

Autumn 2021-22 (1st Semester)

Semester I				
Serial no.	Course code	Course name	Credits	Instructor
1	CH 101	Chemistry for engineers: Fundamental concepts and applications	8	Prof.Nilkamal Mahanta Prof. Rajeswara Rao M
2		Calculus I	4	Prof. Amlan K Barua
3		Calculus II	4	Prof. Sagnik Sen
4	PH 101	Quantum Physics and applications	6	Prof. Santosh Kumar
5	CH 111	Chemistry Lab	3	Prof.Nilkamal Mahanta Prof. Rajeswara Rao M
6	ME 111	Engineering graphics lab	5	Prof.Somashekara, Prof. Amar Gaonkar, Prof.Surya Prakash
7	ME 113	Hands on Engg. lab	3	Prof. Rajshekhar K Prof. Gayatri Prof. Satish Naik MMAE Faculties
8	HS 101	Introductions to fine arts	1	Prof. Ridjima T
9	HS 102	Design Thinking and Creativity	1	Prof. Amarnath Prof. Abhipaul
10	NO 101	Sports	P/NP	
Total credits			35	

Syllabus

Name of Academic Unit: Chemistry

Level: UG

Programme: B.Tech.

i	Title of the course	CH 101 Chemistry for Engineers: Fundamental concepts and Applications
ii	Credit Structure (L-T-P-C)	(3-1-0-8)
iii	Type of Course	Core course
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	<p>Organic and Inorganic</p> <p>(Inorganic): a. Harness the power of periodic table Periodic properties: trends in size, electron affinity, ionization potential and electronegativity • Role of chemical elements in water contamination • Hardness of water • Desalination of brackish and sea water • Role of silicon in semiconducting applications • metal atom (Cu, Au, Pt, Pd etc.) based nanoparticles</p> <p>b. Coordination complexes Transition metal chemistry: inorganic complexes, bonding theories, magnetism, bonding aspects and structural distortion</p> <p>(Organic): a. M.O. theory and π-conjugated compounds Molecular orbitals of common functional groups, Qualitative Huckel MOs of conjugated polyenes and benzene. Aromaticity. Configuration, molecular chirality and isomerism, Conformation of alkanes and cycloalkanes</p> <p>b. Polymers Types and classification of polymers • polymerization techniques • Structure-property relationships of polymers • Conducting polymers</p> <p>Physical Chemistry:</p> <p>a. Quantum chemistry Schrodinger equation, Origin of quantization, Born interpretation of wave function, Hydrogen atom: solution to ϕ-part, Atomic orbitals, many electron atoms and spin orbitals. Chemical bonding: MO theory: LCAO molecular orbitals, Structure, bonding and energy levels of diatomic molecules. Concept of sp, sp^2 and sp^3 hybridization; Bonding and shape of many atom molecules; Intermolecular Forces; Potential energy Surfaces-Rates of reactions; Steady state approximation and its applications;</p>

		<p>Concept of pre-equilibrium; Equilibrium and related thermodynamic quantities</p> <p>b. Electrochemistry Electrochemical cells and Galvanic cells • EMF of a cell • Single electrode potential • Nernst equation • Electrochemical series • Types of electrodes • Reference electrodes • Batteries • Modern batteries • Fuel cells • corrosion</p>
viii	Texts/References	<ol style="list-style-type: none"> 1. J. D. Lee, "Concise Inorganic chemistry" 5th Edition. Wiley India. Ed. 2. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi, "Inorganic Chemistry: Principles of structure and reactivity" 4th Edition, Person. 3. P. Atkins, J. de Paula, "physical chemistry" 5th Edition, Oxford. 4. J. Clayden, N. Greeves, S. Warren, "Organic chemistry" 2th Edition, Oxford. 5. George Odian, Principles of polymerization, 4th edition, Wiley student edition, Wiley India Pvt Ltd. 6. F. W. Billmeyer, Text book of Polymer Science, 3rd edition, Wiley student edition, Wiley India Pvt Ltd. 7. A. K. De, Environmental Chemistry, 8th edition, New Age International publishers. 8. B. K. Sharma, Environmental Chemistry, 16th edition, Krishna Prakashan Media Pvt Ltd. 9. A. R. West, Solid State Chemistry and Its Applications, Wiley student edition, Wiley India Pvt Ltd. 10. T. Pradeep, Nano: The essentials, McGraw-Hill Education publishers. 11. Geoffrey A Ozin and André Arsenault, Nanochemistry: A Chemical Approach to Nanomaterials, 2nd edition, RSC publishing.
ix	Name(s) of Instructor(s)	BLT, MRR
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	NA
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	No
xii	Justification/ Need for introducing the course	This is an existing fundamental chemistry course in the institute which is now revamped by introducing pertaining engineering applications

Name of Academic Unit: Mathematics

Level: Tick mark (or underline) only **one** of the these: UG **Masters** **PhD**

1	Title of the course	Calculus I
2	Credit Structure (L-T-P-C)	L: 3 T: 1 P: 0 C: 4
3	Mention academic programme(s) for which this course will be a core course (Write “elective” if not core for any)	Core course
4	Semester in which normally it is offered Tick mark (or underline) appropriate option(s)	<input checked="" type="checkbox"/> Autumn (August-Nov) <input type="checkbox"/> Spring (Jan-Apr) <input type="checkbox"/> Summer (May-July)
5	Whether full or half semester course Tick mark (or underline) appropriate option	<input type="checkbox"/> Full Semester <input checked="" type="checkbox"/> <u>Half Semester</u>
6	Course content	Review of limits, continuity, differentiability. Mean value theorem, Taylor’s Theorem, Maxima and Minima. Riemann integrals, Fundamental theorem of Calculus, Improper integrals, applications to area, volume. Convergence of sequences and series, power series.
7	Texts/References	1. B. V. Limaye and S. Ghorpade, A Course in Calculus and Real Analysis, Springer International Publishing (2004) 2. James Stewart, Calculus (5th Edition), Thomson Brooks/Cole (2003) 3. T. M. Apostol, Calculus, Volume 1, Wiley Eastern (1980)
8	Name (s) of the instructor (s)	Amlan Barua/Sagnik Sen/Shreedevi K. Masuti/Dhriti Ranjan Dolai
9	Name (s) of other departments / Academic Units to whom the course is relevant	
10	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	NIL
11	Mandatory Pre-requisite(s) - specify course number(s)	Nil
12	Recommended Pre-requisite(s) - specify course number(s)	Nil
13	Mention 8 to 12 keywords/phrases about this course that would facilitate automated course	Sequences, Series, Limits, Continuity, Differentiability, Riemann Integration

	recommendation and course interdependency (These may or may not be from the syllabus content)	
14	Justification/ Need for introducing the course	This course focuses on the rigorous introduction to the subject of single variable calculus. It is a foundational mathematics course that introduces key concepts like sequence and series, definition of limits, continuity and differentiability. The course serves as a background for many subsequent courses offered in the under graduate curriculum.

Name of Academic Unit: Mathematics

Level: Tick mark (or underline) only **one** of the these: UG ~~Masters~~ ~~PhD~~

1	Title of the course	Calculus II
2	Credit Structure (L-T-P-C)	L: 3 T: 1 P: 0 C: 4
3	Mention academic programme(s) for which this course will be a core course (Write "elective" if not core for any)	Core course
4	Semester in which normally it is offered Tick mark (or underline) appropriate option(s)	<input type="checkbox"/> Autumn (August-Nov) <input type="checkbox"/> Spring (Jan-Apr) <input type="checkbox"/> Summer (May-July)
5	Whether full or half semester course Tick mark (or underline) appropriate option	<input type="checkbox"/> Full Semester <input type="checkbox"/> <u>Half Semester</u>
6	Course content	Partial Derivatives, gradient and directional derivatives, Chain rule, Maxima and Minima, Lagrange multipliers. Double and Triple integration, Jacobians and change of variables formula. Parametrization of Curves and Surfaces, Vector fields, Line and Surface integrals. Divergence and Curl, Theorems of Green, Gauss, and Stokes.
7	Texts/References	1. B.V. Limaye and S. Ghorpade, A Course in Multivariable Calculus and Real Analysis, Springer International Publishing (2010) 2. James Stewart, Calculus (5th Edition), Thomson Brooks/Cole (2003) 3. T. M. Apostol, Calculus, Volume 2, Wiley Eastern (1980) 4. Marsden and Tromba, Vector calculus (First Indian Edition), Springer (2012)
8	Name (s) of the instructor (s)	Amlan Barua/Sagnik Sen/Shreedevi K. Masuti/Dhriti Ranjan Dolai
9	Name (s) of other departments / Academic Units to whom the course is relevant	
10	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	NIL
11	Mandatory Pre-requisite(s) - specify course number(s)	Calculus I or Instructor's consent
12	Recommended Pre-requisite(s) - specify course number(s)	Nil
13	Mention 8 to 12 keywords/phrases	Partial derivatives, Total derivative, Lagrange multipliers, Multivariate integration and Gauss, Green

	<p>about this course that would facilitate automated course recommendation and course interdependency</p> <p>(These may or may not be from the syllabus content)</p>	<p>and Stokes theorem.</p>
14	<p>Justification/ Need for introducing the course</p>	<p>This is a first course on multi-variable calculus which introduces the concept of partial derivatives, total derivative, multivariate integration and Gauss, Green and Stokes theorem. The course is essential for different branches of under-graduate program since the multi-variable calculus finds it use in application domain (fluid mechanics, electro-magnetism etc.) as well theoretical studies (partial differential equations, theoretical physics etc.)</p>

Name of Academic Unit: Physics

Level: UG

Programme: B.Tech.

i	Title of the Course	PH 101: Quantum Physics and Applications
ii	Credit Structure (L-T-P-C)	(2-1-0-6)
iii	Type of Course	Core course
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	<ul style="list-style-type: none">• Quantum nature of light: Photoelectric Effect and Compton Effect.• Stability of atoms and Bohr`s rules.• Wave particle duality: De Broglie wavelength, Group and Phase velocity, Uncertainty Principle, Double Slit Experiment.• Schrödinger Equation.• Physical interpretation of Wave Function, Elementary Idea of Operators, Eigen-value Problem.• Solution of Schrödinger equation for simple boundary value problems.• Reflection and Transmission Coefficients. Tunneling.• Particle in a three dimensional box, Degenerate states.• Exposure to Harmonic Oscillator and Hydrogen Atom without deriving the general solution.• Quantum Statistics: Maxwell Boltzmann, Bose Einstein and Fermi Dirac Statistics by detailed balance arguments.• Density of states.• Applications of B-E statistics: Lasers. Bose-Einstein Condensation.• Applications of F-D statistics: Free electron model of electrons in metals. Concept of Fermi Energy.• Elementary Ideas of Band Theory of Solids.• Exposure to Semiconductors, Superconductors, Quantum Communication and Quantum Computing.
viii	Texts/References (separate sheet may be used, if necessary)	<ol style="list-style-type: none">1. Quantum Physics: R. Eisberg and R. Resnick, John Wiley 2002, 2nd Edition.2. Introduction to Modern Physics: F. K. Richtmyer, E. H. Kennard and J.N. Cooper, Tata Mac Graw Hill 1976, 6th Edition.3. Modern Physics: K. S. Krane, John Wiley 1998, 2nd Edition.4. Introduction to Modern Physics: Mani and Mehta, East-West Press Pvt. Ltd. New Delhi 2000.

		5. Elements of Modern Physics: S. H. Patil, Tata McGraw Hill, 1984. 6. Concepts of Modern Physics, A Beiser, Tata McGraw Hill, 2009.
ix	Name(s) of Instructor(s)	RP
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	NA
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	No
xii	Justification/ Need for introducing the course	<p>This course develops the concepts of Quantum Mechanics such that the behavior of the physical universe can be understood from a fundamental point of view. It provides a basis for further study of quantum mechanics.</p> <p>It is necessary for students to undertake this course, as the course sheds light on topics like, the basic principles behind the working of semiconductor devices, superconductors, etc. It is important to note that, such devices occupy the central stage in current technological advancements. The course also deals with the basic concepts behind the most advanced techniques like quantum communication and quantum computation.</p>

Name of Academic Unit: Mechanical Engineering

Level: UG

Programme: B.Tech.

i	Title of the course	ME 111 Engineering Graphics Lab
ii	Credit Structure (L-T-P-C)	(1-0-3-5)
iii	Type of Course	Core course
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	<p>Engineering Graphics with mini-drafter: Around half a semester and bit more with following topics to be covered.</p> <ul style="list-style-type: none">• Introduction to Engineering Graphics• Curves• Projections of Points• Projection of Lines• Projection of Planes• Projections on Auxiliary Planes• Projections of Solids• Sections of Solids• Intersections of Solids <p>Engineering Graphics with 2D Drafting Software: 5 weekly computer laboratory sessions covering above using AutoCAD® as a drafting software, 5th session on Isometric Projections.</p>
viii	Texts/References	<ol style="list-style-type: none">1. N. D. Bhatt, revised and enlarged by V. M. Panchal and P. R. Ingle, Engineering Drawing, 53rd Edition, 2014, Charotar Publishers, Anand.2. Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, Prentice-Hall of India.3. Gopalakrishna K. R., Engineering Drawing Vol. I & II Combined., Subhas Stores, 25th Edition, 2017.4. Narayana. K. L., and Kannaiah, P. E., Text Book on Engineering Drawing, 2nd Edition, 2013, Scitech Publications, Chennai.5. Venugopal K. and Prabhu Raja V., Engineering Drawing + AutoCAD, New Age International Publishers, 5th Edition, 2011.
ix	Name(s) of Instructor(s)	SS, TPG, DVP
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	NA

xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so,	No
xii	Justification/ Need for introducing the course	This is a fundamental course which is essential for appreciating the engineering drawings and compulsory

Name of Academic Unit: Chemistry

Level: B.Tech.

Programme: B.Tech.

i	Title of the course	CH 111 Chemistry Lab
ii	Credit Structure (L-T-P-C)	(0-0-3-3)
iii	Type of Course	Core course
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	Experiments illustrating the concepts of 1) Electrochemical Cell, (2) Chemical kinetics, (3) Estimation of Iron, (4) Oscillatory Chemical Reactions, (5a) Electrolytic Conductance (5b) Crystalline Solids (6) Colorimetric Analysis (7) Complexometric Titration (8) Thin Layer Chromatography
viii	Texts/References	<ol style="list-style-type: none">1. Physical Chemistry, P.W. Atkins, 5th Edition (ELBS/OUP) 1994.2. Vogel's Textbook of Quantitative Analysis revised by G. H. Jeffery, J. Basset J. Mendham and R. C. Denny, 5th Edition.3. Organic Chemistry, Morrison and Boyd, 6th Edition.4. "Patterns in Time and Space - Generated by Chemistry", I. R. Epstein, C and E News, March 1987.5. "An Oscillating Iodine Clock", T. S. Brigg and W.C. Rauscher, Journal of chemical education., Vol no. 50, Issue no 7, Page no 496, year 1973.6. "Oscillating Chemical Reactions", I.R. Epstein, K. Kustin, P. DeKepper and M. Orban, Scientific American, Vol no.248, Page no.112, year 1983.7. "Physical Chemistry", G.K.Vemulapalli (1997).8. Calimente, S.; Strand, S. M.; Chang, S-C.; Lewis, D. E. J. Chem. Ed. 1999, 76, 82-83.9. Wagner, A.J.; Miller, S.M.; Nguyen, S.; Lee, G. Y.; Rychnovsky, S.; Link, R.D. J. Chem. Ed. 2014, 91, 716-721.
ix	Name(s) of Instructor(s)	BLT, MRR
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	NA
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	No

Name of Academic Unit: Mechanical Engineering

Level: B.Tech.

Programme: B.Tech.

i	Title of the course	ME 113 Hands on Engineering Lab
ii	Credit Structure (L-T-P-C)	(0-0-3-3)
iii	Type of Course	Core course
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	<p>List of Experiments (Mechanical Workshop)</p> <ul style="list-style-type: none">• To make a Square-fit from the given mild steel pieces (Fitting)• To make a V-fit from the given mild steel pieces (Fitting)• To make a rectangular tray as per required dimensions (Sheet Metal)• To build a transition piece (Sheet Metal)• To make a Butt joint using the given two M.S pieces (Arc welding)• To make a lap joint using the given two M.S pieces (Arc welding)• To build a pipe-line using fittings for given flow circuit (Plumbing) <p>List of Experiments (Electrical Workshop)</p> <ul style="list-style-type: none">• To control one lamp by a one switch with provision for plug socket with switch control (Electrical wiring)• To do stair case wiring (i.e. control of one lamp by two switches fixed at two different places) (Electrical wiring)• Measurement of hot and cold resistance of filament• Improvement of Power Factor• Calibration of Energy meter• Measurement of Power using three ammeter/voltmeter method <p>List of Experiments (Electronics)</p> <ul style="list-style-type: none">• Understanding breadboard, One-way traffic• Introduction to Arduino and Buzzer• Using Arduino speed measurement of motor/ glowing of LED• Control of water level using Arduino• Line follower using Arduino

vii i	Texts/References	1. Elements of Workshop Technology Vol. 1 (2015), S. K. Hajra Choudhary, A. K. Hajra Choudhary and Nirjhar Roy, Media Promoters and Publishers Pvt. Ltd. 2. W. A. J. Chapman, Workshop Technology, Vol. 1 (2006), Vol 2 (2007), and (1995), CBS Publishers.
ix	Name(s) of Instructor(s)	
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	NA
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	No
xii	Justification/ Need for introducing the course	This is a fundamental course which is essential for appreciating the hands-on aspects for a general engineering and compulsory for all B.Tech. majors.

Name of Academic Unit: HSS

Level: B. Tech.

Programme: B.Tech.

i	Title of the course	HS 101 Introduction to Fine Arts: Urban Dance in India: A Brief & Partial Introduction in Theory & Practice
ii	Credit Structure (L-T-P-C)	
iii	Type of Course	One Credit
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	Body and Movement, Classical Dance in India, Contemporaneity: Modern & Postmodern Forms & Modes of Sustenance for a Dancer, Experimenting, Making Your Own Dance Work (Dance-pieces)
viii	Texts/References	--
ix	Name(s) of Instructor(s)	--
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	Nil
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	No
xii	Justification/ Need for introducing the course	--

Name of Academic Unit: HSS

Level: B.Tech.

Programme: B.Tech.

i	Title of the course	HS 101 Introduction to Fine Arts: Introduction to Basic Drawing and Painting
ii	Credit Structure (L-T-P-C)	
iii	Type of Course	One Credit Course
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	A brief history of drawing/painting. An introduction to the basic drawing, using graphite and charcoal.
viii	Texts/References	--
ix	Name(s) of Instructor(s)	--
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	Nil
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	No
xii	Justification/ Need for introducing the course	--

Name of Academic Unit: HSS

Level: B.Tech.

Programme: B.Tech.

i	Title of the course	HS 101 Introduction to Fine Arts: Introduction to Photography
ii	Credit Structure (L-T-P-C)	
iii	Type of Course	One Credit Course
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	--
vii	Course Content	Overview of the history of Photography, exposure to basic photography, use of digital/slr camera, dslr cameras, Lighting, Black and white photography, Professional photography, building a portfolio.
viii	Texts/References	--
ix	Name(s) of Instructor(s)	--
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	NA
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	No
xii	Justification/ Need for introducing the course	--

Name of Academic Unit: HSS

Level: B.Tech.

Programme: B.Tech.

i	Title of the course	HS 102 Design Thinking and Creativity
ii	Credit Structure (L-T-P-C)	1-0-0-1
iii	Type of Course	Core course / Institute level
iv	Semester in which normally to be offered	Autumn
v	Whether Full or Half Semester Course	Full Semester
vi	Pre-requisite(s), if any (For the students) – specify course number(s)	Nil
vii	Course Content	<p>1.Problem Exploration- Students move around and find problems that need solutions.</p> <p>2.They analyse the problem (not solution) and evolve a problem space. The problem space is converted into a story board and presented in a poster session.</p> <p>3.Feedback at the poster session is used to refine the problem definition(s).</p> <p>4.Solution Exploration: Creative solutions (solution space) are now explored and presented using story boards.</p> <p>5.The solutions are converted into “embodiments”</p>
viii	Texts/References	<p>1.“Stuff Matters” Prof. Mark Miodownik, Penguin</p> <p>2. “Design and Technology” by James Garratt, Cambridge University Press.</p> <p>3. How it works in the home: Walt Disney :9780894340482- Amazon.com.</p> <p>4.How it works in the City (Walt Disney available on Amazon.com)</p> <p>5.Change by design – Tim Brown</p> <p>There are some additional books in this “How it Works” series.</p>
ix	Name(s) of Instructor(s)	Abhi Paul and C. Amarnath
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	Common to all the departments
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	None
xii	Justification/ Need for introducing the course	This is a basic course essential for all branches of engineering to train students in identifying and comprehending problems- followed by ideation for seeking “technology” solutions.