

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai
Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002



B.Tech. Information Technology

Full Time Curriculum and Syllabus

First Year – Second Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MA201	Engineering Mathematics - II	3	2	0	4	40	60	100
1701PH201	Physics of Engineering Materials	3	0	0	3	40	60	100
1701CH201	Environmental Studies	3	0	0	3	40	60	100
1701GE201	Basic Civil and Mechanical Engineering	3	0	0	3	40	60	100
1702CS201	Programming in C++	3	0	0	3	40	60	100
	Language Elective	3	0	0	3	100	-	100
Laboratory Course								
1701GEX53	Workshop Practice	0	0	2	1	50	50	100
1701HS251	Physics and Chemistry Lab II	0	0	2	1	50	50	100
1702CS251	Programming In C++ Lab	0	0	2	1	50	50	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701MA201

ENGINEERING MATHEMATICS II

(Common to all B.E / B.Tech Degree Programmes)

L	T	P	C
3	2	0	4

COURSE OBJECTIVES:

1. To develop an understanding of the standard techniques of Complex variable theory to apply in areas such as heat conduction, elasticity, fluid Dynamics and flow of electric current
2. To train the students with the concepts of Vector calculus needed for problems in all Engineering Disciplines
3. To make the Students apply Laplace Transform to create a new domain in which it is easier to handle the problem that is being investigated

UNIT I ANALYTIC FUNCTIONS

9 Hours

Analytic functions – Cauchy Riemann Equations – Properties – Determination of Analytic function using Milne Thomson’s method, Conformal Mappings – Mappings of $w= z + a$, az , $1/z$ – Bilinear Transformation – Application of Analytic Functions.

UNIT II COMPLEX INTEGRATION

9 Hours

Cauchy’s fundamental theorem (statement only) – Application of Cauchy’s Integral formula – Laurent’s series – Classification of singularities – Cauchy’s Residue theorem (statement only) – Contour integration.

UNIT III MULTIPLE INTEGRAL

9 Hours

Double integration – Cartesian and polar coordinates – Change the order of Integration – Applications: Area of a curved surface using double integral – Triple integration in Cartesian co-ordinates – Volume as triple integral.

UNIT IV VECTOR CALCULUS

9 Hours

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration: Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Applications of the above theorems to find surface area of a closed region and volume of cube and parallel piped.

UNIT V LAPLACE TRANSFORM

9 Hours

Laplace Transform – Conditions for existence – Transform of Elementary Functions – Basic Properties – Transform of Unit step function and Impulse function – Transform of Periodic function – Inverse Laplace Transform – Convolution Theorem (excluding Proof) – Initial and Final value Theorems – Solution of Linear ODE of Second order with constant coefficient using Laplace Transform techniques.

TOTAL: 45 + 15 HOURS

FURTHER READING:

1. Volume of Cylindrical and spherical polar co ordinates.
2. Application of Integral theorems in finding Volume/Area of Hemispheres, cylinders etc.

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

- CO1: Construct Analytic functions and trace the image of a region using transformation.
- CO2: Solve complex integrals.
- CO3: Apply multiple integral technique to find area and volume.
- CO4: Compute surface and volume integral in vector field.
- CO5: Apply Laplace Transform in solving Boundary value problems of second order ODE.

REFERENCES:

1. Veerarajan R., “Engineering Mathematics”, updated second edition for Semester I and II, 2017.
2. Grewal. B.S, “Higher Engineering Mathematics”, 44th Edition, Khanna Publications, Delhi, 2014.
3. Bali N. P and Manish Goyal, “Text book of Engineering Mathematics”, Sixth edition, Laxmi Publications Pvt. Ltd., 2014.
4. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, 2012.
5. P.Kandasamy, K. Gunavathy and K. Thilagavathy, Engineering Mathematics, Volume II, S. Chand & Co., New Delhi, 2009.
6. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing, New Delhi, 2007.
7. Veerarajan R., “Engineering Mathematics”, fifth Edition, Tata Mc Graw Hill Publishing Company, New Delhi, 2006.
8. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co. 2003.
9. nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
10. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.htm

1701PH201

PHYSICS OF ENGINEERING MATERIALS
(Common to B.E. CSE & B.Tech. IT Programmes)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To understand the physical properties of conductors, semiconductors and superconductors.
2. To recognize the basic principle of interaction of light with matter and working of optical devices.
3. To classify the types of dielectric, magnetic materials and polarization mechanisms with their properties.

UNIT I CONDUCTING AND SUPERCONDUCTING MATERIALS 9 Hours

Electrical and thermal conductivity of metals – Wiedemann Franz law – band theory of metals – density of states. Superconductors: properties – types – High T_c superconductors – applications.

UNIT II SEMICONDUCTORS 9 Hours

Elemental and compound semiconductors – intrinsic semiconductors: carrier concentration – electrical conductivity – band gap. Extrinsic semiconductors: carrier concentration – variation of Fermi level. Hall effect: theory and experimental determination – applications: Solar cells.

UNIT III DIELECTRIC MATERIALS 9 Hours

Types of polarization: electronic, ionic, orientation and space charge polarization mechanisms – Langevin – Debye equation – frequency and temperature effects on polarization – dielectric strength and loss – dielectric breakdown mechanisms – active dielectric materials: piezo, pyro and ferroelectricity – applications.

UNIT IV OPTICAL MATERIALS 9 Hours

Interaction of light with materials – optical absorption – transmission – Luminescence in solids – Fluorescence and Phosphorescence – Optical band gap – LED, LCD.

UNIT V MAGNETIC MATERIALS 9 Hours

Classification and properties – domain theory – hard and soft magnetic materials – anti-ferro and ferri magnetic materials – applications: magnetic recording and memories.

TOTAL: 45 HOURS

FURTHER READING:

1. Photonic crystals - LIFI

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

- CO1: Exemplify the physical properties of conductors, superconductors and semiconductors with applications.
- CO2: Identify the suitable semiconducting material for solar cell applications.
- CO3: Select the suitable materials for insulating and dielectric applications.
- CO4: Compare the optical properties of display devices.
- CO5: Analyze the properties of magnetic materials for practical applications.

REFERENCES:

1. Saxena, Gupta, Mandal, Solid State Physics, Pragati Prakashan Educational Publishers, 13th revised edition, Meerut, India, 2013.
2. M.N. Avadhanulu and P.G.Kshirsagar, A Text Book of Engineering Physics, S.Chand & Company Ltd, New Delhi, 2011.
3. S.O.Pillai, Solid State Physics, New Age International Publications, New Delhi, 2010.
4. M.A. Wahab, N.K. Mehta, Solid State physics – structure and properties of materials, Narosa publishing house Pvt. Ltd, 6th edition, 2010.
5. Semiconductor Physics and Devices, Donald A. Neamen, Mc Graw-Hill, 2011.
6. P.K. Palanisamy, Materials Science, Scitech Publications India Pvt.Ltd, 2014.

1701CH201

ENVIRONMENTAL STUDIES
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. Realize the interdisciplinary and holistic nature of the environment.
2. Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development.
3. Recognize the socio-economic, political and ethical issues in environmental science.

UNIT I ECOSYSTEMS AND BIODIVERSITY

10 Hours

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot – spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place.

UNIT II NATURAL RESOURCES

10 Hours

Forest resources: Use and over – exploitation, deforestation, case studies – timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village.

UNIT III ENVIRONMENTAL POLLUTION

9 Hours

Definition – Source, causes, effects and control measures of: (a) Air pollution – Mitigation procedures – Control of particulate and gaseous emission, Control of SO_x, NO_x, CO and HC) – Technology for capturing CO₂ (metallo- organic frame works) (b) Water pollution – Waste water treatment processes. (c) Soil pollution – soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – role of an individual in prevention of pollution – pollution case studies. Documentation study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

8 Hours

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – environmental ethics: Issues and possible solutions – 12 Principles of green chemistry – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments – scheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards – disaster management: floods, earthquake – Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India).

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

8 Hours

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – Environmental impact analysis (EIA) – GIS – remote sensing – role of information technology in environment and human health – Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical report).

TOTAL: 45 HOURS

FURTHER READING:

Human rights: E – waste and biomedical waste – Identification of adulterants in food materials

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

- CO1: Describe the importance of ecosystem and its conservation.
- CO2: Differentiate various natural resources and the urgent need to conserve the natural resources.
- CO3: Explain the different types of pollution and its effects.
- CO4: Describe the various environmental protection acts.
- CO5: Explain the major diseases, women, child development and the impacts of population explosion.

REFERENCES:

1. Trivedi. R.K., “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media, 3rd edition, BPB publications, 2010.
2. Cunningham, W.P.Cooper, T.H. Gorhani, “Environmental Encyclopedia”, Jaico Publishing House, Mumbai, 2001.
3. Dharmendra S. Sengar, “Environmental law”, Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan. R, “Environmental Studies-From Crisis to Cure”, Oxford University Press, 2005.
5. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2006.
6. https://en.wikipedia.org/wiki/Carbon_capture_and_storage
7. Ravikrishnan. A., “Environmental Science and Engineering”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd.

1701GE201	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to B.E. / B.Tech. – CSE, ECE & IT)	L 3	T 0	P 0	C 3
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COURSE OBJECTIVES:

1. To impart basic knowledge on Civil and Mechanical Engineering.
2. To explain the materials used for the construction of civilized structures.
3. To understand the fundamentals of construction of structure.
4. To explain the component of power plant units and detailed explanation to IC engines their working principles.
5. To explain the R & AC system.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9 Hours

Surveying: Objects – types – classification – principles.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections

UNIT II BUILDING COMPONENTS AND STRUCTURES 9 Hours

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring –plastering – Mechanics – Internal and external forces – stress – strain – elasticity.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING AND PUMPS 9 Hours

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV IC ENGINES 9 Hours

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 9 Hours

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 45 HOURS

FURTHER READING:

1. Mechanics of solids.
2. Structural Design.
3. Thermal Engineering, Fluid mechanics, Heat and mass transfer.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

- CO1: Explain the survey and usage of construction material and proper selection of construction materials.
- CO2: Know about the building structures.
- CO3: Identify the components of power plant.
- CO4: Demonstrate working principles of petrol and diesel engine.
- CO5: Explain the components of refrigeration and air conditioning.

REFERENCES:

1. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd., New Delhi, 1999.
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
3. Venugopal K. and Prahua Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2000.
4. Shantha Kumar S R J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.
5. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.

1702CS201	PROGRAMMING IN C++	L	T	P	C
	(Common to B.E. CSE & B.Tech. IT Programmes)	3	0	0	3

COURSE OBJECTIVES:

1. To understand the concepts of Object Oriented Programming.
2. To execute the Object oriented concepts to solve problems using C++
3. To develop programs using files and templates.

UNIT I BASIC CONCEPTS **8 Hours**

Object Oriented Paradigm – Elements of Object Oriented Programming – Merits and Demerits of Object oriented Methodology – C++ fundamentals – Data types, Operators and Expressions, Control flow, Arrays – Implementing ADT in the base language.

UNIT II CLASS AND OBJECTS **10 Hours**

Classes and Objects – Passing objects as arguments – returning objects – Friend functions – Static data and member functions – Constructors – Parameterized Constructor – Destructor – Copy constructor – Array of objects – pointer to object members.

UNIT III POLYMORPHISM AND INHERITANCE **9 Hours**

Polymorphism – Function overloading – Unary operator overloading – Binary operator overloading – Data conversion – Overloading with Friend Functions. Inheritance – Derived Class – Abstract Classes – Types of Inheritance – Iterators and Containers.

UNIT IV VIRTUAL FUNCTIONS AND TEMPLATES **10 Hours**

Virtual functions – Pure virtual functions – Virtual Destructors – RTTI – Typeid – Dynamic casting – Cross casting – Down casting – Template – Class template, Function Template, Generic programming, Standard Template Library.

UNIT V FILES AND EXCEPTION HANDLING **8 Hours**

C++ streams – console streams – console stream classes – formatted and unformatted console I/O operations – Manipulators File streams classes – File modes – File pointers and Manipulations – File I/O – Exception Handling – Try-Catch-Throw Paradigm – Exception specifications – Terminate and unexpected functions – Uncaught Exception.

TOTAL: 45 HOURS

FURTHER READING:

Object Oriented Approach in Java Programming

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

- CO1: Explore the concept of classes and objects.
- CO2: Develop programs using arrays and strings.
- CO3: Implement the various types of inheritance.
- CO4: Exemplify the concepts of functions and streams.
- CO5: Develop programs using files, templates and exception handling.

REFERENCES:

1. K.R.Venugopal, Rajkumar Buyya, and T.Ravishankar, “Mastering C++”, McGraw Hill Education, 2nd Edition, 2017.
2. Bjarne Stroustrup, “The C++ programming language”, Addison Wesley, fourth edition, 2013
3. E.Balagurusamy, “Object Oriented Programming with C++”, McGraw Hill Education, 5th Edition, 2017.
4. Robert Lafore, “Object Oriented Programming in C++”, Galgotia Publications Pvt. Ltd., Third Edition, 1999.
5. Ira Pohl, “Object oriented programming using C++”, 2nd Edition, Pearson Education, Reprint 2004.
6. <http://nptel.ac.in/>

1701HS251

PHYSICS AND CHEMISTRY LABORATORY-II
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills.
3. To bring confidence and ability to develop and fabricate engineering and technical equipments.
4. To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

PHYSICS

LIST OF EXPERIMENTS:

1. Using lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.
2. Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.
3. With the aid of spectrometer, find the angle of Prism and refractive index of the medium.
4. Determine the wavelengths of polychromatic source in the visible region using spectrometer grating.
5. Find the depression at the midpoint of the given wooden beam subjected to non-uniform bending and determines the Young's modulus of the material of the beam.
6. Find the given unknown resistance using Carey-Foster's Bridge.

CHEMISTRY

LIST OF EXPERIMENTS:

1. Conductometric Precipitation titration of BaCl_2 Vs Na_2SO_4
2. Estimation of dissolved oxygen in a water sample/sewage by Winklers method.
3. Estimation of chloride content in water by argentometric method.
4. Conductometric titration of mixture of acids.
5. Comparison of alkalinities of the given water samples.

Additional Experiments:

1. Estimation of heavy metals in the given solution by EDTA method.
2. Determination of concentration of unknown colored solution using spectrophotometer.

TOTAL: 30 HOURS

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

- CO1 : Realize the concept of properties of matter and apply the same for practical applications.
- CO2 : Identify the suitable laser source for fiber optic communication applications.
- CO3 : Determine the velocity of ultrasonic waves and apply the same for day today applications.
- CO4 : Classify the different types of crystal structures and analyze their properties.
- CO5 : Comprehend the efficacy of quantum equations in modern areas.
- CO6 : Illustrate the EMF of the Redox reaction.
- CO7 : Compare the Alkalinity of given water Sample with their standards.
- CO8 : Identify the Concentration of metal ion present in water sample.
- CO9 : Outline the precipitation titration using Conductivity meter.
- CO10: Interpret the dissolved oxygen present in the water.

REFERENCES:

1. D.S.Mathur, Elements of Properties of matter, 5th edition, S.Chand & Company Ltd., New Delhi,2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, Concepts of Modern Physics, 6th edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd, 2013.
7. Laboratory Manual on Engineering Chemistry, S.K. Bhasin, S. Rani, Dhanpat Rai Publishing Company, New Delhi, 2011.
8. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New Yor (2001).
9. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of practical organic chemistry", LBS Singapore (1994).
10. Jeffery G.H., Bassett J., Mendham J.and Denny vogel's R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
11. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.

1702CS251

PROGRAMMING IN C++ LAB
(Common to B.E. CSE & B.Tech. IT Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To understand the concepts of Object Oriented Programming.
2. To execute the Object oriented concepts to solve problems using C++
3. To develop programs using files and templates.

LIST OF EXPERIMENTS:

1. Write a C++ program to implement operator overloading with class and objects.
2. Write a C++ program to implement types of Inheritance.
3. Write a C++ program to implement two different classes for adding a private data member using friend function.
4. Write a C++ program to implement operator and function overloading.
5. Write a C++ program to implement file handling operations.
6. Write a C++ program to implement Class templates and Function templates.
7. Write a C++ program to implement exception handling.

Additional Experiments:

1. Write a C ++ program to perform complex number subtraction by overloading an operator using friend function.
2. Write a C ++ program to perform quick sort using function template.

TOTAL: 30 HOURS

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

- CO1 : Implement the concept of classes and objects.
- CO2 : Develop programs using arrays and strings.
- CO3 : Implement the various types of inheritance.
- CO4 : Exemplify the concepts of functions and streams.

REFERENCES:

1. K.R.Venugopal, Rajkumar Buyya, and T.Ravishankar, "Mastering C++", McGraw Hill Education, 2nd Edition, 2017.
2. Bjarne Stroustrup, "The C++ programming language", Addison Wesley, fourth edition, 2013
3. E.Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Education, 5th Edition, 2017.
4. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publications Pvt. Ltd., Third Edition, 1999.
5. Ira Pohl, "Object oriented programming using C++", 2nd Edition, Pearson Education, Reprint 2004.
6. <http://nptel.ac.in/>