AC/II (20-21).2.RUS16

S.P. Mandali's

Ramnarain Ruia Autonomous College

(Affiliated to University of Mumbai)

RUIA COLLEGE
Explore • Experience • Excel

Syllabus for A.C. (E.I.)

Program: BSc

Program Code: Physics (RUSACEI)

(Credit Based Semester and Grading System with effect from the academic year 2020-21)

PROGRAM OUTCOMES

PO	PO Description **A student completing Bachelor's Degree in Physics program will be able to:**
PO 1	Recall and explain acquired scientific knowledge in a comprehensive manner and apply the skills acquired in their chosen discipline. Interpret scientific ideas and relate its interconnectedness to various fields in science.
PO 2	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organise data and draw inferences
PO 3	Explore and evaluate digital information and use it for knowledge upgradation. Apply relevant information so gathered for analysis and communication using appropriate digital tools.
PO 4	Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyse results.
PO 5	Take complex challenges, work responsibly and independently, as well as in cohesion with a team for completion of a task. Communicate effectively, convincingly and in an articulate manner.
PO 6	Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.
PO 7	Follow ethical practices at work place and be unbiased and critical in interpretation of scientific data. Understand the environmental issues and explore sustainable solutions for it.
PO 8	Keep abreast with current scientific developments in the specific discipline and adapt to technological advancements for better application of scientific knowledge as a lifelong learner

PROGRAM SPECIFIC OUTCOMES

PSO	Description **A student completing Bachelor's Degree in BSc program in the subject of Physics with AC-electronic Instrumentation will be able to:**
PSO 1	To demonstrate procedural knowledge related to different areas of study in Physics including electronic Instrumentation, C++ programming, and Nano-materials at a level attuned with graduate programs in physics at peer institutions
PSO 2	To demonstrate comprehensive, quantitative and conceptual understanding of the core areas of physics and AC-electronic Instrumentation.
PSO 3	To apply the principles and acquired skill-set related to physics and AC-electronic Instrumentation, to handle innovative and unfamiliar problems, so that effective solution or strategy to deal with, could be developed.
PSO 4	The ability to explore and deduce quantitative results in the extents of AC-electronic Instrumentation.
PSO 5	The ability to use contemporary experimental apparatus and analysis tools to acquire, analyse and interpret scientific data in the extents of AC-electronic Instrumentation.
PSO 6	The ability to communicate scientific results effectively in presentations or posters in the extents of physics and AC-electronic Instrumentation.
PSO 7	Utilize acquired ICT skills, electronic-instrumentation related practical skills, mathematical skills to prepare for employment , for advancement of a career path and also for lifelong learning in electronic instrumentation.

PROGRAM OUTLINE

YEAR	SEM	COURSE CODE	TITLE	Credits
2020-21	**V**	**RUSACEI 501**	**ANOLOG CIRCUITS and NANOMATERIAL-I**	
			Unit I :Measuring Instruments	02
			Unit II :Signal conditioning and Power Supplies	
			Unit III :Analysis Techniques-I	
			Unit IV :Nano-materials-I	
		Practicals based on above course RUSACEI 5P1		02
		Total		04

YEAR	SEM	COURSE CODE	TITLE	Credits
2020-21	**VI**	**RUSACEI 601**	**C++ PROGRAMING AND NANOMATERIAL-II**	
			Unit I : Basic Concepts of Object Oriented Programming in C++-I	02
			Unit II : Programming in C++-II	
			Unit III :Analysis Techniques-II	
			Unit IV :Nano-materials-II	
		Practicals based on above course RUSACEI 6P1		02
		Total		04

Semester-V

Course Code: RUSACEI501

Course Title: Analog Circuits and Nano materials - I

Academic year 2020-21

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION
CO 1	Distinguish different actual circuits used in CRO
CO 2	Compare the Transistor Voltmeter and Op Amp used Solid State Voltmeter. Differentiate two methods of D TO A Converters.
CO 3	Distinguish the need of Operational Amplifier in active filter. Compare the functions of Active filters. Demonstrate the bode plots of all cases. Compare the performances of different power supply.
CO 4	Differentiate between the different spectroscopy techniques
CO 5	Demonstrating the analysis of the raw data
CO 6	Compare and study of different properties of Nano materials.
CO7	Demonstrate quantitative problem solving skills in all the topics covered

DETAILED SYLLABUS

Course Code		Title	Credits
RUSAC EI 501	**Unit**	**Analog Circuits and Nano materials - I**	
	I	**Measuring Instruments:** (i) Cathode Ray Oscilloscope: Introduction, CRO block diagram, CRT connection, Vertical amplifier, Basic function of sweep generator, Horizontal deflection system, Triggered sweep, Trigger Pulse, Delay line. Probes: - 1:1 probe, 10:1 probe, Attenuators (Uncompensated and Compensated), Dual trace CRO Ref. **K: 7.1, 7.4, 7.12, 7.6, 7.3.1, 7.7, 7.8, 7.9, 7.10, 7.28.1, 7.28.2, 7.29, 7.29.1, 7.29.2 & 7.15** (ii) Analog Electronic Multimeter:	**15 lectures**

		Transistor voltmeter, Solid state (Op Amp based) voltmeter Ref. **K: 4.7 & 4.9** (iii) Digital Instruments: D/A Conversion, Variable (weighted) resistor and Binary Ladder (4bit) type D/A Converters. Ref. **M&L: 12.1 & 12.2** **DMM**, 3 ½ Digit, resolution and sensitivity, general specification Ref. **K: 6.2, 5.8, 5.9 & 5.10.**	
Unit II	**II**	**a) Instrumentation Amplifier & its applications:** Basic Instrumentation Amplifier, Instrumentation system, Applications of Instrumentation Amplifier, Temperature indicator, light intensity meter, analog weight scale. Ref. **K: 14.3, 14.3.2, 14.4, 14.4.1, 14.4.2, 14.4.3** **b) Active filters:** Introduction, Active Filters, 2nd order Low Pass Butterworth filter, 2nd order High Pass Butterworth filter, Band pass Filters, wide band pass filter, wide band rejection filter and narrow band rejection filter. Ref. **G: 7.1, 7.2, 7.4, 7.6, 7.7, 7.8, 7.8.1, 7.9.1 & 7.9.2** **c) Power Supplies** i) Principle, block diagram, working, important specifications and operating procedures for- Fixed voltage power supply, variable power supply, dual power supply, CV and CC supply, SMPS, DC to DC converter, UPS. Ref. B. S. Sonde, Power Supplies, TMH ii) Linear and switching regulators Fixed output voltage regulator with current booster. Ref. **C & D: 16.11, 16.12, 16.1 M: 24.5** iii) Constant current source (ground load) using OP-Amp and pnp transistor-Ref **C & D: 5.5.2** iv) Basic and Monolithic Switching regulators (buck, boost and buck – boost) (Only basic Configurations) Ref **M: 24.7**	**15 lectures**
Unit III	**III**	**Analysis Techniques-I** 1. Optical spectroscopy: Optical absorption spectroscopy, photoluminescence, FTIR, Raman spectroscopy 2. Electron spectroscopy: XPS, Ultraviolet photo spectroscopy 3. Rutherford back scattering spectroscopy(RBS) 4. Secondary ion mass spectroscopy(SIMS)	**15 lectures**

Unit IV	**IV**	**i) Properties of Nanomaterial** Introduction, Mechanical properties, Structural properties, Melting of nanoparticles, Electric conductivity, Optical Properties, Magnetic Properties. Ref. SK: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6 & 7.7 **ii) Nanolithography** Introduction, Lithography using photon, Lithography using particle beams, Scanning probe lithography, Soft lithography. Ref. SK: 8.1, 8.2, 8.3, 8.4 & 8.5.	**15 lectures**

References:

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta. Technical Teachers training Institute, Tata McGraw Hill Publishing Company Limited.(BKG)

2. Modern Electronic Instrumentation &Measurement Techniques by Albert D. Helfrick & William D. Cooper (PHI) Edition. (H & C)

3. Electronic Instrumentation by H. S. Kalsi, 2nd Edition, Tata McGraw Hill.(K)

4. Digital electronics by G. L. Tokheim (6th Editon) (Tata Mc Graw Hill)(T)

5. “OPAMPs and linear integrated circuits” by Coughlin & F. F. Driscoll (6th Edition), Eastern Economy Education, PHI(C & D)

6. OPAMPs & linear integrated circuits by R. A. Gayakwad,(4th Edition, PHI)(G)

7. “Electronic Principles” by A. P. Malvino (6th edition, PHI).(M)

8. Digital Principle & Applications” by Malvino& Leach (6th edition, TMH) (M & L)

Additional Reference:

1. The Art of Electronics, by Paul Horowitz & Winfield Hill (2nd Edition) (H & H)

References (Nano materials)

1. Nanotechnology, Principles & Practices by Sulabha Kulkarni**(SK)**
2. Introduction to Nanotechnology by C.P.Poole,Jr. and F.J.Owens
3. Instrumental Methods of Analysis by H.H.Willard,I.I. Merit & J.A.Dean
4. X-ray structure Determination by G.H.Stout and I.H.Jensen
5. Fundamentals Of Molecular Spectroscopy by C .Banwell and McCash
6. Nanomaterial by A.K. Bandyopadhyay

PRACTICAL SEM V

RUSACEI5P1 –Analog Circuit & Instruments & Analysis techniques – I

The certified journal must contain a minimum of 8 regular experiments (6 from Group A experiments and 2 experiments from Group B, 1 each from sub-group B1 and B2)

A separate index and certificate in journal is must for each semester course.

- Internal component of Practical examination Evaluation is based on regular experiments.
- For external practical examination, the learner will be examined in one experiment.

A learner will be allowed to appear for the semester end practical examination only if he/she submits a certified journal of Physics.

Group A

1. Basic Instrumentation Amplifier using 3 Op-Amps couple to Resistance Bridge **(C&D Ch. 8)**
2. Second Order active Low Pass/High Pass filter (frequency response & phase relation) **(K.Ch15)**
3. Active Notch Filter (frequency response & phase relation) **(K.Ch.15)**
4. Diode ROM array
5. Adjustable constant Current Source using LM 317 **(C&D Ch. 14)**
6. Constant Current source using OPAMP and PNP transistor (o/p current less than 50 mA) **(C&D Ch. 5)**

GROUP B

B1: 1**.** Synthesis of Graphene & Graphene oxide
2. Synthesis of porous silicon
3. Synthesis of nanomaterial using electrochemical techniques

B2: 1**.** Characterization study of nanomaterial & study of sensors of semiconductor materials(powder)
2. Characterization study of nanomaterial (powder) using XRD techniques.
3. Characterization study of nanomaterial (powder) using UV techniques.
4. Characterization study of nanomaterial (powder) using FTIR techniques.
5. Characterization study of nanomaterial (powder) using RAMAN techniques.

References: Group A & B

1. H&C: Modern Electronic Instrumentation & Measurement Techniques by Albert D. Helfrick & William D. Cooper PHI) Edition
2. C&D: "OPAMPs and linear integrated circuits" by Coughlin & F. F. Driscoll(6th ed. PHI)
3. G: OPAMPs and linear integrated circuits by R.A. Gayakwad (4th edition, PHI)
4. M: "Electronic Principles" by A. P. Malvino (6th edition, PHI)
5. K: Electronic Instrumentation by H. S. Kalsi (TMH) 2nd Edition
6. M&L: Digital Principle and Applications" by Malvino and Leach (5th edition, TMH)
7. RPJ: Modern Digital Electronics 3rd edition (TMH) – R .P. Jain
8. Nanotechnology, Principles & Practices by Sulabha Kulkarni

---

MODALITY OF ASSESSMENT

Semester---- V

Theory Examination Pattern

A) Internal Assessment (40%) = 40 marks.

Theory Paper-Paper code	Test Marks	Assignment	Marks distribution	Total Marks per paper
Applied Component Electronics - Instrumentation RUSACEI501	20	15 Questions on units 1, 2, 3 ,4.	Assessment- 15 mark Viva on it --05 mark --- Total= 20 mark	40

B) Internal test pattern (half an hour test) = 20 marks

Questions	Options	Marks
Q.1	20 objective questions, all compulsory, each question with 4 options; (half mark each)	10
Q.2	Attempt any two numerical out of four.(3 marks each)	06
Q.3	Attempt any one numerical out of two.(4 marks each)	04
	Total marks	**20**

C) External examination = (60 %) = 60 Marks

Semester End Theory Assessment - 60 Marks

i. Duration - These examinations shall be of **2 hours** duration.

ii. Paper Pattern- All questions shall be compulsory with internal choice within the questions.

Questions	Options	Marks	Questions on
Q.1)A)	Any 1 out of 2	6	Unit I
Q.1)B)	Any 1 out of 2	6	
Q.2)A)	Any 1 out of 2	6	Unit II
Q.2)B)	Any 1 out of 2	6	
Q.3)A)	Any 1 out of 2	6	Unit III
Q.3)B)	Any 1 out of 2	6	
Q.4)A)	Any 1 out of 2	6	Unit IV
Q.4)B)	Any 1 out of 2	6	
Q.5)A)	Any 1 out of 2	3	Unit I
Q.5)B)	Any 1 out of 2	3	Unit II
Q.5C)	Any 1 out of 2	3	Unit III
Q.5)D)	Any 1 out of 2	3	Unit IV

Practical Examination Pattern (Sem V)

(A) Internal Examination:

Sr. No.	Activity	Practical-(AC EI) (Marks)
1.	**Seminar on experiment :** Content- 2 mark Presentation-2 mark Q(Teacher) --2 mark Q(Student) -2 mark	**8**
2.	**Continuous Assessment** (3 mark/ experiment/ 8 regular expt.)	**24**
3.	**Main Journal** (1 mark per experiment)	**8**
	Total (=1 +2+ 3)	**40**
	8 experiments as follows:- Group A- 6 experiments ,Group B- 1 experiment each from sub-group B1 and B2	

(B) External (Semester-end practical examination):

Particulars	**Practical (Marks)**
Laboratory work	*50*
Viva	*10*
Total	**60**

PRACTICAL BOOK/JOURNAL

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ coordinator / In-charge of the department; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Theory Course	**Marks distribution**		
RUSACEI501	Internal (Marks)	External (Marks)	Total (Marks)
	40	60	100

Practical Course	**Marks distribution**		
RUSACEI5P1	Internal (Marks)	External (Marks)	Total (Marks)
	40	60	100

(GRAND TOTAL MARKS 200)

Semester-VI

Course Code: RUSAC EI 601

Course Title: C++ Programming and Nanomaterials-II

Academic year 2020-21

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION
CO 1	Analyse the problem, design the flow chart for the problem
CO 2	Formulation of C++ program
CO 3	Understand object orientated programming (OOP)and apply the concept for programming
CO 4	Distinguish between several Nano magnetic techniques.
CO 5	Formulate the different parameters from XRD, SEM, TEM, etc.
CO 6	Explore the application of Nanomaterials in different field.
CO7	Differentiate between special Nanomaterials CNT's, porous silicon and Aerogels.

DETAILED SYLLABUS

Course Code		Title	Credits
RUSACEI 601	**Unit**	**C++ PROGRAMING AND NANOMATERIAL-II**	
Unit I	**I**	**Basic Concepts of Object Oriented Programming and C++** **(1) Basics of Object-Oriented Programming & Beginning with C++:** A look at Procedure-Oriented Programming, Object-Oriented Programming Paradigm, Basic concepts of Object-Oriented Programming, Benefits of OOP, Object-Oriented Languages, Applications of OOP. What is C++?, Applications of C++, A simple C++ program, More C++ Statements, Example with Class, Structure of C++ Program, Creating the Source File, Compiling and	**15 Lectures**

		Linking. **Ref EB: 1.3, 1.4, 1.5, 1.6, 1.7 & 1.8** **EB: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 & 2.8**	
Unit II	**II**	**(2) Tokens and Expressions in C++:** Introduction, Tokens, Keywords, Identifiers and Constants, Basic Data Types, User- Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator, Expressions and Their Types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence. **Ref EB: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20, 3.21, 3.22 & 3.23** **(3) Control Structures and Functions:** Control Structures, Functions: The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Default Arguments, Constant Arguments, Function Overloading, Math Library Functions. **Ref EB: 3.24,4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9 & 4.11**	**15 Lecture**
Unit III	**III**	**Analysis techniques – II** i) XRD, Small angle X – ray scattering (SAXS), Low energy electron diffraction (LEED) ii) Electron Microscopy : SEM, EDAX, TEM, Environmental TEM iii) SPM, AFM, STM iv) Nano magnetic techniques : Super conducting quantum interface device measurement (SQUID), Magneto resistance measurement technique	**15 Lecture**
Unit IV	**IV**	**i) Some Special Nanomaterial** Introduction, Carbon nanotubes (CNTs), Porous Silicon, Aerogels, Zeolites, Ordered Porous Materials Using Micelles as Templates. **Ref. SK: 9.1, 9.2, 9.3, 9.4, 9.5, 9.6.** **ii) Applications of nanomaterial** Introduction, Electronics, Energy, Automobiles, Sports and	**15 Lecture**

		Toys, Textiles, Cosmetics, Domestics Appliances, Biotechnology and Medical Field, Space and Defense, Nanotechnology and Environment. **Ref. SK: 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10, 10.11.**	

References: C++ Programming

1. Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited. (**EB**)

Additional references:

1) Programming with C++ by D. Ravichandran, Tata McGraw-Hill Publ. Company Ltd.

2) Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company

References : Nanomaterial

1. Nanotechnology, Principles & Practices by Sulabha Kulkarni **(S K)**
2. Introduction to Nanotechnology by C.P. Poole, Jr. and F. J. Owens
3. Instrumental Methods of Analysis by H.H. Willard, I.I. Merit & J.A. Dean
4. X – ray Structure Determination by G.H. Stout and I.H. Jensen
5. Fundamentals of Molecular Spectroscopy by C. Banwell and E. McCash
6. Nanomaterial by A.K. Bandyopadhyay

PRACTICALS SEM VI

RUSACEI 6P1 –Programming in C++ and Analysis techniques – II

The certified journal must contain a minimum of 8 regular experiments (6 from Group A experiments and 2 experiments from Group B, one each from sub-group B1 and B2)

A separate index and certificate in journal is must for each semester course.

- Internal component of Practical examination Evaluation is based on regular experiments.
- For external practical examination, the learner will be examined in one experiment.

A learner will be allowed to appear for the semester end practical examination only if he/she submits a certified journal of Physics.

Group A

C++ Programming

1) Program based on Input, Output Statements (Programs to read any two numbers through keyboard and to perform simple arithmetic operations and to display the result)
2) Program based on Control Statements
    a. Program based on if-else statement
    b. Program based on nested if statement
3) Program based on for loop.
4) Program based on while loop and do-while loop.
5) Program using switch statements and if-else ladder.
6) Program to study function declaration, function calling and function prototype.

GROUP B

B1

1. Synthesis of Graphene & Graphene oxide
2. Synthesis of porous silicon
3. Synthesis of nonmaterial using electrochemical techniques

B2

1. Characterization study of nanomaterial & study of sensors of semiconductor materials(powder)
2. Characterization study of nanomaterial (Thin film) using XRD techniques.
3. Characterization study of nanomaterial (Thin film) using UV techniques.
4. Characterization study of nanomaterial (Thin film) using FTIR techniques.
5. Characterization study of nanomaterial (Thin film) using RAMAN techniques.

References: Group A & B

1. EB: Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited.
2. Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company.
3.Nanotechnology, Principles & Practices by Sulabha Kulkarni

Additional references:

1) Programming with C++ by D. Ravichandran, Tata McGraw-Hill Publishing Company Limited.

MODALITY OF ASSESSMENT

Theory Examination Pattern (Sem-VI)

B) Internal Assessment (40%) = 40 Marks.

Theory Paper-Paper code	Test Marks	Assignment	Marks distribution	Total Marks per paper
Applied Component Electronics - Instrumentation RUSACEI601	20	15 Questions on units 1, 2, 3 ,4.	Assessment- 15 mark Viva on it --05 mark ---------- Total= 20 mark	40

B) Internal test pattern (half an hour test)= 20 marks

Questions	options	Marks
Q.1	20 objective questions , all compulsory, each question with 4 options; (half mark each)	10
Q.2	Attempt any two numerical out of four.(3 marks each)	06
Q.3	Attempt any one numerical out of two.(4 marks each)	04
	Total marks	**20**

C) External examination = (60 %) = 60 Marks

Semester End Theory Assessment - 60 Marks

iii. Duration - These examinations shall be of **2 hours** duration.

iv. Paper Pattern- All questions shall be compulsory with internal choice within the questions.

Questions	Options	Marks	Questions on
Q.1)A)	Any 1 out of 2	6	Unit I
Q.1)B)	Any 1 out of 2	6	
Q.2)A)	Any 1 out of 2	6	Unit II
Q.2)B)	Any 1 out of 2	6	
Q.3)A)	Any 1 out of 2	6	Unit III
Q.3)B)	Any 1 out of 2	6	
Q.4)A)	Any 1 out of 2	6	Unit IV
Q.4)B)	Any 1 out of 2	6	

Q.5)A)	Any 1 out of 2	3	Unit I
Q.5)B)	Any 1 out of 2	3	Unit II
Q.5C)	Any 1 out of 2	3	Unit III
Q.5)D)	Any 1 out of 2	3	Unit IV

Practical Examination Pattern (Sem-VI)

(A) Internal Examination:

Sr. No.	Activity	Practical-(AC – EI) (Marks)
4.	**Seminar on experiment :** Content- 2 mark Presentation-2 mark Q(Teacher) --2 mark Q(Student) -2 mark	8
5.	**Continuous Assessment** (3 mark per experiment/ 8 regular experiment))	24
6.	**Main Journal** (1 mark per experiment)	8
	Total (=1 +2+ 3)	40
	8 experiments as follows:- Group A- 6 experiments Group B- 1 experiment each from sub-group B1 and B2	

(B) External (Semester-end practical examination):

Particulars	Practical 1 (Marks)
Laboratory work	*50*
Viva	*10*
Total	**60**

PRACTICAL BOOK/JOURNAL

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ coordinator / In-charge of the department; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Semester---- VI

Theory Course	**Marks distribution**		
RUSACEI 601	**Internal** (Marks)	**External** (Marks)	**Total** (Marks)
	40	**60**	**100**

Practical Course	**Marks distribution**		
RUSACEI 6P1	**Internal** (Marks)	**External** (Marks)	**Total** (Marks)
	40	**60**	**100**

(GRAND TOTAL MARKS 200)

----------x----------