry-focused skills, ethics, a cosmopolitan outlook, and accountability for actions.

SurTech is establishing a national and international footprint through partnerships with world-class universities, study abroad programmes, and overseas internships and research.

It provides a comprehensive curriculum across a wide range of engineering degree programmes. These programmes provide students with a variety of academic options.

The Institute provides great educational opportunities for youth from all over the world at a reasonable cost. Through its social responsibility efforts, the Institute also provides unwavering support for community services.

Message of the Founder Chairman Sir



"Vision looks inward and becomes duty. Vision looks outward and becomes aspiration. Vision looks upward and becomes faith."

---Late Sardar Jodh Singh

I always experienced a yearning to acknowledge my responsibilities and reciprocate by contributing to the growth and development of our society.

Years ago, when I visited my son's school, I perceived that the best way to advance society is by fostering education and it was at that moment that the dream and vision of JIS Group Educational Initiatives was conceived.

Now, when this vision of duty, aspiration and faith has become a reality, it is a proud moment for me and my team to see thousands of students pursuing higher education in JIS Group of Colleges and equipping themselves to become industry ready professionals for successful careers.

In this process the Group intends to unite all dimensions of Education from Undergraduate to Post Graduate Programmes in Engineering and Technology, Computer Applications, Dental Science, Pharmacy, Hospitality, diverse streams of Management and so on under the same umbrella to optimize the reach of Educational Initiatives comprehensively and collectively in every stratum and corner of society towards a better future.

Our educational Initiatives believes that creating an academic foundation for social, cultural, scientific, economic, and technological development in our Nation can mature into Global Interface by giving way to education exchange in the international territory as well.

Therefore, our focus is to achieve unparalleled excellence that will bring development to our society and mankind by optimizing their potential, thereby establishing the observation of the renowned Journalist Sydney J. Harris on the role the purpose of education which is to "turn mirrors into windows".

---Late Sardar Jodh Singh
Founder Chairman, JIS Group

Message of the Managing Director Sir



In its broadest meaning, education is any act or experience that shapes a person's mind, character, or physical abilities.

Technically, education is the deliberate transmission of society's acquired knowledge, skills, and values from generation to generation. Thus, education is the basic fulcrum that drives societal growth.

The quality of education is clearly the priority in this era of globalization. Quality is not a single metric.

A good educational institution works to maintain and improve quality in all areas of operation.

I believe that a teacher may shape an educated and socially responsible human being by instilling two traits in students: curiosity and determination. Second, a teacher's noble life becomes a light for students when they establish strong values and put them into practice.

SurTech's objective to provide the best studying, teaching, and research possibilities for students and academics is to provide students with modern knowledge and strong values.

Our students find the thrill and rigor of new discoveries, and develop skills of investigation, evaluation, and communication that will serve them well in their jobs and lives.

Students' creativity, teamwork, and international competition thrive. SurTech is committed to academic independence and cultural diversity to attract students and teachers.

At Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (SurTech), we try to establish an environment that inspires personal and professional progress. Our efforts are focused on recognizing and understanding human talent and enthusiasm. SurTech is thus about “how we can best educate our students to confront the future's challenges”.

With a 160-year tradition of academic achievement, scientific advancements and high-tech innovation, I urge you to seize this fantastic chance and join us actively contributing to the globalization of our society.

With these remarks, I welcome everyone to SurTech and wish them every success on their new adventure with us.

---**Sardar Taranjit Singh**
MD, JIS Group

Message from the Director Sir

Message from the Principal Sir



I am honoured and greatly privileged to lead Dr. Sudhir Chandra sur Institute of Technology & Sports Complex (SurTech) and continue the ambitious strategy of addressing the challenges and opportunities of future to benefit our communities more widely.

On the global platform, India has the responsibility of transforming itself into a developed nation with a strong ethical system- this; however, is a great challenge, as this can only be achieved through the youth of today who have the power of ideas, ambition, ability and most importantly passion.

I believe passionately that we are all born with tremendous capabilities, but unfortunately, we lose these as time goes by and ironically this can be directly attributed to the current system of education which stifles the creative senses rather than enhancing it.

Stepping into the JIS Group of Institutions is stepping into a brighter world of education and a knowledge hub. It is worthwhile to take advantage of the opportunity to see the difference and enjoy the "joy of learning."

Dr. Sudhir Chandra Sur Institute of Technology and Sports Complex (Formerly known as Dr. Sudhir Chandra Sur Degree Engineering College) is one of India's top educational institutions, providing high-quality education to students with the goal of becoming a world-class technical education and scientific research institution.

Since its inception in 2009, SurTech under the aegis of JIS Group has continued in subtle ways to pour fresh knowledge, human capital, and innovation into the engines of our society and nurturing a new generation of young professionals who are prepared to face the ever-changing social, economic, and technological landscape of our country to build a more inclusive and sustainable society on a national and international scale.

Over the last decade, the Institute has evolved into a strong blend of cutting-edge infrastructure and tightly connected human resources dedicated to providing professional education with a focus on creativity and innovation.

In a short span SurTech has become an ensemble of a multi-layered educational system which covers all aspects of diploma, under-graduate, and post-graduate education with smartly crafted and industry compliant course curricula using state-of-art infrastructure in a climate of possibility and transform lives and enhance communities.

The research activities of our faculty lead to an extraordinary enrichment of the experience of our students that is realized at both the graduate and undergraduate levels. The research training provided to our graduate students creates the next generation of scholars well-prepared to advance knowledge and transfer technology. The extension of research opportunities to an ever-increasing group of undergraduate students adds a dimension of experience to the undergraduate education that simply cannot be duplicated in the classroom.



SurTech

Department of Basic Science and Humanities



SurTech heralds the latest and newest but never allows itself to be consumed by the intellectual fads of the day. Our graduates are smart, collaborative, and entrepreneurial. They use creative space of SurTech to actualize their potential. We are encouraging entrepreneurship and innovation on the campus.

We are facilitating campus recruitments and connecting our students to the world. The College strives for quality in training to instil a feeling of professional responsibility, social and cultural awareness, and to prepare students for leadership roles.

Campus life here emphasises the value of extracurricular activities in addition to academic learning, exposing students to a variety of fresh opportunities. All of this contributes to our student's development as a thoroughbred professional, well-suited to contribute to his chosen field while keeping an open mind to new ideas and concepts in industrial and technical breakthroughs through conducting Guest Lectures, Industrial Visits, Vocational Training (internships), student chapters of international professional groups, sponsored projects, and other means, students can meet with industry experts.

I can say with legitimate pride that the College has achieved far more than just the modest target set at the time of its inception by producing a trained human resource to serve the country in all walks of life and by contributing to the knowledge base.

I am glad to have this opportunity to serve as the Principal of this glorious institution. SurTech pledges to the state, the nation, and the world that our endeavours will benefit all citizens. I invite you to join and strengthen this venture.

---**Prof. (Dr.) Saradindu Panda**

PhD-Tech (NIT, DGP), M. Tech (VLSI, J.U), BE (UIT, BU)

Chair, IEEE CASS Kolkata Section

IQAC Member of Swami Vivekananda College, RKM, Rahara

MIEEE, MIASSE, MIEI, MIETE, MIAENG, MCSTA, MIREN, MIAE, MITEEA

Institutional Vision

To be a top global technology institute that creates leaders & innovators and generates new knowledge for society & industry via transformative education.

Institutional Mission

Excellence in Education: Education of world-class quality, based on ethics and critical thinking, for the betterment of life.

Innovative Research: An innovation ecosystem to advance knowledge and tackle pressing issues.

Impactful People: Happy, accountable, compassionate, and effective employees and pupils.

Productivity Enhancement: Active engagement with national and international companies, as well as institutions, to increase productivity and economic development.

Service to Society: Providing knowledge and compassion to the region and the planet.

Core Values

Integrity, Excellence, Accountability, Transparency, and Empathy are the abiding ideals established by the Institute.

Integrity & Honesty:

Research and teaching must take place in an atmosphere of academic freedom and honesty. In all its efforts, the Institute shall uphold the highest ethical standards.

Equality:

We are dedicated to establishing an institution and a community in which everyone is valued and judged based on their contributions and accomplishments rather than their gender, race, religion, physical abilities, sexual identity, or socioeconomic status. We shall raise awareness of individual and institutional racism, as well as fight to abolish it, through the activities of this institution.



Synergy through Teamwork:

To become synergistic and succeed, the institute concentrated on four key characteristics:

a clear team purpose,
effective communication,
empowerment so that the team can lead itself,

And ensuring that everyone is committed to the goal.



SurTech

Department of Basic Science and Humanities



Accountability:

The Institute is dedicated to creating an atmosphere in which each member of the community recognizes and accepts responsibility for upholding and strengthening our principles.

Empathy:

The Institute's research and education programs will include an awareness of the conditions of our society's poorer members, as well as contributions to solving their problems.

Quality Policy

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (SurTech) is dedicated to academic excellence, providing high-quality technical education, training, and expertise in a variety of industries, and engineering programmes, enhancing students' inherent abilities, capabilities, and thought processes while also promoting their engineering and technological skills. We are committed to meeting the criteria and improving the efficacy of our quality management system on a continuous basis.

Quality Objectives

- To focus on the students' total development by increasing their technological and managerial skills, as well as their leadership talents, and to guarantee that they are well-rounded.
- To foster an environment that promotes effective teaching, active learning, and purposeful research for economic progress.
- Incorporating value-added programmes into the curriculum and increasing students' job chances.
- To review the effectiveness of the institute's programmes on a regular basis, considering the demands of the industry and other areas of employment, and responding positively to those needs.
- To expose students to the difficulties of the twenty-first century while also giving opportunities for them to think creatively and display entrepreneurship abilities to contribute effectively to the nation's growth.
- To provide research creation, consulting, testing, and customised training to satisfy the industry's specific demands, thereby encouraging students to pursue self-employment and entrepreneurship.
- To provide cutting-edge technological infrastructure and to inspire students to reach their full potential.
- To foster mutually beneficial collaboration with industry, other institutions, and organisations.
- To ensure that the Quality Management System is continually improved.
- Benchmarking the institution against top institutions on a regular basis to adopt best practises for quality improvement.

BOG Members

Prof. (Dr.) G.L. Datta (Educationist)	Chairman
The Regional Director, AICTE, Eastern Regional Office	Member
Mr. Partha Ghosh, State Govt. Nominee	Member
Prof. Narayan Banerjee, MAKAUT Nominee	Member
Mr. Taranjit Singh, Managing Trustee, JIS Foundation	Member
Mr. Haranjit Singh, Trustee Member, JIS Foundation	Member
Mr. Amrik Singh, Trustee Member, JIS Foundation	Member
Mr. Simarpreet Singh, Trustee Member, JIS Foundation	Member
Mr. Harjot Singh, Trustee Member, JIS Foundation	Member
Mr. Amanjot Singh, Trustee Member, JIS Foundation	Member
Mr. U. S. Mukherjee, Deputy Director, JIS Group	Member
Mr. Amit Srivastava, Managing Director, Hash Technology	Member
Dr. Asit Guha, Advisor , JIS Group (Educationist)	Member
Dr. Shefalika Ghosh Samaddar, Professor, Dept. of CSE, DSCSITSC	Member
Mr. Vivek Shaw, Asst. Prof of BSHU & In-charge, Exam Cell	Member
Dr. Saradindu Panda, Principal, DSCSITSC	Member Secretary

Academic Council

1	Dr. Saradindu Panda, Principal	Chairman
Three Nominees of MAKAUT, WB		
2	Prof. (Dr.) Manojit Mitra, Dept. of ECE, IEST Shibpur	University Nominee
3	Prof.(Dr.) Subhasish Bhowmik, Dean R&D IEST Shibpur	University Nominee
4	Prof.(Dr.) Amitava Chatterjee, Dept. of EE, JU	University Nominee
Experts / Academicians from Outside the College Nominated by Governing Body		
5	Prof.(Dr.) Goutam Sutradhar, Director, NIT Manipur	External Academic Expert
6	Prof. (Dr.) Debashis De, Professor, MAKAUT	External Academic Expert
7	Prof. (Dr.) Sibapriya Mukherjee, Professor, Jadavpur University	External Academic Expert
8	Mr. Atanu Chowdhury, Deputy General Manager- HR & IR, Electrosteel Castings LTD	Industry Expert
9	Mr. Turjasu Pyne, Senior Embedded Engineer, Silicon Validation for NXP	Industry Expert
Dean (Academics), IQAC Coordinator & Controller of Exam		
10	Mr. Vivek Shaw, Asst. Prof., Dept. of BSH	Member Secretary
11	Ms. Amrita Chadha, PA to Principal ,Dept. of Admin	Member
All the Heads of Department		
12	Mr. Baibaswata Das, Asst. Prof (TIC), Dept. of CE	Member
13	Ms. Rinku Supakar, Asst. Prof. (TIC), Dept. of CSE	Member
14	Mr. Anirbit Sengupta, Asst. Prof. (TIC), Dept. of ECE	Member
15	Mr. Arindam Mukherjee, Asst. Prof. (TIC), Dept. of AUE	Member
16	Mr. Anirban Chowdhury, Asst. Prof. (TIC), Dept. of EE	Member
17	Dr. Ruma Sen, Asst. Prof. (HOD), Dept. of ME	Member
Four Teachers representing different categories		
18	Dr. Shefalika Ghosh Samaddar, Professor, Dept. of CSE	Member
19	Dr. Supriya Srimani, Asst. Prof, Dept. of ECE	Member
20	Dr. Abhijit Kundu, Asst. Prof, Dept. of CE	Member
21	Dr. Biswajit Gayen, Asst. Prof.(HOD), Dept. of BSH	Member



Internal Quality Assurance Cell (IQAC)

<u>Sl.N</u>	<u>Name</u>	<u>Designation</u>
1	Prof. (Dr.) Saradindu Panda, Principal	Chairman
2	Mr. Vivek Shaw, Asst. Prof., Dept. of BSH	Coordinator
3	Mr. Simarpreet Singh, Director, JIS Group	Management Representative
4	Prof. (Dr.) Asish K Mukhopadhyay, "Margadarshak-AICTE", Professor (Emeritus), IET, Bundelkhand University, Jhansi, U.P	Academic Expert
5	Dr. Supriya Srimani, Asst. Prof. Dept. of ECE	Faculty Representative
6	Dr. Shefalika Ghosh Samaddar, Prof. Dept. of CSE	Faculty Representative
7.	Mr. Arindam Mukherjee, Asst. Prof.(TIC) Dept. of AUE	Faculty Representative
8.	Mr. Anirban Chowdhury, Asst.Prof.(TIC), Dept. of EE	Faculty Representative
7.	Mr. Anirbit Sengupta, Asst. Prof., (TIC) Cum Admission Coordinator, Dept. of ECE	Faculty Representative
8.	Mr. Subhasish Halder, Asst. Prof., Dept. of ME	Faculty Representative
9.	Ms. Debina Dey, Manager, Industry Alliance,	Dept. of T&P
10.	Ms. Amrita Chadha, PA to Principal	Admin Representative
11	Ms. Dazy Rani, Asst. Registrar, Dept. of Admin	Admin Representative
12.	Mr. Arunava Kundu, Asst. Treasurer, Suremath Association DumDum	Nominee from local society
13.	Mr. Rivu Ghosh, System on Chief Design Engineer Intel Corporation	Nominee from Employers
14.	Mr. Debasish Mazumdar, Associate Director, CDAC, Kolkata	Industry Representative
15.	Dr. Dipra Bhattacharya	Parents Representative
16.	Mr. Dipi Ranjan Rauth, 3rd Year, Dept. of CSE	Student Representative
17.	Ms. Debosmita Ganguli, Dept. of ECE	Alumni Representative

Administrative Offices

Details	Name of the Contact Person	Contact Number
Academics-Contact Person Details	Principal	9051978666
Admission-Contact Person Details	Aviroop Dewan	6291977707
Centre For Technical Support-Contact Person Details (System Admin)	Abhishek Bysack	7003763638
Estate Office -Contact Person Details (Site Supervision)	Suman Mukherjee	7003831004
Human Resource-Contact Person Details	Amrita Chadha	7829522758
Institutional Information Service (IIS)-Contact Person Details	Nirupam Sarkar	8902496652
TNP & International and Public Relations-Contact Person Details	Debina Dey	9836158442
Office of Student's Welfare-Contact Person Details	Nirupam Sarkar	8902496652
Purchase Office & Store – Contact Person Details	Rahul Chowdhury	8820426030
Registrar Office-Contact Person Details	Amrita Chadha	7829522758
Examination Cell and Student Record Section-Contact Person Details	Vivek Shaw	8296921062
Student Outreach Department-Contact Person	Nirupam Sarkar	8902496652

About the Department

The Department of Basic Sciences and Humanities (BS & HU) is one of the main pillars of an engineering Institute. BS & HU has been a part of Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (SurTech) right from the inception of the college in 2009.

BS & HU offers a strong and solid foundation to the future professional engineers through fundamental understanding of the basic science subjects such as Mathematics, Chemistry, Environmental Science, Physics, and Biology along with subjects of Humanities domain. These subjects lay the essential foundation for the various branches of engineering. The focus is to create an illustration of the basic principles of Sciences, real life applications and to harness the knowledge of the students for designing, building and maintaining a product or process that solves a problem and fulfils the need of well experienced professional technocrats.

BS & HU coordinates programmes for a smoother transformation of school students (10+2 level) to their long expected college life providing the bridge courses in Chemistry, Physics and Mathematics to fill the learning gaps and prepare them for the specialized engineering domains.

The department of BS&H has enriched curriculum and allied activities to provide a comprehensive education for B.Tech. graduates. It prepares them to be technically adept, to be critical thinkers, productive citizens, and leaders in a wide range of career paths including government as well as an array of managerial options in the private sector.

The Department has well-equipped laboratories of Physics, Chemistry and Language to promote overall development of the students by enhancing their practical skills along with incorporation of sound theoretical knowledge.

Each faculty member of BS & HU regularly attend the seminar/webinar, conferences, faculty development programme, workshop and training programme on multi-disciplinary subject areas. Most of them are attached with different scientific committee, organizations not only for their own professional and intellectual development but also for other fellow faculty members.

The trained faculty members encourage students to take up challenging projects and internships at the National and International level in order to fine-tune their technical skills to the reality. These all activities by both faculty members and students create a good foot-print in future R & D and entrepreneurship based outputs.

The department garners the importance of an up-to-date English Communication to increase proficiency in the Language in order to help students demonstrate their ideas and skills in the cut throat competition of the present job market.

To imbibe best humane, moral characters and professional values within the students, BS & HU works as a group by providing full-proof mentorship programme. All the problems from any mentee are well addressed by their concerned Mentors. All of these mentorship activities are under the guidance of HoD, Principal Sir and admin department.

Departmental Vision

To provide guidance to all aspiring technocrats through well-developed & innovative teaching learning methodology and to foster students towards R & D, entrepreneurship activities for their future prospectus with strong foundations in Mathematics, Chemistry, Physics and Communications skills.

Departmental Mission

To achieve the above vision, the department mainly focuses on the following:

- To emphasize the importance of Basic Science and develop a natural flair for Engineering & Technology
- To promote academic excellence in fundamental Science & Humanities
- To produce competent future technocrats through innovative teaching-learning methodologies
- To create an environment where students' Idea, Creativities and R & D activities are encouraged
- To motivate the students for entrepreneurship endeavours to help them turn his/her own dream into reality and contribute in the socio-economic system.

Program Educational Objectives

PEO1: To empower the students with the knowledge of Basic Science, Languages & Communication Skill.

PEO2: To develop the skill of methodological approach for decision making and designing.

PEO3: To expose students towards various scopes for Research & Development, teaching etc. through which society will be served

PEO4: To create awareness towards social and environmental issues and emphasize on effective socialization through their communication skill and professionalism.

Program Outcome (PO)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

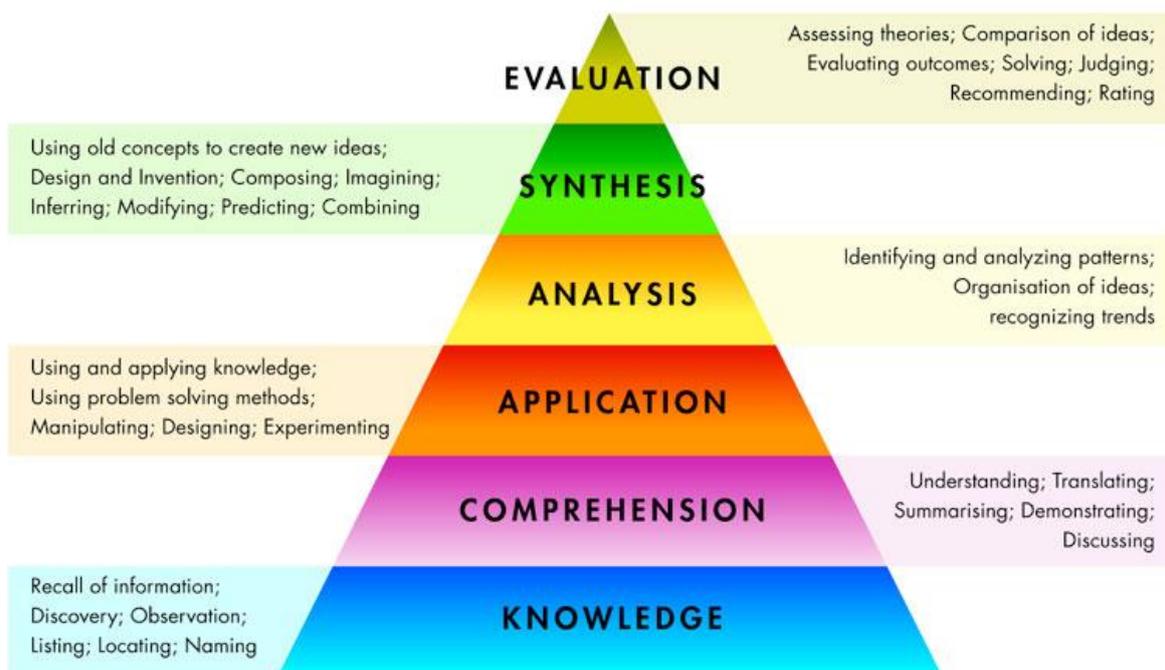
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome

- PSO1:** Graduates will be able to apply technical skills & knowledge of basic science for day to day practice.
- PSO2:** Graduates will be able to participate in critical thinking & problem solving in daily life that requires analytical & technical skills and effective communication ability.
- PSO3:** Graduates will be able to pursue a lifelong learning & professional development to face the challenging & emerging needs of our society.

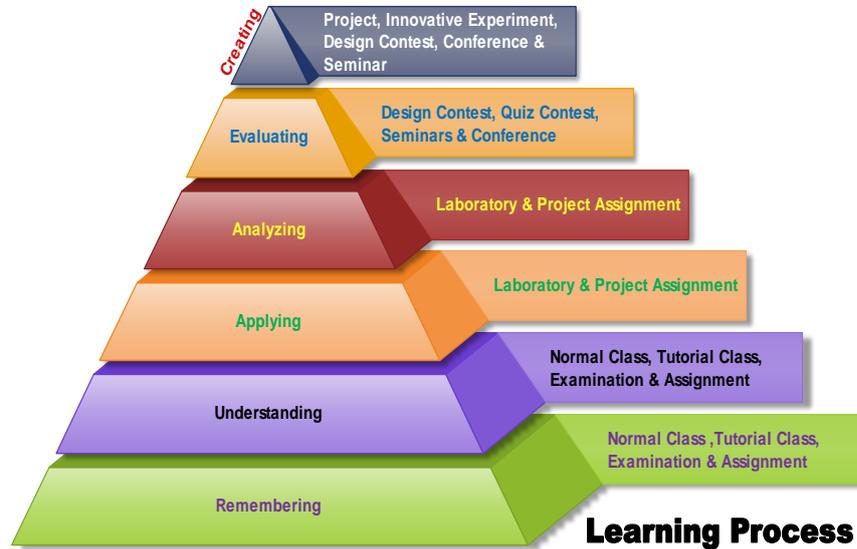
Bloom's Taxonomy of Learning Domains

B L O O M S T A X O N O M Y



Bloom's Taxonomy was created in 1956 under the leadership of educational psychologist Dr Benjamin Bloom to promote higher forms of thinking in education, such as analysing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts (rote learning). It is most often used when designing educational, training, and learning processes.

Bloom's Revised Taxonomy



Lorin Anderson, a former student of Bloom, and David Krathwohl revisited the cognitive domain in the mid-nineties and made some changes, with perhaps the three most prominent ones being (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths, Wittrock, 2000):

- changing the names in the six categories from noun to verb forms
- rearranging them as shown in the chart below
- creating a processes and levels of knowledge matrix

This new taxonomy reflects a more active form of thinking and is perhaps more accurate. The new version of Bloom's Taxonomy, with examples and keywords is shown below, while the old version may be found here.

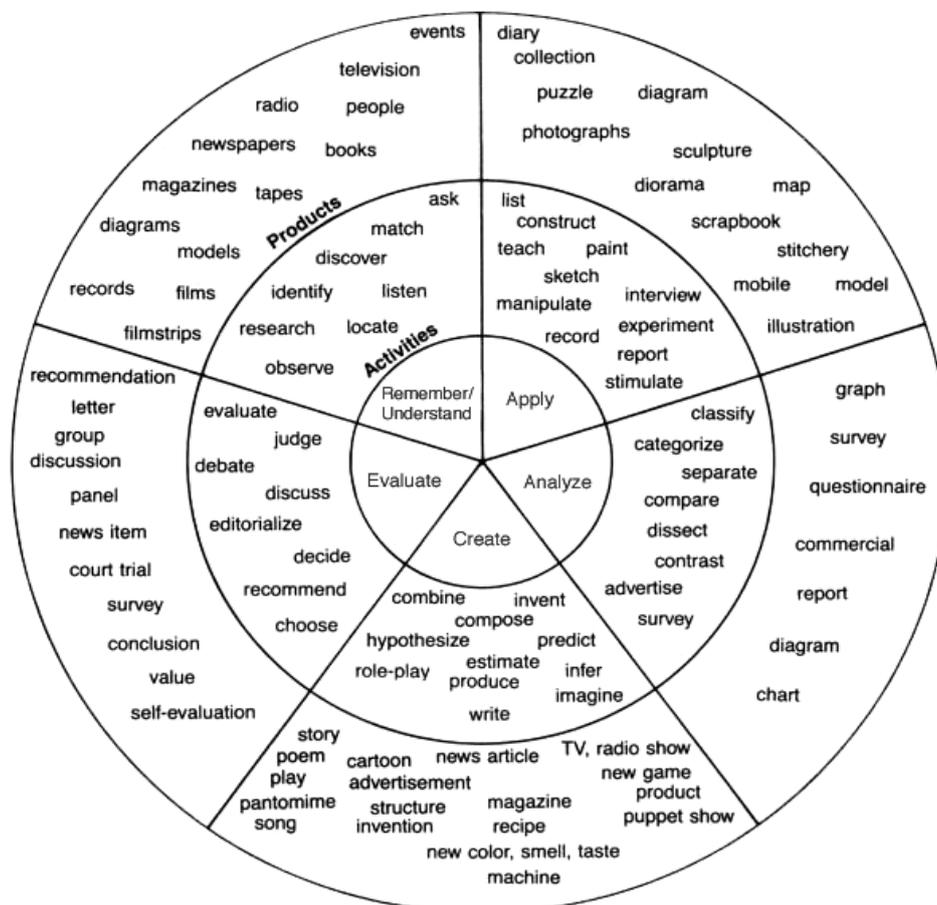


Mapping Out Learning Outcomes and Assessment Levels with Revised Bloom's Taxonomy

This document focuses on cognitive domains and the dimensions of knowledge. Detailed explanations for each domain and the use of this table follow below.

(different levels of thinking)

	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Knowledge Domains	<ul style="list-style-type: none"> Recognizing Listing Describing Identifying Retrieving Naming Locating Finding Recalling 	<ul style="list-style-type: none"> Interpreting Exemplifying Summarizing Inferring Paraphrasing Classifying Explaining 	<ul style="list-style-type: none"> Implementing Carrying out Using Executing 	<ul style="list-style-type: none"> Comparing Organizing Deconstructing Attributing Outlining Structuring Integrating 	<ul style="list-style-type: none"> Checking Hypothesizing Critiquing Experimenting Judging, Testing Detecting Monitoring 	<ul style="list-style-type: none"> Designing Constructing Planning Producing Inventing Devising Making Generating



Mapping of PEOs with Mission of the Department

PEO Statements	M1	M2	M3	M4
PEO1: To enhance the knowledge of the under graduates with fundamental Science of Engineering & Technical abilities.	3	3	2	2
PEO2: To develop high level of technical competency combined with research and problem-solving skills to generate innovative solutions in Mechanical Engineering and/or related interdisciplinary areas.	2	3	2	3
PEO3: To expand capability of methodological approach for taking decision and designing.	2	2	3	3
PEO4: To promote awareness towards socio-economic and energy related challenges and enhance professional as well as communication skill and perform as a team.	2	3	2	2

Note: M1, M2, M3, M4, M5 are distinct elements of Mission statement. Enter correlation levels 1, 2 or 3 as defined below:

‘1’: Slight(Low)

‘2’: Moderate (Medium)

‘3’: Substantial (High)

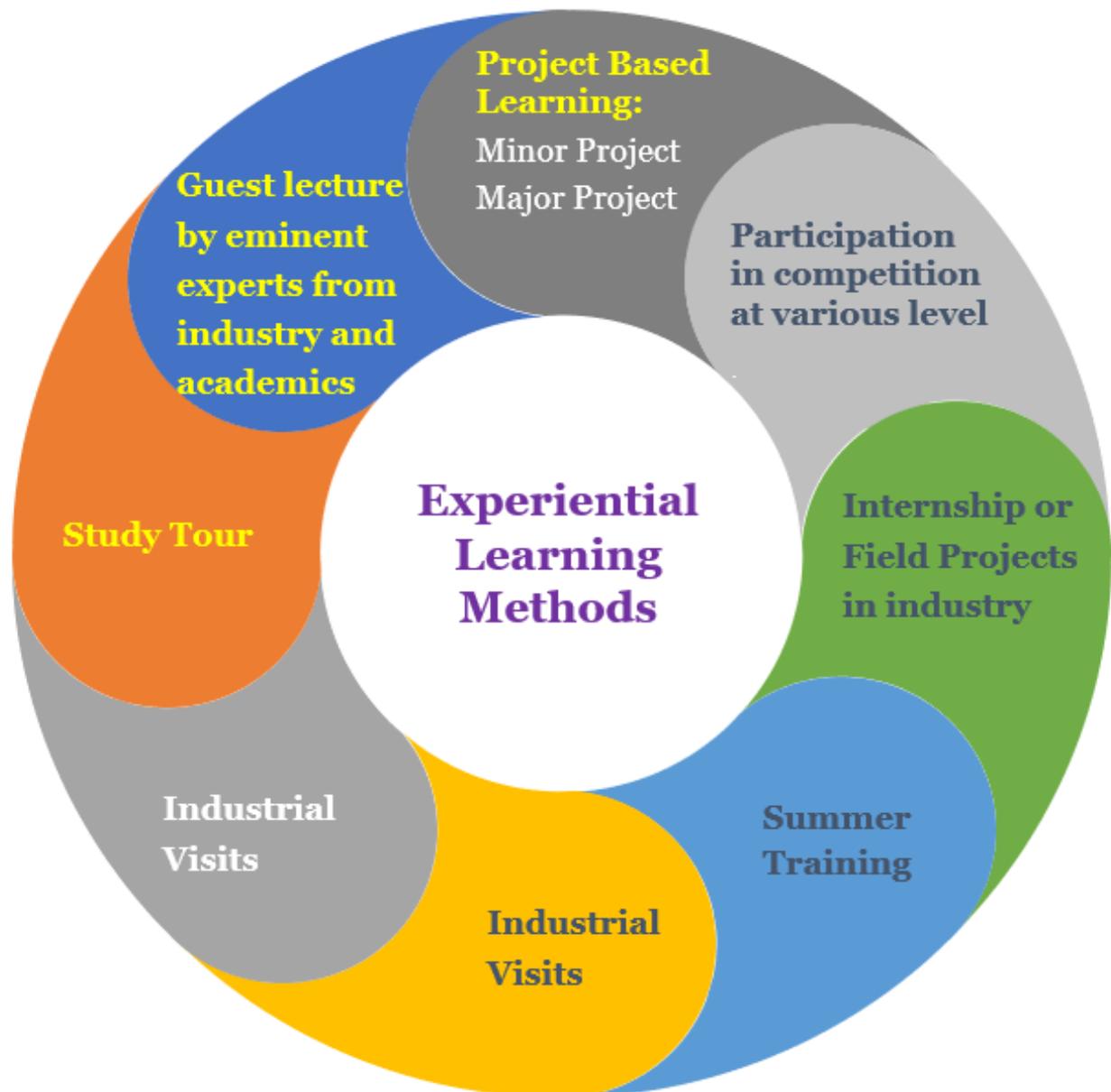
‘--’: *If there is no correlation.*

Mapping of PEOs with POs

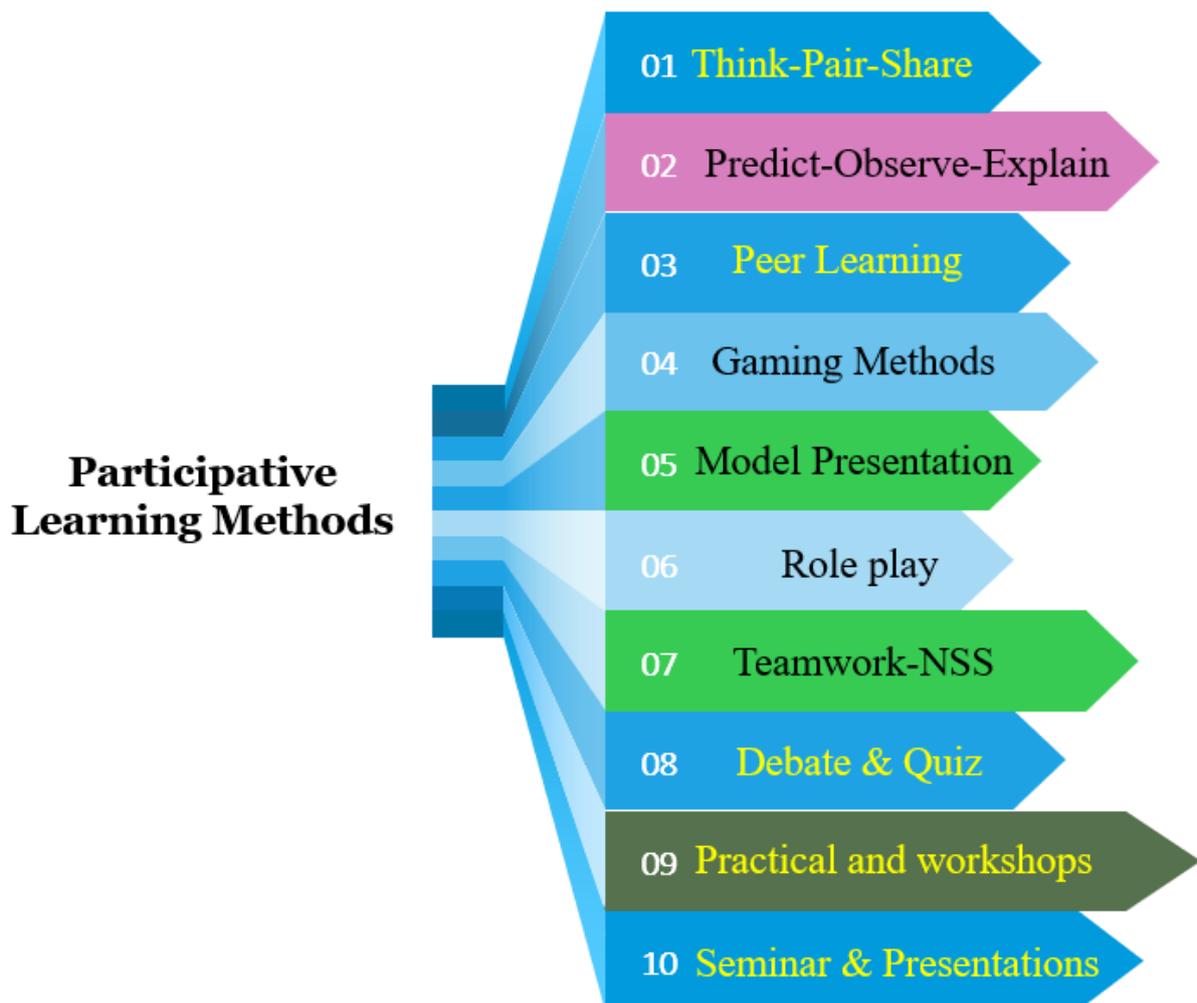
Program Educational Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	1	1	2	3	2	1	2	1	1	
PEO2	3	3	3	1	3	3	3	3	2	3	1	
PEO3	3	3	1	1	2	3	3	1	2	3	2	
PEO4	1	2	1	3	2	1	1	1	3	3	3	

3-Strongly Mapped, 2-Moderately Mapped, 1-Weakly Mapped, 0-NA

Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



Departmental Curriculum Structure

Department of BS & HU mainly deal with the Curriculum on B. Tech. 1st year subjects. The curriculum structure as below:

1st Semester

First Year First Semester							
Mandatory Induction Program- 3 weeks duration							
Sl No.	Category	Subject Code	Subject Name	Total No. of contact hours			Credits
				L	T	P	
Theory							
1	Basic Science course	BS-PH101/ BS-CH101	Physics-I (Gr-A)/ Chemistry-I(Gr-B)	3	1	0	4
2	Basic Science course	BS-M101/ BS-M102	Mathematics –IA*/ Mathematics –IB *	3	1	0	4
3	Engineering Science	ES-EE101	Basic Electrical Engineering	3	1	0	4
<i>Total Theory</i>				9	3	0	12
Practical							
1	Basic Science course	BS-PH191/ BS-CH191	Physics-I Laboratory (Gr-A)/ Chemistry-I Laboratory (Gr-B)	0	0	3	1.5
2	Engineering Science	ES-EE191	Basic Electrical Engineering	0	0	2	1
3	Engineering Science	ES-ME191/ ES-ME192	Engineering Graphics & Design(Gr-B)/ Workshop/Manufacturing Practices(Gr-A)	1	0	4	3
<i>Total Practical</i>				1	0	9	5.5
Total of First Semester				10	3	9	17.5

* Mathematics –IA (BS-M101) - CSE & IT
Mathematics –IB (BS-M102) - All stream except CSE & IT

**Group division:****Group-A:**

Chemistry based subjects: [Bio-Technology, Food Technology, Leather Technology, Textile Technology, Ceramic Technology, Chemical Engineering and any other Engineering that chooses to be Chemistry based] + Physics based subjects: [Mechanical Engineering, Production Engineering, Civil Engineering, Automobile Engineering, Marine Engineering, Apparel Production Engineering, Computer Science & Engineering, Information Technology.]

Group-B:

All Physics based subjects which are also Electrical & Electronics based [Electrical Engineering, Electronics & Communication Engineering, Applied Electronics & Instrumentation Engineering, Power Engineering, Electrical & Electronics Engineering, Bio- Medical Engineering, Instrumentation & Control Engineering]

2nd Semester

First Year Second Semester							
Sl No.	Category	Subject Code	Subject Name	Total No. of contact hours			Credits
				L	T	P	
Theory							
1	Basic Science course	BS-PH201/ BS-CH201	Physics-I (Gr-B)/ Chemistry-I (Gr-A)	3	1	0	4
2	Basic Science course	BS-M201/ BS-M202	Mathematics –IIA#/ Mathematics –IIB #	3	1	0	4
3	Engineering Science	ES-CS201	Programming for Problem Solving	3	0	0	3
4	Humanities and Social	HM-HU201	English	2	0	0	2
<i>Total Theory</i>				11	2	0	13
Practical							
1	Basic Science course	BS-PH291/ BS-CH291	Physics-I Laboratory (Gr-B)/ Chemistry-I Laboratory (Gr-A)	00	0	3	1.5
2	Engineering Science	ES-CS291	Programming for Problem Solving	00	0	4	2



First Year Second Semester							
Sl No.	Category	Subject Code	Subject Name	Total No. of contact hours			Credits
				L	T	P	
3	Engineering Science	ES-ME291/ ES-ME292	Engineering Graphics & Design(Gr-A)/ Workshop/Manufacturing Practices(Gr-B)	11	0	4	3
4	Humanities and Social	HM-HU291	Language Laboratory	0	0	2	1
<i>Total Practical</i>				1	0	13	7.5
Total of Second Semester				12	2	13	20.5

Mathematics –II (BS-M201) - CSE & IT

Mathematics –II (BS-M202) - All stream except CSE & IT

	Group-A	Group-B
1st Year 1st Semester	Physics-I (BS-PH101); Workshop/Manufacturing Practices (ES-ME192)	Chemistry-I (BS-CH101); Engineering Graphics & Design (ES-ME191)
1 st Year 2nd Semester	Chemistry-I (BS-CH201); Engineering Graphics & Design (ES-ME291)	Physics-I (BS-PH201); Workshop/Manufacturing Practices (ES-ME292)

Syllabus & Course Outcomes

1st Semester

BS-CH101: Chemistry-I

Course Code : BS-CH101

Course Title : Chemistry-I

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : First

Credit : 4

Stream : B. Tech. (For EE and ECE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH101.CO 1	Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and list major chemical reactions that are used in the synthesis of drug molecules.
BS-CH101.CO 2	Rationalize bulk properties and processes using thermodynamic considerations, corrosion and water chemistry, electrochemistry, acid base theory, Knowledge of stereochemistry for understanding mechanism of the major chemical reaction.
BS-CH101.CO 3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques like IR, UV, NMR that is usable in structure elucidation and characterization of various molecules.
BS-CH101.CO 4	Understand the periodic properties such as ionization potential, electron affinity, electronegativity, polarizability, thermal stability and determination of shape of molecule.

CO-PO Mapping

Co & PO Mapping BS-CH101 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	3	3	2	2	-	2	-	-	-
CO2	3	3	3	3	3	3	3	-	2	-	-	2
CO3	2	3	3	3	3	3	2	-	3	3	-	-
CO4	3	3	3	3	3	2	-	-	-	2	-	2
Average	2.75	3	2.75	3	3	2.5	2.33	-	2.33	2.5	-	2

Syllabus

Unit I: Atomic and molecular structure

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H₂). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Unit II: Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering

Unit III: Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Unit IV: Use of free energy in chemical equilibria

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

Unit V: Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Unit VI: Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Unit VII: Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Books

Learning Resources:

- Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
- Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- Physical Chemistry, by P. W. Atkins
- Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
- Physical Chemistry, P. C. Rakshit, Sarat Book House
- Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

BS-PH101: Physics

Course Code : BS-PH101

Course Title : Physics-I

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : First

Credit : 4

Stream : B. Tech. (All branches except EE and ECE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-PH101.CO1	Learn basic concepts of quantum physics, simple quantum mechanics calculations; Macrostate, Microstate, Density of states, Qualitative treatment of MB, FD and BE statistics.



BS-PH101.CO2	Solve problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Harmonic oscillator. Damped harmonic motion forced oscillations and Resonance. Motion of a rigid body.
BS-PH101.CO3	Apply the wave properties of light Interference, Diffraction and Polarization; Lasers: Principles and working of laser to solve real life problem
BS-PH101.CO4	Understand Maxwell's equations. Polarization, Dielectrics; Magnetization, magnetic-hysteresis.

CO-PO Mapping

CO-PO Mapping BS-PH101 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	-	2	-	2	-	-	3
CO2	3	3	-	2	-	-	2	-	2	-	-	3
CO3	3	3	-	3	-	-	-	-	2	-	-	3
CO4	3	3	-	3	-	-	-	-	2	-	-	3
Avg.	3	3	-	2.5	-	-	2	-	2	-	-	3

Syllabus

UNIT 1. Mechanics

Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function $F = -\text{grad } V$, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.

UNIT 2. Optics

Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max;min, & intensity and qualitative discussion of fringes); diffraction grating(resolution formulae only), characteristics of diffraction grating and its applications.

Polarization: Introduction, polarization by reflection, polarization by double reflection, scattering of light, circular and elliptical polarization, optical activity.



SurTech

Department of Basic Science and Humanities



Lasers: Principles and working of laser – population inversion, pumping, various modes, threshold population inversion with examples

UNIT 3. Electromagnetism and Dielectric Magnetic Properties of Materials

Maxwell's equations, Polarization, permeability and dielectric constant, polar and non-polar Dielectrics, internal fields in a solid, Clausius-Mossotti equation (expression only), applications of dielectrics.

Magnetization: permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

UNIT 4. Quantum Mechanics

Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.

UNIT 5. Statistical Mechanics

Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

BOOKS

Learning Resources:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley
3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola, Cengage India
8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill



10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
13. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
14. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
15. Optics , Hecht, Pearson Education
16. Optics, Ghatak, McGraw Hill Education India Private Limited
17. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
18. Statistical Mechanics , Pathria , Elsevier
19. Statistical Physics, L.D.Landau , E.M. Lifshitz, Butterworth-Heinemann

BS-M101: Mathematics - IA

Course Code	: BS-M101
Course Title	: Mathematics - IA
L-T-P	: 3-1-0
Category	: Basic Science Courses
Semester	: First
Credit	: 4
Stream	: B. Tech. (For CSE).
Full Marks	: 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 101.CO 1	Apply the concept and techniques to differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
BS-M 101.CO 2	Explain the domain of applications of mean value theorems to engineering problems.
BS-M 101.CO 3	Learn different types of matrices, concept of rank, methods of matrix inversion and their applications.
BS-M 101.CO 4	Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science.
BS-M 101.CO 5	Develop the concept of Eigen values, Eigen vectors, Diagonalization of



	matrices and orthogonalization in inner product spaces for understanding physical and engineering problems.
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CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	2	-	2	-	2	-	2	2
CO2	3	3	2	-	2	2	2	-	2	-	-	-
CO3	3	3	2	2	2	2	2	-	2	-	3	2
CO4	3	3	2	2	3	2	2	-	-	-	2	3
CO5	3	3	3	2	2	-	-	-	-	-	2	1
Average	3	3	2.4	2	2.2	2	2	-	2	-	2.25	2

Syllabus

Syllabus

Module 1: Calculus (Integration) [8L]

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus (Differentiation) [6L]

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3: Matrices [7L]

Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Module 4: Vector Spaces [9L]

Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.

Module 5: Vector Spaces (Continued) [10L]

Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Books

Learning Resources:

1. Reena Garg, Engineering Mathematics-I, Khanna Publishers.



2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.
7. S.K. Mapa, Higher Algebra: Abstract and Linear, Sarat Book House Pvt.Ltd.
8. Hoffman and Kunze: Linear algebra, PHI.

BS-M102: Mathematics - IB

Course Code	: BS-M102
Course Title	: Mathematics - IB
L-T-P	: 3-1-0
Category	: Basic Science Courses
Semester	: First
Credit	: 4
Stream	: B. Tech. (For Except CSE).
Full Marks	: 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 102.CO 1	Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
BS-M 102.CO 2	Understand the domain of applications of mean value theorems to engineering problems.
BS-M 102.CO 3	Learn the tools of power series and Fourier series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
BS-M 102.CO 4	Apply the knowledge for addressing the real-life problems which comprise of several variables or attributes and identify extremum points of different surfaces of higher dimensions.
BS-M 102.CO 5	Analyze the concept of rank-nullity, eigen values, eigen vectors, diagonalization and orthogonalization of matrices for understanding physical and engineering problems.

CO PO Mapping

CO & PO Mapping BS-M102 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	2	2	2	-	3	-	2	2
CO2	3	3	3	2	2	2	-	-	2	-	2	2
CO3	3	3	2	2	2	-	2	-	-	-	2	-
CO4	3	3	2	2	3	2	-	-	2	-	2	2
CO5	3	3	2	2	2	2	2	-	-	-	-	3
Average	3	3	2.4	2	2.2	2	2	-	2.33	-	2	2.25

Syllabus (BS-M102)

Syllabus

Module 1: Calculus (Integration) [8L]

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus (Differentiation) [6L]

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3: Sequence and Series [11L]

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 4: Multivariate Calculus [9L]

Limit, continuity and partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.

Module 5: Matrices [8L]

Inverse and rank of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and Eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Books

Learning Resources:

1. Reena Garg, Engineering Mathematics-I, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.

ES-EE101: Basic Electrical Engineering

Course Code : ES-EE101

Course Title : Basic electrical engineering

L-T-P : 3-1-0

Category : Engineering Science Courses

Semester : First

Credit : 4

Stream : B. Tech.

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

Course outcome codes	Statement
ES-EE-101.1	Describe fundamentals of DC and AC circuits
ES-EE-101.2	Explain the operating principle of transformer
ES-EE-101.3	Illustrate construction, working of Electrical Machines
ES-EE-101.4	Classify different power converters and installation process

CO-PO Mapping

Co & PO Mapping ES-EE101 to PO attainment

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ESEE-101.1	3	3	2	2	2	2	3	-	2	-	-	3
ESEE-101.2	3	3	3	2	2	2	3	-	2	-	-	3
ESEE-101.3	3	2	3	2	2	2	3	-	2	-	-	3
ESEE-101.4	3	2	2	2	2	2	3	-	2	-	-	3
Average	3.00	2.50	2.50	3.00	2.00	2.00	3.00	-	2.00	-	-	3.00

Syllabus (ES-EE101)

Module 1: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4: Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Module 5: Power Converters

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.



Module 6: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Books

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Book Publishing Co. (P) Ltd., Delhi.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
5. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
6. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

BS-CH191: Chemistry-I Lab

Course Code : BS-CH191

Course Title : Chemistry-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : First/ Second

Credit : 1.5

Stream : B. Tech. (For EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH191.CO 1	Use modern instrumentation and classical techniques like viscometer, stalagmometer, pH-meter, potentiometer and conductometer etc. to design experiments and to properly record the results of their experiments to achieve high accuracy.
BS-CH191.CO 2	Separate the mixture of amino acids by TLC and analysis of chemical salts by qualitatively.
BS-CH191.CO 3	Estimate the quantitative analysis of Dissolved oxygen, chloride ion and



	removal of hardness of water etc. which are required to determine the usability of water used in industries.
BS-CH191.CO 4	Understand the miscibility of solutes in various solvents required in paint, emulsion and material industries and determine the acid value of an oil, kinetics of oxidation of iodide by hydrogen peroxide.

CO-PO Mapping

Co & PO Mapping BS-CH191 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	-	3	-	-	3	3	3	-
CO2	3	3	3	3	-	2	-	-	3	2	3	-
CO3	3	3	3	2	-	3	-	-	3	3	2	-
CO4	3	3	3	-	-	-	-	-	3	-	-	-
Average	3	3	3	2.6	-	2.6	-	-	3	2.6	2.6	-

Syllabus

1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution
2. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution
3. Determination of dissolved oxygen present in a given water sample.
4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5. Determination of surface tension and viscosity
6. Thin layer chromatography
7. Ion exchange column for removal of hardness of water
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry - determination of redox potentials and emfs



11. Saponification/acid value of an oil
12. Chemical analysis of a salt
13. Determination of the partition coefficient of a substance between two immiscible liquids
14. Adsorption of acetic acid by charcoal
15. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

N.B.: Choose 10 experiments from the above 15

Books

- Advance Practical Chemistry by Subhas C Das, Sarat Book House
- A test book of Macro and Semimicro qualitative Inorganic Analysis by I. Vogel

BS-PH191: Physics Laboratory

Course Code : BS-PH191

Course Title : Physics-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : First

Credit : 1.5

Stream : B. Tech. (All branches except EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-PH191.CO1	Observe and read data in slide calliper's, screw gauge. Calculate different modulus of elasticity to apply basic knowledge Physics of Elasticity and apply viscosity principle of streamline motion of water to calculate its viscosity coefficient required in fluid mechanics.



BS-PH191.CO2	Operate optical instruments to illustrate physical properties of light and to observe spectral lines of light to verify medium specific characteristics. Calculate Rydberg constant by studying Hydrogen spectrum to visualize visible spectra and to assess this empirical fitting parameter as a fundamental physical constant.
BS-PH191.CO3	Determine Band Gap and Hall coefficient of a given intrinsic semiconductor and distinguish between different intrinsic semiconductors. Determine the dielectric constant of different capacitors to correlate their usage like insulator and limitation of their usage as a dielectric material.
BS-PH191.CO4	Determine Planck's constant and Stefan's constant applying modern Physics.

CO-PO Mapping

CO-PO Mapping BS-PH191 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	-	-	2	-	3	-	-	3
CO2	3	3	3	3	-	-	2	-	3	-	-	3
CO3	3	3	3	3	-	-	3	-	3	-	-	3
CO4	3	3	-	3	-	-	-	-	3	-	-	3
Avg.	3	3	2.67	3	-	-	2.33	-	3	-	-	3

Syllabus

Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton's ring
3. Determination of wavelength of a monochromatic light by Fresnel's bi-prism
4. Determination of wavelength of the given laser source by diffraction method

Electricity & Magnetism experiments

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson's method.



3. Determination of dielectric constant of a given dielectric material.
4. Determination of Hall coefficient of a semiconductor by four probe method.
5. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge
8. Study of Transient Response in LR, RC and LCR circuits using expereys
9. Generating sound from electrical energy using expereys

Experiments in Quantum Physics

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.
6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Miscellaneous experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method
5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseulle's capillary flow method

ES-EE191: Basic Electrical Engineering

Course Code : ES-EE191

Course Title : Basic Electrical Engineering Laboratory

L-T-P : 0-0-2

Category : Engineering Science Courses



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Semester : First

Credit : 1

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

ESEE191.1	Identify different instruments and cut section of different machine
ESEE191.2	Describe the steady -state and transient behavior of RLC circuits.
ESEE191.3	Calculate the power of 3-ph system by two wattmeter
ESEE191.4	Analyze different characteristics of transformer & DC machines

CO-PO Mapping

Co & PO Mapping ES-EE191 to PO attainment

COs	PROGRAM OUTCOMES(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ESEE191.1	3	2	2	2	2	-	3	-	2	-	-	3
ESEE191.2	3	2	2	2	2	-	3	-	2	-	-	3
ESEE191.3	3	2	2	2	2	-	3	-	2	-	-	3
ESEE191.4	3	2	2	2	2	-	3	-	2	-	-	3
AVERAGE	3	2	2	2	2	-	3	-	2	-	-	3

Syllabus (ES-EE191)

Name of the Experiment Performed:

1. First activity: Introduction to basic safety precautions and mentioning of the do's and Don'ts. Noting down list of experiments to be performed, and instruction for writing the laboratory reports by the students. Group formation. Students are to be informed about the modalities of evaluation.

2. Introduction and uses of following instruments :

(a) Voltmeter

(b) Ammeter

(c) Multimeter



(d) Oscilloscope

Demonstration of real life resistors, capacitors with colorcode , inductors and autotransformer.

3. Demonstration of cut-out sections of machines: DC machine, Induction machine, Synchronous machine and single phase induction machine.

4. Calibration of ammeter and Wattmeter.

5. Determination of steady state and transient response of R-L, R-C and R-L-C circuit to a step change in voltage.

6. Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of impedance and power factor.

7. Determination of resonance frequency and quality factor of series and parallel R-L-C circuit.

8. (a) Open circuit and short circuit test of a single-phase transformer

(b) Load test of the transformer and determination of efficiency and regulation

9. Demonstration of three phase transformer connections. Voltage and current relationship, phase shifts between the primary and secondary side.

10. Measurement of power in a three phase unbalanced circuit by two wattmeter method.

11. Determination of Torque –Speed characteristics of separately excited DC motor.

12. Determination of Torque speed characteristics and observation of direction reversal by change of phase sequence of connection of Induction motor.

13. Determination of operating characteristics of Synchronous generator.

14. Demonstration of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for speed control of an Induction motor

15. Demonstration of components of LT switchgear

ES-ME191: Engineering Graphics & Design

Course Code : ES-ME191

Course Title : Engineering Graphics & Design

L-T-P : 1-0-4

Category : Engineering Science Courses



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Semester : First

Credit : 3

Stream : B. Tech.

Full Marks : 100 (60 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
CO2	Demonstrate engineering scales, dimensioning, and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface, and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
CO4	Apply computer aided drafting useful to share the design model to different section of industries as well as for research & development.

CO-PO-Mapping

Co & PO Mapping ES-ME191 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	2	-	-	-	-	2	2
CO2	2	2	3	2	2	-	-	-	-	-	2	2
CO3	2	3	3	2	3	2	-	-	-	-	2	3
CO4	3	2	2	2	2	2	-	-	-	-	2	2
Avg.	2.5	2.5	2.5	2.00	2.25	2	-	-	-	-	2	2.25

Syllabus (ES-ME191)

INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.

LETTERING, DIMENSIONING, SCALES

Plain scale, Diagonal scale and Vernier Scales.

GEOMETRICAL CONSTRUCTION AND CURVES

Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedean Spiral.

PROJECTION OF POINTS, LINES, SURFACES



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Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes.

PROJECTION OF REGULAR SOLIDS

Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).

COMBINATION OF REGULAR SOLIDS, FLOOR PLANS

Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

ISOMETRIC PROJECTIONS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION& CAD DRAWING

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

ANNOTATIONS, LAYERING & OTHER FUNCTIONS

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization



exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM)

Books

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of CAD Software Theory and User Manuals

ES-ME192: Workshop/ Manufacturing

Course Code : ES-ME192

Course Title : Workshop/ Manufacturing Practices

L-T-P : 1-0-4

Category : Engineering Science Courses

Semester : First

Credit : 3

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Identify and operate various hand tools related to variety of manufacturing operations
CO2	Fabricate simple components with their own hands.



CO3	Apply practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
CO4	Produce small devices of their interest in project or research purpose.

CO-PO Mapping

Co & PO Mapping ES-ME192 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	2	-	-	-	-	2	2
CO2	2	3	3	2	2	2	-	-	-	-	2	2
CO3	3	2	2	2	2	2	-	-	-	-	2	3
CO4	2	3	3	2	2	2	-	-	-	-	2	2
Avg.	2.5	2.5	2.5	2	2	2	-	-	-	-	2	2.25

Syllabus (ES-ME192)

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical & Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

(ii) Workshop Practice:

Machine shop

Typical jobs that may be made in this practice module:

To make a pin from a mild steel rod in a lathe.



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To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Fitting shop

Typical jobs that may be made in this practice module: To make a Gauge from MS plate.

Carpentry

Typical jobs that may be made in this practice module:

To make wooden joints and/or a pattern or like.

Welding shop

Typical jobs that may be made in this practice module:

ARC WELDING To join two thick (approx 6mm) MS plates by manual metal arc welding.

GAS WELDING: To join two thin mild steel plates or sheets by gas welding

Casting

Typical jobs that may be made in this practice module:

One/ two green sand moulds to prepare, and a casting be demonstrated.

Smithy

Typical jobs that may be made in this practice module:

A simple job of making a square rod from a round bar or like.

Plastic moulding & Glass cutting

Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made. For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.

Electrical & Electronics

Familiarization with LT switch gear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable. Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point. Simple wiring exercise to be executed to understand the basic electrical circuit. Simple soldering exercises to be executed to understand the basic process of soldering. Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.



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Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Books

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
4. Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology – I” Pearson Education, 2008.

2st Semester

BS-CH201: Chemistry-I

Course Name: Chemistry-I

Course Code : BS-CH201

Course Title : Chemistry-I

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : 2nd

Credit : 4

Stream : B. Tech. (Other than EE and ECE).

Full Marks = 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH201.CO 1	Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and list major chemical reactions that are used in the synthesis of drug molecules.
BS-CH201.CO 2	Rationalize bulk properties and processes using thermodynamic considerations, corrosion and water chemistry, electrochemistry, acid base theory, Knowledge of stereochemistry for understanding mechanism of the major chemical reaction.
BS-CH201.CO 3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques like IR, UV, NMR that is usable in structure elucidation and characterization of various molecules.
BS-CH201.CO 4	Understand the periodic properties such as ionization potential, electron affinity, electronegativity, polarizability, thermal stability and determination of shape of molecule.

CO-PO Mapping

Co & PO Mapping BS-CH201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
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CO1	3	3	2	3	3	2	2	-	2	-	-	-
CO2	3	3	3	3	3	3	3	-	2	-	-	2
CO3	2	3	3	3	3	3	2	-	3	3	-	-
CO4	3	3	3	3	3	2	-	-	-	2	-	2
Average	2.75	3	2.75	3	3	2.5	2.33	-	2.33	2.5	-	2

Syllabus

Unit I: Atomic and molecular structure

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g. H₂). Energy level diagrams of diatomic. molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Unit II: Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering

Unit III: Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Unit IV: Use of free energy in chemical equilibria

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

Unit V: Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies,



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electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Unit VI: Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Unit VII: Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Books

Learning Resources:

- ❖ Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
- ❖ Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- ❖ Physical Chemistry, by P. W. Atkins
- ❖ Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
- ❖ Physical Chemistry, P. C. Rakshit, Sarat Book House

Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

BS-PH201: Physics

Course Code : BS-PH201

Course Title : Physics-I

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : 2nd

Credit : 4

Stream : B. Tech. (All branches except EE and ECE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)



CODE	DESCRIPTION
BS-PH201.CO1	Learn basic concepts of quantum physics, simple quantum mechanics calculations; Macrostate, Microstate, Density of states, Qualitative treatment of MB, FD and BE statistics.
BS-PH201.CO2	Solve problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Harmonic oscillator. Damped harmonic motion forced oscillations and Resonance. Motion of a rigid body.
BS-PH201.CO3	Apply the wave properties of light Interference, Diffraction and Polarization; Lasers: Principles and working of laser to solve real life problem
BS-PH201.CO4	Understand Maxwell's equations. Polarization, Dielectrics; Magnetization, magnetic-hysteresis.

CO-PO Mapping

CO-PO Mapping BS-PH201 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	-	2	-	2	-	-	3
CO2	3	3	-	2	-	-	2	-	2	-	-	3
CO3	3	3	-	3	-	-	-	-	2	-	-	3
CO4	3	3	-	3	-	-	-	-	2	-	-	3
Avg.	3	3	-	2.5	-	-	2	-	2	-	-	3

Syllabus

UNIT 1. Mechanics

Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function $F = -\text{grad } V$, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.

UNIT 2. Optics

Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max;min, & intensity



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and qualitative discussion of fringes); diffraction grating(resolution formulae only), characteristics of diffraction grating and its applications.

Polarization: Introduction, polarization by reflection, polarization by double reflection, scattering of light, circular and elliptical polarization, optical activity.

Lasers: Principles and working of laser – population inversion, pumping, various modes, threshold population inversion with examples

UNIT 3. Electromagnetism and Dielectric Magnetic Properties of Materials

Maxwell's equations, Polarization, permeability and dielectric constant, polar and non-polar Dielectrics, internal fields in a solid, Clausius-Mossotti equation (expression only), applications of dielectrics.

Magnetization: permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

UNIT 4. Quantum Mechanics

Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.

UNIT 5. Statistical Mechanics

Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

Books

Learning Resources:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley
3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola, Cengage India



8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill
10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
13. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
14. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
15. Optics , Hecht, Pearson Education
16. Optics, Ghatak, McGraw Hill Education India Private Limited
17. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
18. Statistical Mechanics , Pathria , Elsevier
19. Statistical Physics, L.D.Landau , E.M. Lifshitz, Butterworth-Heinemann

BS-M201: Mathematics - IIA

Course Code	: BS-M201
Course Title	: Mathematics - IIA
L-T-P	: 3-1-0
Category	: Basic Science Courses
Semester	: First
Credit	: 4
Stream	: B. Tech. (For CSE).
Full Marks	: 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 201.CO 1	Learn the ideas of probability and random variables, calculate probabilities using conditional probability, rule of total probability and Bayes' theorem.
BS-M 201.CO 2	Illustrate the Various discrete and continuous probability distribution with their properties and their applications in physical and engineering environment.



BS-M 201.CO 3	Understand the basic ideas of statistics with different characterization of a univariate and bivariate data set.
BS-M 201.CO 4	Apply statistical tools for analyzing data samples and drawing inference on a given data set.

CO-PO Mapping

CO & PO Mapping BS-M201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	-	3	-	-	-	-	-	2
CO2	3	3	2	-	3	2	2	-	2	-	3	2
CO3	3	3	-	2	2	-	2	-	2	-	2	2
CO4	3	3	3	2	3	2	-	-	-	-	1	2
Average	3	3	2.67	2.33	2.67	2.33	2	-	2	-	2	2

Syllabus (BS-M201)

Syllabus

Module 1: Basic Probability [11L]

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the Multinomial distribution, Poisson approximation to the Binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Module 2: Continuous Probability Distributions [4L]

Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities.

Module 3: Bivariate Distributions [5L]

Bivariate distributions and their properties, distribution of sums and quotients, Conditional densities, Bayes' rule.

Module 4: Basic Statistics [8L]

Measures of Central tendency, Moments, Skewness and Kurtosis, Probability distributions: Binomial, Poisson and Normal and evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Module 5: Applied Statistics [8L]



Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Module 6: Small samples [4L]

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Books

Learning Resources:

1. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. S. Ross, A First Course in Probability, Pearson Education India
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
5. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill.

BS-M202: Mathematics - IIB

Course Code : BS-M202

Course Title : Mathematics - IIB

L-T-P : 3-1-0

Category : Basic Science Courses

Semester : 2nd

Credit : 4

Stream : B. Tech. (For Except CSE).

Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-M 202.CO 1	Understand multiple integrals and use their applications to different physical problems.



BS-M 202.CO 2	Analyze different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences
BS-M 202.CO 3	Learn different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.
BS-M 202.CO 4	Apply different types of transformations between two 2- dimensional planes for analysis of physical or engineering problems.

CO-PO Mapping

CO & PO Mapping BS-M202 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	2	2	2	-	-	-	2	2
CO2	3	3	2	2	2	2	-	-	2	-	2	2
CO3	3	3	1	2	2	-	2	-	2	-	-	2
CO4	3	3	2	2	3	2	-	-	-	-	2	2
Average	3	3	2	2.25	2.25	2	2	-	2	-	2	2

Syllabus (BS-M202)

Syllabus

Module 1: Multivariate Calculus (Integration) [11L]

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, change of variables (Cartesian to Polar), Applications: Areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Module 2: First order ordinary differential equations [5L]

Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 3: Ordinary differential equations of higher orders [9L]

Second order linear differential equations with constant coefficients, Use of D - operators, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 4: Complex Variable – Differentiation [6L]



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Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties.

Module 5: Complex Variable – Integration [9L]

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville’s theorem and Maximum-Modulus theorem (without proof); Taylor’s series, Zeros of analytic functions, Singularities, Laurent’s series; Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Books

Learning Resources:

1. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.
7. E. L. Ince, Ordinary Differential Equations, Dover Publications.
8. J. W. Brown and R. V. Churchill, Complex Variables and Applications, Mc-GrawHill

HMHU 201: ENGLISH

- Course Code** : HMHU201
Course Title : English
L-T-P : 2-0-0
Category : Humanities and Social Sciences including Management courses
Semester : Second
Credit : 2
Stream : B. Tech. (ALL).
Full Marks : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

Student will be able to:



COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
HMHU201.CO 1	Learn and revise basic grammar of English language.
HMHU 201.CO 2	Understand appropriate use of English language to enhance knowledge on building vocabulary and framing sentences.
HMHU 201.CO 3	Develop sensible style in technical writing.
HMHU201.CO 4	Apply expertise in reading, writing, listening and speaking to attain proficiency in English language and communication.

CO-PO Mapping

Co & PO Mapping HMHU201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	2	3	2	3
CO4	-	2	-	-	-	-	2	2	2	3	2	3
Average	-	2	-	-	-	-	2	2	2	3	2	3

Syllabus (HMHU201)

Syllabus

MODULE I

Vocabulary Building 1.1

The concept of Word Formation: Compounding, Backformation, Clipping, Blending. 1.2 Root words from foreign languages and their use in English 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. 1.4 Synonyms, antonyms, and standard abbreviations: Acronyms

MODULE II

2. Basic Writing Skills 2.1 Sentence Structures & Types: Simple, Compound, Complex 2.2 Use of phrases and clauses in sentences: Transformation of sentences, active, passive, narration 2.3 Importance of proper punctuation 2.4 Creating coherence: Arranging paragraphs & Sentences in logical order 2.5 Creating Cohesion: Organizing principles of paragraphs in documents 2.6 Techniques for writing precisely

MODULE III

3. Identifying Common Errors in Writing 3.1 Subject-verb agreement 3.2 Noun-pronoun agreement 3.3



Misplaced modifiers 3.4 Articles 3.5 Prepositions 3.6 Redundancies 3.7 Clichés

MODULE IV

4. Nature and Style of sensible Writing 4.1 Describing 4.2 Defining 4.3 Classifying 4.4 Providing examples or evidence 4.5 Writing introduction and conclusion

MODULE V

5. Writing Practices 5.1 Comprehension 5.2 Précis Writing 5.3 Essay Writing 5.4 Business Letter, Cover Letter & CV; E-mail

Books

Learning Resources:

- (i) Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.
- (ii) Practical English Usage. Michael Swan. OUP. 1995.
- (iii) Remedial English Grammar. F.T. Wood. Macmillan. 2007
- (iv) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (v) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (vi) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- (vii) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- (viii) Universal English Prof. Prasad Kataria Publications, 2019.
- (ix) "Communication Skills for Professionals"-NiraKonar, Prentice Hall of India 2nd edition, NewDelhi, 2011.
- (x) Gajendra Singh Chauhan, SmitaKashiramka and L. Thimmesha. Functional English. Cengage, 2019.

ES-CS201: Programming for Problem Solving

- Course Code** : ES-CS201
- Course Title** : Programming for Problem Solving
- L-T-P** : 3-0-0
- Category** : Engineering Science Courses
- Semester** : 2nd
- Credit** : 3
- Stream** : B. Tech.
- Full Marks** : 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COs	CO Statement
ES-CS 201.1	Describe the meaning of system of numbers, logic gates and the basic anatomy of a computer.



ES-CS 201.2	Understand the inherent meaning of the basic elements of C Programming Language like; constants, variables, operators, operator precedence etc., and identify the use of data types and C statements and classify the statements.
ES-CS 201.3	Organize the statements in appropriate order to prepare a complete program that solves a specific problem and analyze a program to point out the bugs that might be present in it and change it to achieve the goal.
ES-CS 201.4	Construct the final program and create the executable module for execution purpose.

CO-PO Mapping

Co & PO Mapping ES- CS 201 to PO attainment

CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ES-CS 201.1	-	-	3	2	-	-	-	-	3	-	1	2
ES-CS 201.2	1	3	1	-	-	-	-	2	-	3	1	2
ES-CS 201.3	3	1	1	2	-	-	-	2	2	2	-	3
ES-CS 201.4	3	2	3	-	-	-	-	2	2	2	1	-
Average	2.33	2	2	2	-	-	-	2	2.33	2.33	1	2.33

Syllabus (ES-CS201)

Unit 1: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code-

Unit 2: Arithmetic expressions and precedence

Unit 3: Conditional Branching and Loops

Writing and evaluation of conditionals and consequent branching

Unit 4: Arrays

Arrays (1-D, 2-D), Character arrays and Strings

Unit 5: Basic Algorithms

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 6: Function

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference



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JIS GROUP
Educational Initiatives

Books

Learning Resources:

1. R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

BS-PH291: Physics-I Lab

Course Code : BS-PH291

Course Title : Physics-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : Second

Credit : 1.5

Stream : B. Tech. (EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-PH291.CO1	Observe and read data in slide calliper's, screw gauge. Calculate different modulus of elasticity to apply basic knowledge Physics of Elasticity and apply viscosity principle of streamline motion of water to calculate its viscosity coefficient required in fluid mechanics.
BS-PH291.CO2	Operate optical instruments to illustrate physical properties of light and to observe spectral lines of light to verify medium specific characteristics. Calculate Rydberg constant by studying Hydrogen spectrum to visualize visible spectra and to assess this empirical fitting parameter as a fundamental physical constant.
BS-PH291.CO3	Determine Band Gap and Hall coefficient of a given intrinsic semiconductor and distinguish between different intrinsic semiconductors. Determine the dielectric constant of different capacitors to correlate their usage like insulator and limitation of their usage as a dielectric material.
BS-PH291.CO4	Determine Planck's constant and Stefan's constant applying modern Physics.

CO-PO Mapping

CO-PO Mapping BS-PH291 to PO attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO1	3	3	2	3	-	-	2	-	3	-	-	3
CO2	3	3	3	3	-	-	2	-	3	-	-	3
CO3	3	3	3	3	-	-	3	-	3	-	-	3
CO4	3	3	-	3	-	-	-	-	3	-	-	3
Avg.	3	3	2.67	3	-	-	2.33	-	3	-	-	3

Syllabus

Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton's ring
3. Determination of wavelength of a monochromatic light by Fresnel's bi-prism
4. Determination of wavelength of the given laser source by diffraction method

Electricity & Magnetism experiments

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
3. Determination of dielectric constant of a given dielectric material.
4. Determination of Hall coefficient of a semiconductor by four probe method.
5. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge
8. Study of Transient Response in LR, RC and LCR circuits using expeyes
9. Generating sound from electrical energy using expeyes

Experiments in Quantum Physics

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.
6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Miscellaneous experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure



2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method
5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseuille's capillary flow method

BS-CH291: Chemistry-I Lab

Course Code : BS-CH291

Course Title : Chemistry-I Laboratory

L-T-P : 0-0-3

Category : Basic Science Courses

Semester : Second

Credit : 1.5

Stream : B. Tech. (Other than EE and ECE).

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
BS-CH291.CO 1	Use modern instrumentation and classical techniques like viscometer, stalagmometer, pH-meter, potentiometer and conductometer etc. to design experiments and to properly record the results of their experiments to achieve high accuracy.
BS-CH291.CO 2	Separate the mixture of amino acids by TLC and analysis of chemical salts by qualitatively.
BS-CH291.CO 3	Estimate the quantitative analysis of Dissolved oxygen, chloride ion and removal of hardness of water etc. which are required to determine the usability of water used in industries.
BS-CH291.CO 4	Understand the miscibility of solutes in various solvents required in paint, emulsion and material industries and determine the acid value of an oil, kinetics of oxidation of iodide by hydrogen peroxide.



CO-PO Mapping

Co & PO Mapping BS-CH291 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	-	3	-	-	3	3	3	-
CO2	3	3	3	3	-	2	-	-	3	2	3	-
CO3	3	3	3	2	-	3	-	-	3	3	2	-
CO4	3	3	3	-	-	-	-	-	3	-	-	-
Average	3	3	3	2.6	-	2.6	-	-	3	2.6	2.6	-

Syllabus

1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution
2. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution
3. Determination of dissolved oxygen present in a given water sample.
4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5. Determination of surface tension and viscosity
6. Thin layer chromatography
7. Ion exchange column for removal of hardness of water
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry - determination of redox potentials and emfs
11. Saponification/acid value of an oil
12. Chemical analysis of a salt
13. Determination of the partition coefficient of a substance between two immiscible liquids
14. Adsorption of acetic acid by charcoal
15. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

N.B.: Choose 10 experiments from the above 15

Books

- Advance Practical Chemistry by Subhas C Das, Sarat Book House
- A test book of Macro and Semimicro qualitative Inorganic Analysis by I. Vogel



HMHU 291: ENGLISH

Course Code : HMHU291
Course Title : English
L-T-P : 0-0-2
Category : Humanities and Social Sciences including Management courses
Semester : Second
Credit : 1
Stream : B. Tech. (ALL).
Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

Student will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
HMHU291.CO 1	Understand and incorporate professional application of English Language with emphasis on listening and speaking skills through language lab aids.
HMHU 291.CO 2	Learn and Practice sessions on pronunciation, intonation, voice modulation, stress, pitch and accent and developing communicative skills with special focus on Group Discussion.
HMHU 291.CO 3	Develop effective reading and writing style through Language Lab aids.
HMHU291.CO 4	Demonstrate proficiency in reading, listening comprehension, technical writing and in speaking.

CO-PO Mapping

Co & PO Mapping HMHU291 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	2	-	2	2	3	2	3
CO2	-	-	-	-	-	-	-	-	3	3	-	3
CO3	-	-	-	-	-	-	-	-	2	3	-	3
CO4	-	-	-	-	-	-	2	-	3	3	3	3
Average	-	-	-	-	-	2	2	2	2.5	3	2.5	3

Syllabus (HMHU291)

Syllabus

- 1) Honing 'Listening Skill' and its sub skills through Language Lab Audio device; 3P
- 2) Honing 'Speaking Skill' and its sub skills 2P
- 3) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/ Voice modulation/ Stress/ Intonation/ Pitch & Accent) of connected speech 2P
- 4) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone & Role Play Mode) 2P
- 5) Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success 2P
- 6) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD 4P
- 7) Honing 'Reading Skills' and its sub skills using Visual / Graphics/ Diagrams /Chart Display/Technical/Non Technical Passages Learning Global / Contextual / Inferential Comprehension; 2P8)
Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions

ES-ME291: Engineering Graphics & Design

Course Code	: ES-ME291
Course Title	: Engineering Graphics & Design
L-T-P	: 1-0-4
Category	: Engineering Science Courses
Semester	: First
Credit	: 3
Stream	: B. Tech.
Full Marks	: 100 (60 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
CO2	Demonstrate engineering scales, dimensioning, and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface, and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
CO4	Apply computer aided drafting useful to share the design model to different section of industries as well as for research & development.

CO-PO-Mapping

Co & PO Mapping ES-ME291 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	2	-	-	-	-	2	2
CO2	2	2	3	2	2	-	-	-	-	-	2	2
CO3	2	3	3	2	3	2	-	-	-	-	2	3
	3	2	2	2	2	2	-	-	-	-	2	2
Avg.	2.5	2.5	2.5	2.00	2.25	2	-	-	-	-	2	2.25

Syllabus (ES-ME291)

INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.

LETTERING, DIMENSIONING, SCALES

Plain scale, Diagonal scale and Vernier Scales.

GEOMETRICAL CONSTRUCTION AND CURVES

Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedean Spiral.

PROJECTION OF POINTS, LINES, SURFACES

Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes.

PROJECTION OF REGULAR SOLIDS

Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).

COMBINATION OF REGULAR SOLIDS, FLOOR PLANS

Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

ISOMETRIC PROJECTIONS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION & CAD DRAWING



listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

ANNOTATIONS, LAYERING & OTHER FUNCTIONS

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM)

Books

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of CAD Software Theory and User Manuals



ES-ME291: Workshop/ Manufacturing

Course Code : ES-ME292

Course Title : Workshop/ Manufacturing Practices

L-T-P : 1-0-4

Category : Engineering Science Courses

Semester : 2nd

Credit : 3

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Identify and operate various hand tools related to variety of manufacturing operations
CO2	Fabricate simple components with their own hands.
CO3	Apply practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
CO4	Produce small devices of their interest in project or research purpose.

CO-PO Mapping

Co & PO Mapping ES-ME291 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	2	-	-	-	-	2	2
CO2	2	3	3	2	2	2	-	-	-	-	2	2
CO3	3	2	2	2	2	2	-	-	-	-	2	3
CO4	2	3	3	2	2	2	-	-	-	-	2	2
Avg.	2.5	2.5	2.5	2	2	2	-	-	-	-	2	2.25



Syllabus (ES-ME291)

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical & Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

(ii) Workshop Practice:

Machine shop

Typical jobs that may be made in this practice module: To make a pin from a mild steel rod in a lathe. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Fitting shop

Typical jobs that may be made in this practice module: To make a Gauge from MS plate.

Carpentry

Typical jobs that may be made in this practice module: To make wooden joints and/or a pattern or like.

Welding shop

Typical jobs that may be made in this practice module: ARC WELDING

To join two thick (approx 6mm) MS plates by manual metal arc welding. GAS WELDING: To join two thin mild steel plates or sheets by gas welding

Casting

Typical jobs that may be made in this practice module: One/ two green sand moulds to prepare, and a casting be demonstrated.

Smithy

Typical jobs that may be made in this practice module: A simple job of making a square rod from a round bar or like.

Plastic moulding & Glass cutting

Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made. For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.



Electrical & Electronics

Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable. Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point. Simple wiring exercise to be executed to understand the basic electrical circuit. Simple soldering exercises to be executed to understand the basic process of soldering. Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

ES-CS291: Programming for Problem Solving

Course Code : ES-CS291

Course Title : Programming for Problem Solving

L-T-P : 0-0-4

Category : Engineering Science Courses

Semester : 2nd

Credit : 2

Stream : B. Tech.

Full Marks : 100 (40 for Continuous Evaluation; 60 for End Semester Exam.)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COs	CO Statement
ES-CS 291.1	Define the specifications like input and output relating to a particular problem and describe the algorithm that solves the problem.
ES-CS 291.2	Construct each of the modules of a program by restating the steps of the algorithm using functions in the framework of C language.
ES-CS 291.3	Create the program by using the functions and execute the program.
ES-CS 291.4	Point out the bugs if any and modify the program to solve the problem.

CO-PO Mapping

Co & PO Mapping ES- CS 291 to PO attainment



CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ES-CS 291.1	2	-	2	-	-	-	-	2	2	-	2	-
ES-CS 291.2	2	-	2	2	-	-	-	-	2	2	-	2
ES-CS 291.3	2	2.5	2	2	-	-	-	-	3	2	2	-
ES-CS 291.4	-	3	2	3	-	-	-	2	-	2	-	2
Average	2	2.5	2	2.33	-	-	-	2	2.33	2	2	2

Syllabus (ES-CS291)

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations



Mandatory Additional Requirement (MAR)

Mandatory Additional Requirement (MAR) for earning B.Tech Degree

Addressing the needs of the industry and the society: Globally, engineering education systems have continuously evolved, in order to address the needs of the industry and the society. It is becoming imperative that every University should create opportunities for the students to inculcate attributes, which are not restricted only to engineering knowledge and acumen. Industry needs professionals who can work successfully in teams, who have leadership qualities, who are alive to social and community needs and who can bring innovation and creativity to their work and who are also digitally proficient. Hence, in order to prepare its students to match these multiple requirements, MAKAUT, WB has created a unique mechanism of awarding 100 Activity Points over and above the academic grades. It is planned that the students at MAKAUT, WB will be able to reap benefits from these activities at their own pace and comfort. It is expected that by the time MAKAUT, WB's students reach their Final Year, they would have developed themselves so well both through their studies in the respective technological field and through their active participation in the co-curricular and extra-curricular activities as also through SAWYAM based learning activities that they would be well-prepared for contributing to building the India and the world of their dreams.

The additional requirement applies to: Every student, who is admitted to the 4 years B.Tech program from the academic year 2018-19 onwards, is required to earn minimum 100 Activity Points in addition to the required academic grades, for getting MAKAUT, WB's B.Tech degree. Similarly, it is mandatory to earn 75 Activity Points, in addition to the academic grades, for getting B.Tech degree by a student (Lateral Entry) who is admitted to the B.Tech program from the academic year 2018-19 onwards. *(Please see Table 1 for details.)* [Lateral Entry students will have a multiplying factor of 1.33 to bring uniformity in score].

Table I:

Level of Entry in B.Tech Course	Total duration for earning Points	Minimum Points
1 st Year from the academic year 2018-19 onwards	1 st to 4 th Year	100
2 nd Year from the academic year 2018-19 onwards (Lateral Entry)	2 nd to 4 th Year	75

These points must be earned on the basis of active participation in co-curricular and extracurricular activities spanning through all the semesters of study. Every student may choose, as per his/her liking, activities in order to achieve the mandatory points (as per Table- II, depending on his/her entry level), before becoming eligible for award of the Degree. These activities can be spread over the years, as per convenience of the student.

Table II provides a List of Activity Heads and Sub-Activity Heads along with their capping of the Activity Points that can be earned by the students during the entire B.Tech duration.

Table II:

Sl. No.	Name of the Activity	Points	Maximum Points Allowed
1	MOOCS (SWAYAM/NPTEL/Spoken Tutorial) (per course)		40
	For 12 weeks duration	20	
	for 8 weeks duration	16	



2	Tech Fest/Teachers Day/Freshers Welcome		
	Organizer	5	10
	Participants	3	6
3	Rural Reporting	5	10
4	Tree Plantation (per tree)	1	10
5	Participation in Relief Camps	20	40
6	Participation in Debate/Group Discussion/ Tech quiz	10	20
7	Publication of Wall magazine in institutional level (magazine / article / internet)		
	Editor	10	20
	Writer	6	12
8	Publication in News Paper, Magazine & Blogs	10	20
9	Research Publication (per publication)	15	30
10	Innovative Projects (other than course curriculum)	30	60
11	Blood donation	8	16
	Blood donation camp Organization	10	20
12	Participation in Sports/Games		
	College level	5	10
	University Level	10	20
	District Level	12	24
	State Level	15	30
	National/International Level	20	20
13	Cultural Programme (Dance, Drama, Elocution, Music etc.)	10	20
14	Member of Professional Society	10	20
15	Student Chapter	10	20
16	Relevant Industry Visit & Report	10	20
17	Photography activities in different Club(Photography club, Cine Club, Gitisansad)	5	10
18	Participation in Yoga Camp (Certificate to be submitted)	5	10
19	Self-Entrepreneurship Programme	20	20
20	Adventure Sports with Certification	10	20
21	Training to under privileged/Physically challenged	15	30
22	Community Service & Allied Activities	10	20

Notes:

- ❖ Every student shall participate in the co-curricular and extra-curricular activities and produce documentary proof to the designated Faculty Members appointed by the Head of Department / Principal / Director in the respective college. Thereby the student should earn the required Points before he/she appears for his/ her Final Examinations.
- ❖ A student's result of his/her Final Examinations will be withheld until he/she completes the minimum Activity Points by the end of his/her B.Tech Program.



- ❖ In every semester, every student is required to prepare a file containing documentary proofs of activities, done by him / her. This file will be duly verified and Activity Points will be assigned by the teachers as appointed above, at the end of every semester.
- ❖ The college will form a 3 members committee and finalize the Activity Points for each student before entering them into the Online Point Entry System (at the URL, as specified by the COE of the University).
- ❖ Every student has to earn at least 100 activity points. The points students has earned will be reflected in the student's mark sheet.
- ❖ Activity points earned by Lateral Entry students will be multiplied by 1.33.

MOOCs

Massive Open Online Courses (MOOCs) scheme (Applicable from the session 2018-19)

All India Council for Technical Education (AICTE) has introduced Model Curriculum for Bachelor of Technology programme with 160 credits in the entire programme of 4 years, and additional 20 credits will be required to be achieved through Massive Open Online Courses (MOOCs) from different platform for the degree of **Bachelor of Technology with Honours**. These additional 20 credits will have to be acquired with online courses (MOOCs) as per AICTE. Students of B Tech program will have to complete additional 20 credits through MOOCs within 4 years of time. 16 credit points is applicable for 3 year UG programs. This creates an excellent opportunity for students to acquire the necessary additional skill set for employability through massive open online courses where the rare expertise of world famous experts from academics and industry are available. Maulana Abul Kalam Azad University of Technology, West Bengal (MAKAUT,WB) has thus decided to introduce AICTE model curriculum for its B.Tech Programmes and allow students to choose courses from any established online platform as per following guidelines from academic year 2018-19.

GUIDELINES FOR MOOCs:

MOOCs (Massive Open Online Courses) have been inducted in University curriculum and academic activities in the following ways:

1. MOOCs for Honours Degree at Undergraduate Level
2. MOOCs for mandatory Coursework of Research Scholars for Ph.D. degree
3. MOOCs for credit transfer as equivalent to theory courses of Curriculum under recommendation of BoS.
4. MOOCs for Mandatory Additional Requirements (MAR)

1. MOOCs for Honours Degree at Undergraduate Level:

For B.Tech Honours Degree, a B.Tech student will have to earn 20 credits from MOOCs from any established MOOCs platform addition to 160 credits for B.Tech degree.

The total of 20 credits that is required to attain eligibility for B.Tech Honours degree is distributed over four years in the following way:

1st year: 4-8 credits

2nd year: 4-8 credits

3rd year: 4-8 credits

4th year: 4 credits

A student of first year has to cover courses from at least three skills:

1. Computer Programing with Python /R
2. Soft skills
3. values and Ethics

Students of all streams are to be equipped with Programming skill in the language that is in high demand worldwide in the first year itself so that they can apply this skill in the subsequent semesters in their different areas including their core area of study.



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Department of Basic Science and Humanities



Soft skill is very essential for grooming of the student and student must be exposed to it in the very beginning of the 4 year long program.

Ethics is something that one should practice. Students are to be made aware of the ethics right in the beginning of the 4 year long program so that they can practice at least some of the ethical norms as applicable to Institutional environment and society, and be prepared to practice ethics in their working life.

All of the MOOCs courses are to be taken any MOOCs platform as per following scheme of credit points. There would not be any concept of fixed basket anymore. However, during choosing courses in the online platform students would essentially avoid the courses taught/offered through the curriculum in the offline / class room mode.

- ❖ **For NPTEL/Swayam platform: Credit points as specified in the platform**
- ❖ **For other MOOCs platforms like Coursera, edX, Udemy, Simplilearn etc**
 - Courses of 4 weeks to 7 weeks: 1 credit point**
 - Courses of 8 weeks to 11 weeks: 2 credit point**
 - Courses of 12 weeks to 15 weeks: 3 credit point**
 - Courses of 16 weeks or more: 4 credit point**
- ❖ **Where duration of MOOCs courses are available in hours**
 - For every 8 hours of course: 1 credit point**

However, for the courses with duration less than 8 hours, multiple courses could be taken together (preferably in the same area) to consider 1 credit point. But where duration is available in week, count of hours will not be applicable.

The above structure is indicative only. And BoS/DC concerned may propose credit points of the courses offered through MOOCs platform based on the content and level (beginner/ intermediate/ advanced) of the courses.

2. MOOCs for Credit Transfer:

University had already introduced provision of credit transfer through MOOCs courses. Therefore, different courses of curriculum could be taken from MOOCs platform and credits could be transferred, if offered through online and credits are earned. However, to offer courses of curriculum through MOOCs platform like NETEL/SWAYAM/ Coursera/edX/Simplilearn etc, offering institute must get the course mapping (Mapping between the University course and that offered from the online platform) approved from the University for appropriate Credit Transfer Scheme.

If a student of the university is unable to attend a theory course due to attending internship or any other justified reason, the student may be allowed with special permission of the University to pursue equivalent MOOCs for against the theory course. However, content mapping to be completed preferably by BoS or appropriate authority is essential before opting the courses in MOOCs platform. More than one MOOCs courses may be necessary to be mapped to cover the syllabus of the theory course and the student has to complete all the MOOCs to cover the course. Credits earned in total in all the courses will be considered for equivalence and credit transfer.

3. MOOCs for Mandatory Additional Requirements (MAR):

MOOCs in MAR is provided for encouraging every student to enter in Digital Content form of Education from well-known Universities or organizations.

Students can choose any MOOCs course as per their interest area. There is no credit system for MOOCs in MAR as points could be earned as specified in the scheme and the MOOCs courses which are taken for earning credits for Honours degree will not be considered in MAR purpose.



SurTech

Department of Basic Science and Humanities



Evaluation of the MOOCs course:

Evaluation of the MOOCs courses would be done by the organization by whom it is being offered. In extraordinary circumstances, the modality of evaluation through certified personnel, online or offline, will be decided by the appropriate authority.

Uploading of MOOCs Data:

Every Affiliated Institution has to upload the details of MOOCs data in respect of each student time to time in University's examinations portal and/or hard/soft copy as per instruction of the Controller of Examinations of the University. This is applicable for University's In-House Programs also.

The validity of uploaded certificates in the University portal is subject to acceptance of appropriate committee/expert review.

Colleges interested to deliver any course(s) online through MOOCs platform, should get vetted from the University regarding mapping of course for credit transfer/assessment process.



Code of Conducts of the Students

1. PREPARATION

All students must understand that it is their responsibility to follow this Code of Ethics and Conduct (hence referred to as the 'Code') and the rights, obligations, and limitations that it entails.

That the Institute's goal in implementing this Code is to pioneer and administer an equitable, conscientious, effective, and timely student discipline procedure, as well as to provide a system that encourages student progress through individual and communal accountability.

All students are expected to be well-versed in this Code, which may also be found on the Institute's official website.

2. JURISDICTION

2.1 The Institute shall have jurisdiction over the conduct of students associated/enrolled with the Institute, and shall be aware of all acts of misconduct, including incidents of ragging or otherwise, that occur on the Institute campus or in connection with Institute-related activities and functions.

2.2 The Institute may have jurisdiction over conduct that occurs off-campus that violates the ideal student conduct and discipline as outlined in this Policy and other regulations, as if the conduct occurred on campus, which shall include:

- a) Any violations of the Sexual Harassment Policy of the Institute against other students of the Institute.
- b) Physical assault, threats of violence, or conduct that threatens the health or safety of any person including other students at the Institute.
- c) Possession or use of weapons, explosives, or destructive devices off campus.
- d) Manufacturing, selling, or distributing illegal narcotics, alcohol, or other substances.
- e) Conduct that has a negative impact on members of the off-campus community or is a nuisance to them.

The Institute shall consider the seriousness of the alleged offence, the risk of harm involved, whether the victim(s) are members of the campus community, and/or whether the off-campus conduct is part of a series of actions that occurred both on and off-campus when deciding whether to exercise such off-campus jurisdiction in the situations enumerated herein.

3. BEHAVIOR AND ETHICS

3.1 This Code applies to all types of student conduct on Institute grounds, including Institute-sponsored activities, functions hosted by other recognized student organizations, and any off-campus conduct that has or may have serious consequences or a negative impact on the Institute's interests or reputation.

3.2 Each student must sign a declaration recognizing this Code and promising to follow it at the time of admission:

- a) He/she must be regular and complete his/her studies at the Institute.



SurTech

Department of Basic Science and Humanities



b) If a student is obliged to abandon studies for any justifiable reason, he/she may be removed from the Institute with the Principal's written agreement.

c) As a result of such relief, the student will be required to pay any outstanding hostel/mess dues, and if the student was admitted on a scholarship, the grant will be cancelled.

3.3. The Institute believes that implementing behavioral norms would help to create a safe and efficient environment. All students must maintain academic integrity, respect all individuals and their rights and property, and ensure the safety of others, among other things.

3.4 All students shall refrain from engaging in all forms of wrongdoing, including engaging in any off-campus activities that could jeopardize the Institute's interests and reputation.

3.5 Discrimination (physical or verbal) based on a person's gender, caste, race, religion, or religious beliefs, color, region, language, disability, or sexual orientation, marriage, or family status, physical or mental disability, gender identity, or other factors.

3.6 Deliberately causing damage to Institute property or the property of other students and/or faculty members.

3.7 Any disruptive behavior in a classroom or at an Institute-sponsored event.

3.8 Inability to produce the Institute's identity card or refusal to produce it when asked by campus security officers.

3.9 Participating in activities without the Institute's consent, such as:

3.9.1 Organizing gatherings and processions.

3.9.2 Accepting membership in religious or terrorist organizations that the Institute/Government of India has outlawed.

3.9.3 Contrary to law or policy, illegal possession, carrying, or use of any weapon, ammunition, explosives, or potential weapons, fireworks.

3.9.4 Illegal possession or use of hazardous chemicals and controlled substances.

3.9.5 Smoking on the Institute's premises.

3.9.6 Possessing, consuming, distributing, selling, and/or tossing empty bottles on the Institute's campus are all prohibited.

3.9.7 Parking a vehicle in an area designated for parking other types of vehicles or in a no parking zone.

3.9.8 Improper driving on campus that may cause others to be inconvenienced.

3.9.9 Not informing the Chief Medical Officer about a pre-existing health problem, whether physical or psychological, that could impede academic development.

3.9.10 Unauthorized access to others' resources or theft.

3.9.11 Misconduct during student body elections or any Institute-sponsored activity.



3.9.12 Behaving in a disorderly, lewd, or indecent manner at the Institute, including, but not limited to, making excessive noise, pushing, and shoving, inciting or participating in a riot, or causing a group disruption.

3.10 Students are not permitted to communicate with media representatives on behalf of the Institute or to invite media persons to the campus without the authorization of the Institute management.

3.11 Without prior authorization, students are not permitted to capture audio or video lectures in classes or the behaviors of other students, instructors, or staff.

3.12 Students are not permitted to supply media with audio or video clips of any campus activity without prior approval.

3.13 Students are required to use social media properly and with caution. They are prohibited from making negative comments about other Institute employees on social media or engaging in any other activity that could harm the Institute's reputation.

3.14 Unauthorized entry, use, tampering, etc. of Institute property or facilities, private residences of staff/professors, offices, classrooms, computers networks, and other restricted facilities, as well as interference with others' work, is punishable.

3.15 Any damage to or destruction of Institute property or the property of others on Institute grounds.

3.16 Without the person's knowledge and explicit agreement, making a video/audio recording, taking pictures, or streaming audio/video of any person in a location where the person has a reasonable expectation of privacy.

3.17 Harassment, which is defined as harsh and objective behavior motivated by a person's race, color, national or ethnic origin, citizenship, sex, religion, age, sexual orientation, gender, gender identity, marital status, ancestry, physical or mental disability, or medical condition.

4 If there is a case against a student for a probable breach of code of conduct, then a committee will be constituted to recommend a suitable disciplinary action who shall enquire into the alleged violation and consequently indicate the action to be taken against the said student.

The committee may meet with the student to determine the extent of the misbehavior and recommend one or more of the disciplinary actions listed below, depending on the severity of the misconduct.

4.1 **WARNING-** Indicating that the delinquent student's actions were in breach of the Code, and that any future acts of misbehaviour will result in serious disciplinary punishment.

4.2 **RESTRICTIONS** - Reprimanding and restricting access to certain campus facilities for a period.

4.3 **COMMUNITY SERVICE** - For a set amount of time, which may be extended if necessary. Any future wrongdoing, as well as failure to comply with any imposed limitations, may result in severe disciplinary action, such as suspension or expulsion.

4.4 **EXPULSION** - Permanent expulsion of a student from the Institute, indicating that attending the Institute or participating in any student-related activities or living on campus is prohibited.



SurTech

Department of Basic Science and Humanities



4.5 FINANCIAL PENALTY- This could include the suspension or forfeiture of a scholarship or fellowship for a set period.

4.6 SUSPENSION- A student may be suspended for a length of time, preventing them from engaging in student-related activities, classes, or programmes. Furthermore, unless permission is acquired from the Competent Authority, the student will be prohibited from using various Institute facilities. Suspension may be followed by dismissal, as well as the other punishments listed below.

4.7 For a period of three years, you will be ineligible to reapply for admission to the Institute, and

4.8 Withholding the grade card or certificate for the courses studied or work \scarred out.

5 APPEALS:

If a delinquent student feels he or she has been wronged by the application of any of the above punishments, he or she may file an appeal with the Principal. The Principal may decide on one of the following:

5.1 Accept the committee's proposal and impose the punishment recommended by the Committee or amend and impose any of the punishments stated in this Code that are appropriate with the degree of the proven wrongdoing. Or

5.2 Recommend the case to the committee for further consideration.

In all circumstances where there is a potential for student misconduct, the Director's decision is final and binding.

6 ACADEMIC INTEGRITY

The Institute values academic integrity and is devoted to building an intellectual and ethical environment based on academic integrity principles as a top institution for advanced scientific and technology research and education.

Academic integrity includes honesty, accountability, and awareness of ethical standards for study and scholarship. The Institute believes that the ideas and contributions of others should be appropriately acknowledged in all academic work. Academic integrity is critical to the Institute's and its research missions' success, and so academic integrity infractions are a significant offence.

6.1 Purpose and Scope

A. The academic integrity policy, which is an integral aspect of the Code, applies to all students at the Institute, and they are obligated to follow it.

The Policy serves a dual purpose:

- To make the ideals of academic honesty clearer, and
- To give examples of dishonest behavior and academic integrity infractions.

NOTE: These examples are intended to be illuminating rather than exhaustive.



B. Failure to follow these academic integrity principles jeopardizes the Institute's reputation as well as the worth of the degrees issued to its students.

As a result, every member of the Institute community takes responsibility for upholding the highest standards of academic integrity.

C. Academic integrity dictates that a student appropriately acknowledges and references the use of others' ideas, results, materials, or language.

Ensures that all work submitted as his or her own in a course or other academic activity is produced without the use of impermissible materials or impermissible collaboration; properly acknowledges all contributors to a given piece of work; and ensures that all work submitted as his or her own in a course or other academic activity is produced without the use of impermissible materials or impermissible collaboration.

Obtains all data or results ethically and accurately reports them, with no results suppressed that contradict his or her interpretation or conclusions.

Demonstrates ethical behavior toward all other students, respecting their integrity and right to pursue their educational goals without hindrance. This means that a student must not assist others in academic dishonesty or hamper their own academic advancement.

6.2 Examples of policy violations include, but are not limited to:

(i)Plagiarism Violation:

Plagiarism is defined as the use of someone else's content, ideas, figures, code, or data without properly recognizing the original source. This could include submitting material written by another person or previously published by oneself, directly or paraphrased.

Plagiarism can be defined as:

(a) reproducing text/sentences from a report, book, thesis, publication, or the internet in whole or in part.

(b) Reproducing previously published data, illustrations, figures, or images, whether one's own or someone else's.

(c) Incorporating non-textual material from other sources into one's class reports, presentations, manuscripts, research papers, or thesis without proper attribution, such as graphs, drawings, photographs, diagrams, tables, spreadsheets, computer programmes, or other non-textual material from other sources.

(d) Self plagiarism which comprises copying verbatim from one's own earlier \published work in a journal or conference proceedings without necessary citations.

e) Completing a course requirement by submitting a purchased or downloaded term paper or other resources.

f) Without citation, paraphrasing or modifying an author's words or style.



SurTech

Department of Basic Science and Humanities



(ii) Cheating:

Cheating can take many forms, including, but not limited to:

- (a) Exam copying, as well as copying of homework assignments, term papers, theses, or manuscripts.
- (b) Permitting or enabling copying, making a report, or taking an examination on behalf of another person.
- (c) Using unlawful materials, copying, collaborating without permission, and purchasing or borrowing papers or materials from a variety of sources.
- (d) fabricating (falsifying) data and reporting it in theses and publications.
- (e) Inventing new sources or citations when none exist
- (f) Making changes to previously evaluated work and submitting it for re-evaluation
- (g) Signing an assignment, report, research paper, thesis, or attendance sheet in the name of another student.

(iii) Conflict of Interest:

In a variety of activities such as teaching, research, publication, serving on committees, research funding, and consultancy, a clash of personal or private interests with professional actions can lead to a potential conflict of interest. Actual professional independence, integrity, and commitment must be protected, as well as the appearance of any impropriety resulting from conflicts of interest.

Conflict of interest is not restricted to personal financial gain; it extends to a vast range of professional academic activities including peer reviewing, serving on numerous committees, which may, for example, monitor financing or grant recognition, as well as influencing public policy.

Potential conflicts of interest must be notified in writing to competent authorities for a thoughtful decision to be made on a case-by-case basis, to promote transparency and boost credibility. In the part below dealing with resources, there is also some more information.

4.3 Academic behavior guidelines are presented here to protect against both negligence and purposeful dishonesty:

- (a) For experiments and computational tasks, use suitable procedures. Data should be accurately described and compiled.
- b) Save primary and secondary data such as original photographs, equipment data readouts, laboratory notebooks, and computer folders with care. Digital alteration of images/photos should be kept to a minimum; the original version should be maintained for subsequent inspection if necessary, and the changes done should be clearly indicated.
- c) Ensure that experiments and simulations are robustly reproducible and statistically analyzed. It's critical to be honest about the facts and avoid "cherry picking" (omitting some data pieces to produce an outstanding statistic).



- d) Laboratory notes should be kept in bound notebooks with printed page numbers so that they can be checked later for publication or patenting purposes. Each page should have a date on it.
- e) Use your own language to write clearly. It is vital to resist the temptation to “copy and paste” from the Internet or other sources for class tasks, manuscripts, and thesis.
- f) Cite prior reports, methodologies, computer programmes, and other sources appropriately. It's also a good idea to cite material from your own published work; otherwise, it'll be regarded self-plagiarism.

6.3. Individual and Collective Responsibilities: Responsibilities differ depending on the role played.

a) Student responsibilities:

Before submitting a thesis to the department (B.Tech, M Tech), the student is responsible for reviewing the thesis for plagiarism using proper tools. Furthermore, the student must guarantee that he or she is aware of the Institute's academic norms, that the paper has been examined for plagiarism, and that the thesis is original work. Plagiarism cannot always be detected with a web search. If a student notices or learns of any violations of the academic integrity policy, he or she should report the wrongdoing as soon as possible.

b) Faculty responsibilities:

Faculty members should guarantee that suitable methods for experiments, computations, and theoretical developments are followed, and that data is properly recorded and stored for future reference. They should also thoroughly analyze manuscripts and theses. Faculty members must also ensure personal compliance with the broad principles of academic integrity. Faculty members are expected to inform students in their respective courses about the Institute's academic integrity policy, to ensure minimum academic dishonesty, and to respond appropriately and promptly to academic integrity violations.

c) Institutional responsibilities:

A breach of academic integrity is a serious offence that can result in a variety of sanctions for both the individual and the institute. In the event of a student, the first academic infringement will result in a warning and/or a "F" mark in the course. If a repeat offence is deemed serious enough, it may result in expulsion. Faculty should bring any academic infractions to the attention of the department chairperson. When the Director receives reports of scientific misconduct, he or she may create a committee to review the situation and make recommendations for appropriate action on a case-by-case basis.