Course code	Course Name	L-T-P - Credits	Year of Introduction
**341	DESIGN PROJECT	0-1-2-2	2016

Prerequisite : Nil

Course Objectives

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products, processes or systems
- To develop design that add value to products and solve technical problems

Course Plan

Study : Take minimum three simple products, processes or techniques in the area of specialisation, study, analyse and present them. The analysis shall be focused on functionality, strength, material, manufacture/construction, quality, reliability, aesthetics, ergonomics, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

Design: The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality, design for strength is not expected.

Note : The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.

Expected outcome .

The students will be able to

i. Think innovatively on the development of components, products, processes or technologies in the engineering field
ii. Analyse the problem requirements and arrive workable design solutions

Reference:

Michael Luchs, Scott Swan, Abbie Griffin, 2015. Design Thinking. 405 pages, John Wiley & Sons, Inc

Evaluation

First evaluation (Immediately after first internal examination)	20 marks
Second evaluation (Immediately after second internal examination)	20 marks
Final evaluation (Last week of the semester)	60 marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

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Course code	Course Name	Credits	Year of Introduction
**492	PROJECT	6	2016

Prerequisite : Nil

Course Objectives

- To apply engineering knowledge in practical problem solving
- To foster innovation in design of products, processes or systems
- To develop creative thinking in finding viable solutions to engineering problems

Course Plan

In depth study of the topic assigned in the light of the preliminary report prepared in the seventh semester
Review and finalization of the approach to the problem relating to the assigned topic
Preparing a detailed action plan for conducting the investigation, including team work
Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed
Final development of product/process, testing, results, conclusions and future directions
Preparing a paper for Conference presentation/Publication in Journals, if possible
Preparing a report in the standard format for being evaluated by the dept. assessment board
Final project presentation and viva voce by the assessment board including external expert

Expected outcome

The students will be able to

iii. Think innovatively on the development of components, products, processes or technologies in the engineering field
iv. Apply knowledge gained in solving real life engineering problems

Evaluation

Maximum Marks : 100

(i) Two progress assessments	20% by the faculty supervisor(s)
(ii) Final project report	30% by the assessment board
(iii) Project presentation and viva voce	50% by the assessment board

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

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Course code	Course Name	L-T-P - Credits	Year of Introduction
**451	Seminar and Project Preliminary	0-1-4-2	2016

Prerequisite : Nil

Course Objectives

- To develop skills in doing literature survey, technical presentation and report preparation.
- To enable project identification and execution of preliminary works on final semester project

Course Plan

Seminar: Each student shall identify a topic of current relevance in his/her branch of [illegible] get approval of faculty concerned, collect sufficient literature on the topic, study it thoroughly, prepare own report and present in the class.

Project preliminary:

Identify suitable project relevant to the branch of study. Form project team (not exceeding four students). The students can do the project individually also. Identify a project supervisor. Present the project proposal before the assessment board (excluding the external expert) and get it approved by the board.

The preliminary work to be completed: (1) Literature survey (2) Formulation of objectives (3) Formulation of hypothesis/design/methodology (4) Formulation of work plan (5) Seeking funds (6) Preparation of preliminary report

Note: The same project should be continued in the eighth semester by the same project team.

Expected outcome .

The students will be able to

i. Analyse a current topic of professional interest and present it before an audience
ii. Identify an engineering problem, analyse it and propose a work plan to solve it.

Evaluation

Seminar : **50 marks**

(Distribution of marks for the seminar is as follows: i. Presentation : 40% ii. Ability to answer questions : 30% & iii. Report : 30%)

Project preliminary : **50 marks** (Progress evaluation by the supervisor : 40% and progress evaluation by the assessment board excluding external expert : 60%. Two progress evaluations, mid semester and end semester, are mandatory.)

Note: All evaluations are mandatory for course completion and for awarding the final grade.

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Course Code	Course Name	L-T-P-Credits	Year of Introduction
CE334	COMPUTER AIDED CIVIL ENGINEERING LAB	0-0-3-1	2016

Prerequisite : CE231 Civil Engineering Drafting Lab

Course objectives:

1. To introduce the fundamentals of Civil Engineering drafting and drawing.
2. To familiarize with the FEA software packages for analysis and Design of structures
3. To understand the Total Station data transfer and interpretation.
4. To enable the usage of Project Management Software

List of Experiments :

I. Structural Drawings for

a) Slabs and Beams
   i. One Way / Two way Slab/Continuous Slabs
   ii. Singly reinforced /Double reinforced Beams
   iii. Continuous / Flanged Beams
b) Stair Case (Doglegged and Tread and Riser Type)
c) Foundations (Isolated and Combined Rectangular)

II Analysis and design of steel and RCC elements using STAAD/SAP 2000/ ETABS/any FEM software package.

a) Continuous and Cantilever beams
b) Plane truss and Frames

III Use of Project Management Software (MS Project/Primavera)

a) Preparation of Bar Chart/Gantt Charts/CPM/PERT Charts and finding Critical Path
b) Practice on Resource allocation (and Project Monitoring(Cost and Time)

IV. Conduct of Survey camp using Total Station (minimum 3 days duration) and its plotting.

Expected Outcomes:

- The students are expected to accomplish the [illegible] for the use of [illegible] Drafting/Analysis, Design and Project Management Software.

Text Books / References:

1. N Krishna Raju, Structural Design and Drawing, Second Edition, Universities Press (India), Private Limited, Hyderabad, 2009
2. Reference Manual of the Relevant Software
3. Satheesh Gopi, Dr. R Sathikumar, N Madhu, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2006
4. AutoCAD Essentials, Autodesk official Press, John Wiley & Sons, US, 2015

Note:

(1) Evaluation of drawing, along with a viva, to be done at the end of every class.
(2) A survey camp of minimum 3 days duration using total station is to be conducted in the semester, and is compulsory
(3) Evaluation Criteria :

Best 8 plate/Exercises - 40 marks
Survey Camp - 30 marks
End semester examination - 30 marks
TOTAL - 100 marks

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Course code.	Course Name	L-T-P - Credits	Year of Introduction
EE431	Power Systems Lab	0-0-3-1	2016

Prerequisite : EE306 Power System Analysis

Course Objectives

- Impart practical knowledge about various power system equipment
- Get a knowledge about the operation of power systems and the philosophy behind the relay settings, fault calculations etc.
- Simulate the power system operations which will be helpful in the design of power systems

List of Exercises/Experiments: (At least 12 experiments out of 18 experiments listed are mandatory)

1. **Visit a local Substation.**
   Aim: To see firsthand apparatus that will be studied in this course and learn about their role in operation and protection of power systems.
2. **Introduction to PSCAD/MATLAB/MIPOWER**
   Aim: 1). Learn the usage of PSCAD/MATLAB/MIPOWER in modeling of ac circuits and plotting of results.
   2). Understanding reactive power and power factor in single-phase and three-phase circuits.
3. **Transmission Line and Modeling.**
   Aim: Obtaining the parameters of a 345 kV transmission line and modeling it in PSCAD/MATLAB/MIPOWER
4. **Power Flow**
   Aim: To carry out power flow calculations.
5. **Transformers in Power Flow.**
   Aim: To look at the influence of including a tap-changer and a phase-shifter on power flow and bus voltages.
6. **Including an HVDC Transmission Line for Power Flow.**
   Aim: 1). To include an HVDC transmission line and see its effect on power transfer on other transmission line.
   2). To understand the operating principle of 12-pulse thyristor converters used in HVDC transmission systems.
7. **Power Quality.**
   Aim: To obtain the current harmonics drawn by power electronics interface.
8. **Synchronous Generators.**
   Aim: To obtain the effect of sudden short-circuit on a synchronous generator output.
9. **Voltage Regulation.**
   Aim: 1). To study the effect of real and reactive powers on bus voltages.
   2). Understanding the operation of a Thyristor Controlled Reactor (TCR).
10. **Transient Stability.**
    Aim: To simulate transient stability in a 3-bus example power system.

10. A. Making a Power System Reliable.

Aim: 1). To understand the planning/design process that goes into making a power system reliable.

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SEMESTER -4

07CS 7102 MASTER RESEARCH PROJECT PHASE-II

Credits: 0-0-21 : 12

Year: 2015

Pre-requisites: Nil

Course Objectives:

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical concepts and practical tools/techniques to solve real life problems related to industry and current research.

Assesment Guidelines:

The project work can be a design project/experimental project and/or computer simulation project on any of the topics in computer science/inter disciplinary topics. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to continue their project outside the parent institute, subject to the conditions in M. Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and two experts in the specified area.

Master Research project phase - II is a continuation of project phase - I started in the third semester. There would be two reviews in the fourth semester, first in the middle of the semester and the second at the end of the semester. First review is to evaluate the progress of the work, presentation and discussion. Second review would be a pre-submission presentation before the evaluation committee to assess the quality and quantum of the work done. This would be a pre-qualifying exercise for the students for getting approval by the departmental committee for the submission of the thesis. At least one technical paper is to be prepared for possible publication in journal or conferences. The technical paper is to be submitted along with the thesis. The final evaluation of the project will be external evaluation.

Course Outcomes:

This course enables students to apply the acquired fundamental engineering knowledge for investigating and solving complex problems. Empowers students with problem analysis skills, familiarizes with the usage and study of modern tools. Students also gain expertise for the design and development of solutions, by enhancing engineering knowledge. This course also teaches the importance of team work, by improving upon the aspects of communication and inter-personal skills.

Internal Continuous Assessment (100 marks):

Project evaluation by the supervisor/s	:30 Marks
Evaluation by external expert	:30 Marks
Presentation and evalution by the commitee	:40 Marks

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07CS 7119 MASTER RESEARCH PROJECT PHASE-I

Credits: 0-0-12 : 6 **Year:** 2015

Pre-requisites: Nil

Course Objectives:

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply acquired theoretical concepts and practical tools/techniques to solve real life problems related to industry and current research.

Assesment Guidelines:

The project work can be a design project/experimental project and/or computer simulation project on any of the topics in computer science/inter disciplinary topics. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to continue their project outside the parent institute, subject to the conditions in M. Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and two experts in the specified area each.

The student is required to undertake the master research project phase 1 during the third semester and the same is continued in the 4thsemester (Phase 2). Phase 1 consist of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.

Course Outcomes:

This course enables students to apply the acquired fundamental engineering knowledge for investigating and solving complex problems. Empowers students with problem analysis skills, familiarizes with the usage and study of modern tools. Students also gain expertise for the design and development of solutions, by enhancing engineering knowledge, and improving inter-personal skills.

Internal Continuous Assessment (50 marks):

Project Progress Evaluation:

Progress evaluation by project supervisor	: 20 Marks
Presentation and evaluation by the committee	: 30 Marks

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07CS 6126 MINI PROJECT

Credits: 0-0-4 : 2 **Year:** 2015

Pre-requisites: Nil

Course Objectives:

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical concepts and practical tools/techniques to solve real life problems related to industry and current research.

Assesment Guidelines:

The project work can be a design project/experimental project and/or computer simulation project on any of the topics in computer science related topics. The [illegible] topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to continue their project outside the parent institute, subject to the conditions in M. Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and two experts in the specified area.

The student is required to undertake the master research project phase 1 during the third semester and the same is continued in the 4thsemester (Phase 2). Phase 1 consist of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.

Course Outcomes:

Students shall be able to apply their theoretical knowledge to develop a solution for real time problem.

This course empowers students with problem analysis skills, improve effective communication skills, and also inculcate lifelong learning skills.

Internal Continuous Assessment (100 marks):

Mini project will have internal marks 50 and semester end examination marks 50. Internal marks will be awarded by respective guides as per the stipulations given below.

Progress achieved and regularity of the student	= 20 marks
Individual evaluation through viva voce/test	= 30 marks
Total	**= 50 marks**

Semester End examination will be conducted by a committee consisting of three faculty members. The students are required to bring the report completed in all respects duly authenticated by the respective guide and head of the department before the committee. Students individually will present their work before the committee. The committee will evaluate the students individually and marks shall be awarded as follows.

Report	: 25 marks
Concept/Knowledge in the topic	: 15 marks
Presentation	: 10 marks
Total marks	**: 50 marks**

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Course No:07BT7202
Course Title:PROJECT [PHASE 2]
Credits: 0-0-12:12
Year: 2015

Course Objective:

- *To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.*

Outline

Masters Research project phase-II is a continuation of project phase-I started in the third semester. Before the end of the fourth semester, there will be two reviews, one at middle of the fourth semester and other towards the end. In the first review, progress of the project work done is to be assessed. In the second review, the complete assessment (quality, quantum and authenticity) of the Thesis is to be evaluated. Both the reviews should be conducted by guide and Evaluation committee. This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis. At least one technical paper is to be prepared for possible publication in journal or conferences. The technical paper is to be submitted along with the thesis. The final evaluation of the project will be external evaluation.

- **Internal Continuous Assessment: 100 marks**

Project evaluation by the Supervisor/s : 30 Marks
Presentation & evaluation by the Committee : 40 Marks
Evaluation by the External expert : 30 Marks

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Course No:07BT7207

Course Title:PROJECT [PHASE 1]

Credits: 0-0-12: 6

Year: 2015

Course Objective:

- *To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.*

Outline

The project work can be a purely research based / industry based project which contains and applies the basic and advanced principles of biotechnology as well as chemical engineering. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If it is found essential, they may be permitted to continue their project outside the parent institute subject to the conditions in clause 10 of M.Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members.

The student is required to undertake the Masters research project phase-I during the third semester and the same is continued in the 4th semester (Phase-II). Phase-I consists of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.

- **Internal continuous assessment :Marks 50**

Progress evaluation by the Project Supervisor: 20 Marks

Presentation and evaluation by the C[illegible] 20 M[illegible]

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award marks to the students. Each student shall submit two copies of a write up of his / her seminar topic. One copy shall be returned to the student after duly certifying it by the Chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

- **Internal continuous assessment: 100 marks**

  Marks for the report: 30%

  Presentation: 40%

  Viva Voce: 30%

Course No: 07BT6214

Course Title: MINI PROJECT

Credits: 0-0-4: 2

Year: 2015

Pre-requisites: Nil

Course Objectives:

- To estimate the ability of the student in transforming the theoretical knowledge studied so far into an application at the basic research level that could lead to an industrial application. For enabling the students to gain experience in organisation and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year. The basic concepts of product design may be taken into consideration while designing the project. A committee consisting of minimum three faculty members specialised in biotechnology/chemical engineering/instrumentation engineering will perform [illegible] Students have to submit a report on the mini project and demonstrate the mini project before the evaluation committee.

- **Internal continuous assessment: 100 marks**

  Marks for the report: 20%

  Demonstration and Presentation: 50%

  Results: 30%

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07EC6416 MINI PROJECT

Credits: 0-0-4: 2 **Year: 2015**

Prerequisite: Nil

Course Objectives:

- To practice the steps involved for the selection, execution, and reporting of the project

Outline and Evaluation procedure:

Individual students are required to choose a topic of their interest in the field of Embedded systems. The subject content of the mini project shall be from emerging / thrust areas, topics of current relevance having research aspects. The final evaluation of mini project will be carried out by a committee consisting of three faculty members from the department. The students should bring the report duly authenticated by the respective guide. Students individually will present their work before the committee. The report complete in all respects should be submitted to the Head of the department.

Course Outcomes:

- The graduate will have acquired skills to select and execute projects.
- The graduate will have acquired technical report writing skills.

Internal continuous assessment: 100 marks

The distribution of marks for the mini project is as follows.

Report – 20%

Demonstration and presentation – 50%,

Results -30%

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07 EC 7407: MASTERS RESEARCH PROJECT (PHASE I)

Teaching scheme: 12 hours per week **Credits:** 6

Course objectives:

- To identify current issues in the area of Embedded Systems.
- To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory.
- The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

. Course Outcomes:

The graduate will have acquired

- Knowledge about contemporary issues and research opportunities
- Capacity to communicate effectively and professionally in both verbal and written forms
- Capability of self education and lifelong learning
- Understanding of professional and ethical responsibility

Outline and Evaluation procedure:

The project work should be a project in Embedded system stream. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to do their project outside the parent institute subject to the conditions in clause 10 of M.Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members.

The student is required to undertake the masters research project phase-Iduring the third semester and the same is continued in the 4th semester.(Phase-II).Phase-I consists of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4thsemester.

Internal continuous assessment : 50 marks

Progress evaluation by the Project Supervisor : 20 Marks

Presentation and evaluation by the committee : 30 Marks

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SEMESTER 4

07 EC 7402: MASTERS RESEARCH PROJECT (PHASE II)

Teaching scheme: 21 hours per week **Credits:** 12

Course Objectives:

- To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes.
- The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

Course Outcomes:

The graduate will have acquired

- Knowledge about contemporary issues and research opportunities
- Capacity to communicate effectively and professionally in both verbal and written forms
- Capability of self education and lifelong learning
- Understanding of professional and ethical responsibility

Outline and Evaluation procedure:

Masters Research project phase-II is a continuation of project phase-Istarted in the third semester. Before the end of the fourth semester, there will be two reviews, one at middle of the fourth semester and other towards the end. In the first review, progress of the project work done is to be assessed. In the second review, the complete assessment (quality, quantum and authenticity) of the Thesis is to be evaluated. Both the reviews should be conducted by guide and Evaluation committee. This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis. At least one technical paper is to be prepared for possible publication in journal or conferences. The technical paper is to be submitted along with the thesis. The final evaluation of the project will be external evaluation.

Project Progress evaluation details: Marks:100

Internal continuous assessment : 70 marks

Extenal assessment : 30 marks

Project evaluation by the supervisors : 30 Marks

Presentation & evaluation by the Committee : 40 Marks

Evaluation by the External expert : 30 Marks

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CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EEL201	CIRCUITS AND MEASUREMENTS LAB	PCC	0	0	3	2

Preamble : This laboratory course is designed to train the students to familiarize and practice various measuring instruments and different transducers for measurement of physical parameters. Students will also be introduced to a team working environment where they develop the necessary skills for planning, preparing and implementing basic instrumentation systems.

Prerequisite : Basic Electrical Engineering

Course Outcomes : After the completion of the course the student will be able to

CO 1	Analyse voltage current relations of RLC circuits
CO 2	Verify DC network theorems by setting up various electric circuits
CO 3	Measure power in a single and three phase circuits by various methods
CO 4	Calibrate various meters used in electrical systems
CO 5	Determine magnetic characteristics of different electrical devices
CO 6	Analyse the characteristics of various types of transducer systems
CO 7	Determine electrical parameters using various bridges
CO 8	Analyse the performance of various electronic devices for an instrumentation systems and, to develop the team management and documentation capabilities.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2						2			3
CO 2	3	3	-	-	-	-	-	-	2	-	-	3
CO 3	3	3	-	-	-	-	-	-	2	-	-	3
CO 4	3	3	2	-	-	-	-	-	2	-	-	3
CO 5	3	3	-	-	-	-	-	-	2	-	-	3
CO 6	3	3	2	-	-	-	-	-	2	-	-	3
CO 7	3	3	-	-	-	-	-	-	2	-	-	3
CO 8	3	3	3	3	2	-	-	-	3	3	3	3

ASSESSMENT PATTERN:

Mark distribution:

Total Marks	CIE marks	ESE marks	ESE Duration
150	75	75	3 hours

Continuous Internal Evaluation (CIE) Pattern:

Attendance	Regular Lab work	Internal Test	Course Project	Total
15	30	25	5	75

Internal Test Evaluation (Immediately before the second series test)

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End Semester Examination (ESE) Pattern:

The following guidelines should be followed regarding award of marks

(a) Preliminary work	: 15 Marks
(b) Implementing the work/Conducting the experiment	: 10 Marks
(c) Performance, result and inference (usage of equipments and trouble shooting)	: 25 Marks
(d) Viva voce	: 20 marks
(e) Record	: 5 Marks

General instructions : Practical examination is to be conducted immediately after the second series test after conducting 12 experiments from the list of experiments given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

LIST OF EXPERIMENTS:

(12 experiments are mandatory)

1. Verification of Superposition theorem and Thevenin's theorem.
2. Determination of impedance, admittance and power factor in RLC series/ parallel circuits.
3. 3-phase power measurement using one wattmeter and two-wattmeter methods, and determination of reactive/apparent power drawn.
4. Resistance measurement using Kelvin's Double Bridge and Wheatstone's Bridge and extension of range of voltmeters and ammeters.
5. Extension of instrument range by using Instrument transformers(CT and PT)
6. Calibration of ammeter, voltmeter, wattmeter using Potentiometers
7. Calibration of 1-phase Energy meter at various power factors (minimum 4 conditions)
8. Calibration of 3-phase Energy meter using standard wattmeter
9. Determination of B-H curve, μ-H curve and μ-B curve of a magnetic specimen
10. Measurement of Self inductance, Mutual inductance and Coupling coefficient of a 1-phase transformer
11. a. Measurement of Capacitance using AC bridge

    b. Setup an instrumentation amplifier using Opamps.
12. Determination of characteristics of LVDT, Strain gauge and Load-cell.
13. Determination of characteristics of Thermistor, Thermocouple and RTD
14. Verification of loading effect in ammeters and voltmeters with current measurement using Clamp on meter.

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15. Demo Experiments/Simulation study:
    (a) Measurement of energy using TOD meter
    (b) Measurement of electrical variables using DSO
    (c) Harmonic analysers
    (d) Simulation of Circuits using software platform
    (e) Computer interfaced measurements of circuit parameters.

Mandatory Group Project Work : Students have to do a mandatory micro project (group size not more than 5 students) to realise a functional instrumentation system. A report also is

along with the internal test and a maximum of 5 marks shall be awarded.

Example projects (Instrumentation system with sensors, alarm, display units etc)

1. Temperature Monitoring System.
2. Gas / Fire smoke Detection Systems.
3. Simulation using LabVIEW, PLC or Similar Softwares.

Reference Books:

1. A. K. Sawhney: A course in Electrical and Electronic Measurements & Instrumentation, Dhanpat Rai Publishers
2. J. B. Gupta: A course in Electrical & Electronic Measurement & Instrumentation., S. K. Kataria & Sons Publishers
3. Kalsi H. S.: Electronic Instrumentation, 3/e Tata McGraw Hill New Delhi

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SAHRDAYA COLLEGE OF ENGINEERING & TECHNOLOGY
SCET
KOD

CODE EEL203	ANALOG ELECTRONICSLAB	CATEGORY	L	T	P	CREDIT
		PCC	0	0	3	2

CO 1	Use the various electronic instruments and for conducting experiments.
CO 2	Design and develop various electronic circuits using diodes and Zener diodes.
CO 3	Design and implement amplifier and oscillator circuits using BJT and JFET.
CO 4	Design and implement basic circuits using IC (OPAMP and 555 timers).
CO 5	Simulate electronic circuits using any circuit simulation software.
CO 6	Use PCB layout software for circuit design

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2								2			
CO 2	2	2	2						2			
CO 3	2	2	2						2			
CO 4	2	2	2						2			
CO 5	1	1			3				3			
CO 6	1				3				3			

LIST OF EXPERIMENTS

1. Measurement of current, voltage, frequencyand phase shift of signal in a RC network using oscilloscope.
2. Clipping circuits usingdiodes.
3. Clamping circuits usingdiodes.
4. Design and testing ofsimpleZener voltage regulator.
5. RC coupled amplifier using BJT in CE configuration-Measurement of gain, BW and plotting of frequencyresponse.
6. JFETamplifier-Measurement of gain, BW and plotting of frequencyresponse.
7. Op-amp circuits – Design and set up of invertingand non-inverting amplifier, scale changer, adder, integrator, and differentiator.
8. Op-amps circuits – Scale changer, adder, integrator, and differentiator.
9. Precision rectifierusingOp-amps.
10. Phase shift oscillator usingOp-amps.
11. Wein'sBridgeoscillator using Op-amps.
12. Waveform generation – Square, triangular andsaw tooth waveformgeneration usingOPAMPs.
13. Basic comparator and Schmitt triggercircuits using Op-amp (Use comparator ICs such as LM311).
14. Design and testing of series voltage regulator using Zenerdiode.
15. Astable and Monostable circuit using555IC.
16. RC phase shift oscillator using Op-amp.
17. Introductionto circuit simulation using any circuit simulation software.
18. Introduction to PCB layout software.

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Text Books

1. Bell D. A., Electronic Devices and Circuits, Prentice Hall of India, 2007.
2. Malvino A. and D. J. Bates, Electronic Principles //e, Tata McGraw Hill, 2010.
3. Boylestad R. L. and L. Nashelsky, Electronic Devices and Circuit Theory, 10/e, Pearson Education India, 2009.
4. Choudhury R., Linear Integrated Circuits, New Age International Publishers. 2008.

Reference Books

1. Floyd T.L., Fundamentals of Analog Circuits,, Pearson Education, 2012.
2. Robert T. Paynter and John Clemons, Paynter's Introductory electronic devices & circuits, Prentice Hall Career & Technology, New Jersey.
3. Millman J. and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill, 2010.
4. Gayakward R. A., Op-Amps and Linear Integrated Circuits, PHI Learning Pvt. Ltd., 2012.

Course Project: Students have to do a mandatory course project (group size not more than 4 students) using to realise a functional analog circuit on PCB. A maximum of 5 marks shall be awarded for this project (to be evaluated along with the final internal test). Report to be submitted.

Example projects:

1. Audio amplifier.
2. Electronic Pest Repellent Circuit.
3. Electronic Siren.

Assessment Pattern :

Mark distribution :

Total Marks	CIE	ESE	ESE Duration
150	75	75	2.5 hours

Continuous Internal Evaluation (CIE) Pattern:

Attendance	Regular Lab work	Internal Test	Course Project	Total
15	30	25	5	75

End Semester Examination Pattern:

The following guidelines should be followed regarding award of marks

(a) Preliminary work : 15 Marks

(b) Implementing the work/Conducting the experiment : 10 Marks

(c) Performance, result and inference (usage of equipment and troubleshooting) : 15 Marks

CODE EEL204	DIGITAL ELECTRONICS LAB	CATEGORY	L	T	P	CREDIT
		PCC	0	0	3	2

Course Outcomes : After the completion of the course the student will be able to:

CO 1	Formulate digital functionsusing Boolean Algebra and verify experimentally.
CO 2	Design and implement combinational logic circuits.
CO 3	Design and implement sequential logic circuits.
CO 4	Design and fabricate a digital circuit using the knowledge acquired from the laboratory.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	3	3			2	3	3		1
CO 2	3	3	3	3	3			2	3	3		1
CO 3	3	3	3	3	3			2	3	3		1
CO 4	3	2	1	3	2			2	3	3	2	3

LIST OF EXPERIMENTS

Pre-lab assignment :Familiarisation of Logic Gates, Identification of typical logic ICs, Interpreting IC datasheets.

1. Verification & Realisation of De Morgan's theorem.
2. Realisation of SOP & POS functions after K-map reduction.
3. Half adder & Full adder using gates.
4. 4-bit adder/subtractor & BCD adder using IC 7483.
5. Realisation of 2-bit comparator using gates and study of four-bit comparator IC 7485.
6. BCD to decimal decoder and BCD to 7-segment decoder & display.
7. Study of multiplexer IC and realization of combinational circuits using multiplexers.
8. Realization of RS, T, D & JK flip flops using gates.
9. Study of flip flop ICs (7474 & 7476).
10. Realisation of ripple up and down counters and modulo-N counter using flip-flops.
11. Study of counter ICs (7490, 7493).
12. Design of synchronous up, down & modulo-N counters.
13. Realization of 4-bit serial IN serial OUT registers using flip flops.
14. Study of shift register IC 7495, ring counter and Johnsons counter.
15. VHDL implementation of full adder, 4 bit magnitude comparator

Course Project : Students have to do a mandatory course project (group size not more than 4 students) using digital ICs or Programmable Logic Devices (CPLD/FPGA) to realise a functional digital circuit. A maximum of 5 marks shall be awarded for this project (to be evaluated along with the final internal test).

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Example of course projects :

1. Realisation of a real-time digital clock with display.
2. Digital Alarms
3. ALU (May be implemented in FPGA)
4. Digital Security Monitoring System
5. Traffic Control

Assessment Pattern :

Mark distribution :

Total Marks	CIE	ESE	ESE Duration
150	[illegible]	[illegible]	[illegible]

Continuous Internal Evaluation (CIE) Pattern:

Attendance	Regular Lab work	InternalTest	CourseProject	Total
15	30	25	5	75

End Semester Examination Pattern:

The following guidelines should be followed regarding award of marks:

(a) Preliminary work : 15 Marks
(b) Implementing the work/Conducting the experiment : 10 Marks
(c) Performance, result and inference (usage of equipment and troubleshooting) : 25 Marks
(d) Viva voce : 20 marks
(e) Record : 5 Marks

General instructions : Practical examination to be conducted immediately after the second series test covering entire syllabus given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

Reference Books:

1. Floyd T.L, Digital Fundamentals, 10/e, Pearson Education, 2011.
2. C.H.Roth and L.L.Kimney Fundamentals of Logic Design, 7/e, Cengage Learning, 2013.

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