NATIONAL ENGINEERING COLLEGE, K.R.NAGAR, KOVILPATTI

(An Autonomous Institution – Affiliated to Anna University Chennai)

Estd :1984

THE MINUTES OF THE 8th ACADEMIC COUNCIL

MINUTES OF THE EIGHTH ACADEMIC COUNCIL MEETING HELD ON **02.12.2017** AT **11.00 A.M.** IN THE CONFERENCE HALL OF ADMINISTRATIVE BLOCK, NATIONAL ENGINEERING COLLEGE, KOVILPATTI UNDER THE CHAIRMANSHIP OF **Dr.S.SHANMUGAVEL**, PRINCIPAL

The following members were present:

Dr.S.Shanmugavel	Principal, National Engineering College
Academic Experts	
Dr.T.V. Geetha	Director/ Academic Courses, Anna University, Chennai–25
Dr.L.Karunamoorthy	Chairman/Faculty of Mechanical Engg., Anna University, Chennai–25
Dr.M.A.Bhagyaveni	Professor / Dept. of ECE, Anna University, Chennai –25
Industrial Experts	
Mr.A.K.Pattabiraman	Head, Accreditation Process for South India, Tata Consultancy Services Limited, Chennai – 96
Dr.V.Veerappan	Cofounder & President, Tessolve Services Private Limited, Bangalore
Mrs.A.Bhanurekha	Senior Program Manager. WIPRO Limited, Chennai – 32
University Nominees	
Dr. Indra Getzy David	Principal, Government College of Engineering, Tirunelveli
Dr.N.G.Ramesh Babu	Prof. & Head / Bio-Technology, Adhiyamaan College of Engineering, Hosur – 09

Special Invitees	
Dr.Kn.K.S.K.Chockalingam	Director, National Engineering College
Dr.V.Seenivasagam	Controller of Examinations, National Engineering College
Internal Members	
Dr.K.Manisekar	Dean (Academic), National Engineering College
Dr.K.Kalidasa Murugavel	Prof. & Head / Mechanical, National Engineering College
Dr.D.Ravindran	Prof. / Mechanical, National Engineering College
Dr.A.Shenbagavalli	Prof. & Head / ECE, National Engineering College
Dr.S.Tamilselvi	Prof. & Head / ECE (PG), National Engineering College
Dr.B.Paramasivan	Prof. & Head / CSE, National Engineering College
Dr.D.Manimegalai	Prof. & Head / IT, National Engineering College
Dr.K.G.Srinivasagan	Prof. / IT, National Engineering College
Dr.M.Willjuice Iruthayarajan	Prof. & Head / EEE, National Engineering College
Dr.B.Sankaragomathi	Prof. & Head / EIE, National Engineering College
Dr.C.Puthiyasekar	Prof. & Head / Civil, National Engineering College
Dr.M.A.Neelakandan	Prof. & Head / S & H, National Engineering College
Dr. S.Rammurthy	Prof. / Mathematics, National Engineering College
Dr.L.Kalaivani	Asso. Prof. / EEE, National Engineering College
Dr.S.Sankar Ganesh	Asso. Prof. / IT, National Engineering College
Students Members	
Mr. J.Nigesh	Final year CSE
Ms. J.Mariesh Preethi	Final year ECE

The University Nominee member **Dr.V.Abhai Kumar**, Principal, Thiagarajar College of Engineering, Madurai, Industrial Expert Members **Mr.R.Dhamodaran,** Sr. Vice President, HCL Services Limited, Chennai and **Dr.S.Ganesan**, Additional Director, Combat Vehicles Research and Development Establishment (CVRDE), Avadi, Chennai could not attend the meeting due to their prior commitments and unavoidable circumstances.

The meeting began with the Principal's (Academic Council Chairman, National Engineering College) welcome address. He outlined briefly the various agenda items to be presented at the meeting. He also described the various committees and Academic meetings held to formulate the Syllabi of one credit courses for the UG degree

Programmes offered under Regulation 2015. After the formal welcome, he requested the Director to deliver the Special Address.

The Director while addressing the Council highlighted that the syllabi of additional one credit courses of 7 UG programmes under Regulation 2015 would be discussed in the Academic Council.

Following the address by the Director, the Dean (Academic) moved the following agenda items on behalf of the Principal.

The following agenda items are considered and approved by the 08th Academic Council

DA 08.01 TO CONFIRM THE MINUTES OF SEVENTH ACADEMIC COUNCIL MEETING HELD ON 20th MAY 2017

The minutes of the **Seventh Academic Council meeting** held on **20/05/2017** were communicated to the members vide **Email dated 06/06/2017.** The comments received have been incorporated and placed for confirmation. The same was approved by the council.

- **Minutes of 07th Academic Council**
- **Action taken report for minutes of 07th Academic Council**

DA 08.02 TO CONSIDER AND APPROVE THE AMENDMENTS TO CLAUSE 5.1, 11.1.1., 11.3.1, 11.11 and 17.0 OF REGULATIONS 2015 FOR UG DEGREE PROGRAMMES OF NATIONAL ENGINEERING COLLEGE

RESOLVED TO APPROVE the amendments to CLAUSE 5.1, 11.3.1, 11.11 and 17.0 of Regulations 2015 for UG degree programmes of National Engineering College.

However, the clause 11.1.1 introduction of Supplementary Examination is not approved by the academic council, since the members felt that the introduction of supplementary examination may deteriorate the quality of examination and evaluation system.

- **AMENDMENTS – UG REGULATIONS 2015**

DA 08.03 TO CONSIDER AND APPROVE THE INTRODUCTION OF LIVE-IN-LAB IN STRUCTURE OF THE CURRICULUM FOR UG DEGREE PROGRAMMES OF NATIONAL ENGINEERING COLLEGE

RESOLVED TO APPROVE the introduction of LIVE-IN-LAB in structure of the curriculum for UG degree programmes of National Engineering College and to incorporate this provision in the clause 4.5.2 and clause 12.7.1 of Regulation 2015

- **Live-in-Lab** (Concept and activities)

DA 08.04 TO CONSIDER AND APPROVE THE INTRODUCTION OF NON-CGPA COURSE ON CRITICAL AND CREATIVE THINKING FOR UG DEGREE PROGRAMME TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the introduction of Non-CGPA course on Critical and Creative Thinking for UG degree programme to be offered under R-2015

- **Critical and creative Thinking - Syllabi**

BUSINESS BROUGHT FORWARD BY THE BOARD OF STUDIES

AGENDA FROM DEPARTMENT OF MECHANICAL ENGINEERING

Dr. K.Kalidasa Murugavel, Chairman, Mechanical Engineering moved the following items based on the decision of the Board of Studies in Mechanical Engineering.

ME 08.01 TO CONSIDER AND APPROVE THE REFINEMENT OF COURSE OUTCOMES FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the refinement of course outcomes for the UG degree programmes to be offered under R-2015

- **B.E. MECHANICAL ENGG. – Refinement of COs**

ME 08.02 TO CONSIDER AND APPROVE THE ADDITIONAL ELECTIVE COURSE 15ME44E – NEW PRODUCT DEVELOPMENT FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the additional elective course 15ME44E – New Product Development for the UG degree programmes to be offered under R-2015

- **15ME44E – NEW PRODUCT DEVELOPMENT – Syllabi**

ME 08.03 **TO CONSIDER AND APPROVE** THE ADDITIONAL ELECTIVE COURSE 15EN27E – DESIGN OF EXPERIMENTS FOR THE M.E. – ENERGY ENGINEERING PROGRAMME TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the additional elective course 15EN27E – Design of Experiments for the M.E. – ENERGY ENGINEERING programme to be offered under R-2015

- **15EN27E – DESIGN OF EXPERIMENTS – Syllabi**

AGENDA FROM DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Dr. A.Shenbagavalli, Chairman, Electronics and Communication Engineering moved the following items based on the decision of the Board of Studies in Electronics and Communication Engineering.

EC 08.01 **TO CONSIDER AND APPROVE** THE INCORPORATION AND MODIFICATION OF ONE CREDIT COURSES FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the incorporation and modification of one credit courses for the UG degree programmes to be offered under R-2015

- **B.E. ECE – Syllabi of one credit courses**

AGENDA FROM DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Dr. B.Paramasivan, Chairman, Computer Science and Engineering moved the following items based on the decision of the Board of Studies in Computer Science and Engineering.

CS 08.01 **TO CONSIDER AND APPROVE** THE INCORPORATION AND MODIFICATION OF ONE CREDIT COURSES FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the incorporation and modification of one credit courses for the UG degree programmes to be offered under R-2015

- **B.E. CSE – Syllabi of one credit courses**

AGENDA FROM DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Dr. M.Willjuice Iruthayarajan, Chairman, Electrical and Electronics Engineering moved the following items based on the decision of the Board of Studies in Electrical and Electronics Engineering.

EE 08.01 **TO CONSIDER AND APPROVE** THE INCORPORATION AND MODIFICATION OF ONE CREDIT COURSES FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the incorporation and modification of one credit courses for the UG degree programmes to be offered under R-2015

- **B.E. EEE. – Syllabi of one credit courses**

AGENDA FROM DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

Dr. B.Sankaragomathi, Chairman, Electronics and Instrumentation Engineering moved the following items based on the decision of the Board of Studies in Electronics and Instrumentation Engineering.

EI 08.01 **TO CONSIDER AND APPROVE** THE INCORPORATION AND MODIFICATION OF ONE CREDIT COURSES FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the incorporation and modification of one credit courses for the UG degree programmes to be offered under R-2015

➢ **B.E. EIE. – Syllabi of one credit courses**

AGENDA FROM DEPARTMENT OF CIVIL ENGINEERING

Dr. C.Puthiyasekar, Chairman, Civil Engineering moved the following items based on the decision of the Board of Studies in Civil Engineering.

CE 08.01 **TO CONSIDER AND APPROVE** THE INCORPORATION AND MODIFICATION OF ONE CREDIT COURSES FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the incorporation and modification of one credit courses for the UG degree programmes to be offered under R-2015

➢ **B.E. CIVIL ENGG. – Syllabi of one credit courses**

AGENDA FROM DEPARTMENT OF INFORMATION TECHNOLOGY

Dr.V.Seenivasagam, Chairman, Information Technology moved the following items based on the decision of the Board of Studies in Information Technology.

IT 08.01 **TO CONSIDER AND APPROVE THE REFINEMENT OF COURSE OUTCOMES OF SYLLABI FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015**

➢ **B.Tech. IT – Refinement of COs**

IT 08.02 **TO CONSIDER AND APPROVE** THE INCORPORATION AND MODIFICATION OF ONE CREDIT COURSES FOR THE UG DEGREE PROGRAMMES TO BE OFFERED UNDER R-2015

RESOLVED TO APPROVE the incorporation and modification of one credit courses for the UG degree programmes to be offered under R-2015

➢ **B.Tech. IT – Curriculum & Syllabi**

ANY OTHER ITEMS, WITH THE PERMISSION OF THE CHAIRMAN OF THE ACADEMIC COUNCIL

The Principal informed the academic council members that the institution in the process of establishing a section (8) non profitable company "**K.R. INNOVATION CENTRE**" at our campus to support and to encourage the student's start-ups. The members appreciated the efforts taken by the Management, Director, Principal and the faculty for the improvement of the quality of education.

Other Points discussed by the Academic Council

1. To organize a One day workshop on 'zigzag thinking' and 'system thinking' for both students and staff members.
2. Staff members may also be advised to undergo 'critical and creative thinking' course. The follow up may be carried out in the subsequent semesters in order to motivate the students.
3. To include value engineering in the syllabus of the course "**New product development**" and to try to get the support from industry for conducting such course.
4. To make the course "Research Methodology" as a compulsory one for all the PG students.
5. For PCB design course, a separate "FAB" lab may be established and the course must be offered for all circuit branch (EEE, EIE and ECE) students.
6. To conduct the Virtual Instrumentation course in collaboration with the National Instruments laboratory for the benefit of students.
7. In CIVIL curriculum, the concepts about mobile building should be disseminated to the students.
8. To conduct the courses Gamification and Enterprise IOT as practical courses.
9. To setup IOT Laboratory for conducting courses and for product development.
10. To give due importance for topics like Automation, Artificial Intelligence, Deep Learning and Machine Learning courses while designing the curriculum in the forthcoming regulations.
11. To take care while designing the curriculum for CSE and IT in order to differentiate the field of specialization for both programmes in the forthcoming regulation.
12. To get the support of Industries for funding, in order to carry out the activities at the adopted villages through Live in lab and all the services may be carried out along with NSS.

Members Present

Dr.S.Shanmugavel Academic Council Chairman National Engineering College	
Academic Experts	
Dr.T.V. Geetha Director/ Academic Courses Anna University, Chennai	2/12/17
Dr.L.Karunamoorthy Chairman / Faculty of Mechanical Engineering Anna University, Chennai	2/12/17
Dr.M.A.Bhagyaveni Professor / Dept. of Electronics and Communication Engineering Anna University, Chennai	2/12/17
Industrial Experts	
Mr.A.K.Pattabiraman Head, Accreditation Process for South India, Tata Consultancy Services Limited Chennai	
Dr.V.Veerappan Cofounder & President, Tessolve Semiconductor Private Limited, Bangalore	
Mrs.A.Bhanurekha Senior Program Manager WIPRO Limited, Chennai	
University Nominees	
Dr. Indra Getzy David Principal Government College of Engineering Tirunelveli	
Dr.N.G.Ramesh Babu Prof. & Head / Bio-Technology Adhiyamaan College of Engineering Hosur	N. G. Ramesh Babu
Special Invitees	
Dr.Kn.K.S.K.Chockalingam Director	12.12.17
Dr.V.Seenivasagam Controller of Examinations	
Internal Members	
Dr.K.Manisekar Prof. & Dean (Academic)	

Dr.K.Kalidasa Murugavel Prof. & Head / Mechanical	
Dr.D.Ravindran Prof. / Mechanical	
Dr.A.Shenbagavalli Prof. & Head / ECE	2/12/17
Dr.S.Tamilselvi Prof. & Head / ECE(PG)	2/12/17.
Dr.B.Paramasivan Prof. & Head / CSE	2/12/17
Dr.D.Manimegalai Prof. & Head / IT	
Dr.K.G.Srinivasagan Prof. / IT	
Dr.M.Willjuice Iruthayarajan Prof. & Head / EEE	2/12/17
Dr.B.Sankaragomathi Prof. & Head / EIE	2/12/17
Dr.C.Puthiyasekar Prof. & Head / Civil	
Dr.M.A.Neelakandan Prof. & Head / S & H	
Dr. S.Rammurthy Prof. / Mathematics	
Dr.L.Kalaivani Asso. Prof. / EEE	
Dr.S.Sankar Ganesh Asso. Prof. / IT	
Student Members	
Mr. J.Nigesh, Final year CSE	
Ms. J.Mariesh Preethi, Final year ECE	

CHAIRMAN
ACADEMIC COUNCIL

Actions Taken Report on Minutes of 7th Academic Council Meeting

S. No.	Suggestions given by Expert members	Action Taken
1.	Constitute a question paper scrutinizing board.	Question paper scrutinizing boards have been constituted for every programme with Internal senior faculty as members
2.	Implement the revised passing requirements in Regulation 2015 from the Academic year 2017-18 onwards if possible it may be extended to current batch.	Revised passing requirements have been introduced to current batch of students
3.	For one credit courses, it is suggested to conduct classes with a maximum of 3 hours per day.	As per the members suggestions, the maximum number of hours of conducting one credit courses are limited to 3 hours per day
4.	For the evaluation of one credit courses conducted by the industrial expert, a committee consisting of the Head of the department, subject expert and industrial persons handling the course may be constituted.	This condition was incorporated into the regulation itself. Further, most of the courses have been handled by the faculties trained by the Industrial experts and Adjunct faculty
5.	Number of one credit courses may be restricted to less than 10.	Almost every department has identified more than 10 one credit courses which include one credit laboratory courses in order to satisfy their requirements in various domain
6.	It is suggested to include more number of one credit practical courses rather than theory courses.	Almost all the circuit branches have introduced 5 to 6 one credit courses
7.	A common method may be evolved for coding one credit courses ie. to indicate number of practical hours, lecture and tutorial hours.	We are in the process of identifying a common method of coding one credit courses
8.	Transdisciplinary elective course 15TD17E-Microfinance and Patent Laws may be split into two courses.	Introduced as a single course
9.	M.Tech. (IT) curriculum and syllabus may be restructured.	Restructured
10.	Gamification can be added as one of the assessment procedure.	HoDs have been insisted to include gamification as one of the assessment procedure
11.	Elective courses should not be split into one credit courses.	All the one credit courses have been designed with the help of Industrial experts.

CHAIRMAN
ACADEMIC COUNCIL

AMENDMENTS IN **REGULATIONS 2015** (8th Academic Council Meeting on 02.12.2017)

UNDER GRADUATE DEGREE PROGRAMMES

Existing UG Regulations – 2015

5.0 DURATION OF THE PROGRAMMES

5.1 The minimum and maximum periods for completion of the UG programmes are given below.

TABLE – 6

Programme	Minimum No. of semesters	Maximum No. of semesters
B.E. / B.Tech.	8	16
B.E. / B.Tech. Lateral Entry	6	14

11.3.1 For one credit courses, the End Semester Examination of 1 hour duration shall be conducted as and when the course is completed (if necessary). Further, the end semester question pattern shall be G type as detailed in Table – 8.

11.11 N I L

Amended UG Regulations – 2015

5.0 DURATION OF THE PROGRAMMES

5.1 The minimum and maximum periods for completion of the UG programmes are given below.

TABLE – 6

Programme	Minimum No. of semesters	Maximum No. of semesters
B.E. / B.Tech.	8	**14**
B.E. / B.Tech. Lateral Entry	6	**12**

11.3.1 For one credit courses, the End Semester Examination of 1 hour duration shall be conducted as and when the course is completed (if necessary). If a course is conducted by an industrial expert, then a committee consisting of the head of the department, subject expert and industrial expert handling the course may be constituted to normalize the evaluation. Further, the end semester question pattern shall be G type as detailed in Table – 8.

11.11 PRESERVATION OF ASSESSED ANSWER BOOKS

All answer books shall be preserved for six consecutive semesters in the strong room of Examination Cell.

UNDER GRADUATE DEGREE PROGRAMMES	
Existing UG Regulations – 2015	**Amended UG Regulations – 2015**
17.0 ELIGIBILITY FOR THE AWARD OF THE DEGREE A student shall be declared to be eligible for the award of the Degree only when he/she has	**17.0 ELIGIBILITY FOR THE AWARD OF THE DEGREE** A student shall be declared to be eligible for the award of the Degree only when he/she has
ii. Successfully completed the B.E./B.Tech. Degree programme within 8 (EIGHT) years (SIXTEEN consecutive semesters) from the date of admission to the first semester of the programme and 7 (SEVEN) years (FOURTEEN consecutive semesters) for the lateral entry candidates from the date of admission to the third semester of the programme.	ii. Successfully completed the B.E./B.Tech. Degree programme within **7 (SEVEN) years (FOURTEEN consecutive semesters)** from the date of admission to the first semester of the programme and **6 (SIX) years (TWELVE consecutive semesters)** for the lateral entry candidates from the date of admission to the third semester of the programme.

Live –in-Lab

Context:

"India lives in villages" were the golden words of Mahatma Gandhi many decades ago. Ironically after almost 70 years the data does not seem to disagree. Today India has come a long way in modernizing its economy, reducing poverty and improving living standards for a large segment of its population. But, still India continues to have the largest number of poor in the world (approximately 300 million are in extreme poverty). This may be due to the income gaps between India's states, and a growing urban-rural divide. The Rural Economy in India is mostly agriculture based and is very important because of its vital supply and demand links with the other Indian industries. Indian rural economy's greatest contribution is the number of people it has somehow continued to employ under it. Further, the rural poverty alleviation has been the primary concern in the economic planning and development process of the country population. The rural development encompasses the entire gamut of improvement in the overall quality of life in the rural areas that can be achieved only through education and eradication of poverty in rural area technological developments. At this Juncture, National Engineering College feels that this can be achieved only through high end basic research and development of cutting edge technologies to serve the technological requirements of the common man through development of appropriate skills and technologies. By keeping these in mind, we propose to introduce the concept **Live-in-Lab** in our curriculum for the development of livelihood and socio-economical status of rural people through student and faculty participation in societal development.

Objective

1. To recognize the problems of the population living in villages and to identify projects to address the problems, develop solutions, put into practice, assess results, and ultimately reveal **multidisciplinary innovative** solutions for betterment of the rural people and future India.
2. To motivate the students to learn through reflective process where they assess their decisions in the light of natural consequences, mistakes, and successes.

Major Activities of the Lab

Technological Development

- To equip and provide a platform to the students to link their academic learning into practical experience.
- To create awareness and training about digital literacy
- To work with youth groups to develop innovative mechanisms to improve the livelihoods and economic status of rural population

- To promote innovation and entrepreneurship in the industrial application of traditional cultural products in the service sectors as well as in key sectors for food security and agricultural productivity.
- To raise awareness about environmental conservation in water, energy, organic composting and waste management
- To support and promote efforts to harmonize modern technologies with traditional and indigenous knowledge for sustainable rural development
- To create and develop educational programmes for rural communities aimed at disease prevention
- To support the development, transfer and use of safe and environmentally sound construction technologies and practices, in particular for housing, to improve living standards and to create employment in rural areas
- To empower rural women to achieve their full economic potential by inspiring both women and men to become advocates, change makers and leaders in their community.
- To support training and capacity-building for rural communities to effectively implement adaptation programmes to climate change at the local level

Skill development

- To empower the rural youth by imparting education and employability skills
- To promote training, technical support and innovative approaches to expand income-generating activities that require little or no farmland
- To develop life skills in youths and deploy them for local community development process.
- To provide vocational skills for those who missed school education or dropped out from their education.
- To organize "**Learning the fun way**" workshop for school students: science experiments, computer programming and internet basics

Approach

A team of students with faculty advisors of NSS/NCC will be sent to different villages to identify a needy village

Once the village is identified, a set of questionnaires will be prepared by the team to identify the requirement of the village which includes health care, education, sanitation, energy & source of power, water conservation and efficient use, waste management, environment and farming, infrastructure and basic facilities

Based on the study, the identified requirements will be presented to the departments concerned and clubs to provide solutions to the community either through Government projects or schemes under village adoption schemes or NGOs

Interested students and faculties will be identified based on the recommendations of the Head and various club in charges

Before heading to the village, the students should get proper approval from the Head of the department concerned and Principal. Further, the students will be given training about village life, value and culture.

Period of Study

- The interested students have to stay at least for two weeks continuously in the village adopted/selected during his/her course of study.

Evaluation Procedure

- At the end of the study, the students have to submit a report as a group consisting of Maximum of 6 numbers to the department about the visit which includes date of visit, questionnaires prepared for the identification of problem, justification and the suggestions/solutions given for the identified problem. Photo proof is essential for all activities.
- The report will be evaluated by committee constituted by the controller with the approval of Principal as per the procedure formulated for the evaluation of project.
- All such projects will be considered as Internship.
- The best solution will be rewarded suitably.

CRITICAL & CREATIVE THINKING

Course Outcome:

CO1: After completing the course the students will be critical thinkers and creative problem solvers by generating new ideas.

Creativity is not an external force or a rare skill, it is a habit that can be learned and exercised every day. This course challenges preconceived notions about creativity and provides valuable tools that will unlock this skill to help you generate better ideas faster. We will lead you through few short, fun exercises that will bring little creativity and will also bring out your hidden thinking skills that you might not have realized before.

1. INTRODUCTION

1A. Types of Human Thinking

a) Remembering and Recalling
b) Understanding
c) Applying
d) Analyzing
e) Evaluating
f) Creating

1B. Opposing Categories of Types of Thinking

a) Vertical vs. Lateral Thinking
b) Concrete Thinking vs. Abstract Thinking.
c) Convergent Thinking vs. Divergent Thinking.
d) Logical vs. Analytical Thinking
e) Creative Thinking vs. Analytical Thinking.
f) Sequential (linear) Thinking vs. Holistic Thinking.

1C. Errors in thinking

a) Partialism
b) Adversary Thinking
c) Time scale error
d) Initial Judgement
e) Arrogance and Conceit

1D. Thinking Formula

a) AIMS Goals Objective
b) Consider all factors
c) Plus Minus Interesting
d) Other Peoples View
e) Alternatives Possible choices

2. **CRITICAL THINKING SKILLS**
    a) Interpretations Skill
    b) Analysis Skill
    c) Inference Skills
    d) Evaluation
    e) Explanation
    f) Self Regulation Skills

3. **CREATIVE THINKING & INNOVATION**
    a) Creative vs. Critical Thinking
    b) Creativity vs. Innovation
    c) Invention vs. Innovation
    d) Creativity and Innovation in Entrepreneurship
    e) Creative Team and Collaborative Thinking
    f) Exploring Innovation and Creativity within Organizations

4. **DESIGN THINKING**
    a) What is Design Thinking
    b) Design thinking process:
        Step 1.Empathy understanding of Problem
        Step 2.Define the problem
        Step 3. Ideate (Generating new ideas for Problem Solving)
        Step 4. Prototype
        Step 5.Test

5. **IDEATION TOOLS AND METHODS**
    a) Brainstorming
    b) Reverse Brainstorming
    c) Mind mapping tool
    d) SWOT Analysis
    e) SCAMPER method