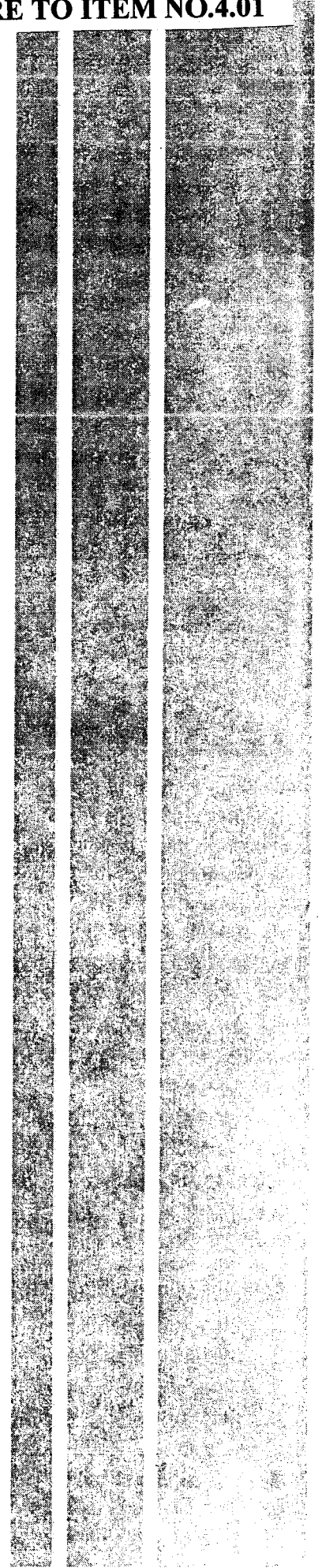


Evaluation Reforms
in Higher Education Institutions in India
- Recommendations



Preface

The University Grants Commission (UGC) has taken various initiatives to bring in academic reforms in the Higher Education Institutions in India. Development and regular revision of curriculum based on "Learning Outcomes" is one of the quality initiatives taken up by the UGC. In continuation with this, evaluation reforms are the next major milestone to be achieved. Some limitations in the current system of testing students have made the need of reforms in evaluation system relevant. However, evaluation should be primarily linked to the teaching pedagogy and learning methods adopted and should be adaptable to situation.

This report of the committee formed by the University Grants Commission is intended to draw attention to areas, which require attention and provide ways and means to be undertaken by institutions to improve the methods of conduct of evaluation. Evaluation plays a pivotal role in the educational system. To make evaluation more meaningful, this report has considered several aspects. Foremost, it was felt necessary to link evaluation to "Learning Outcomes." This document proposes and recommends Learning Outcome-based Framework to structure and link evaluation right up to Institutional goals. It specifies required activities and work products, models of assessment and outlines the role of rubrics to increase objectivity in assessments.

Taking a more comprehensive view of evaluation, this document also covers different types of assessment by considering requisite learning attributes and has been categorized into four groups. Adequate focus is also given to need for more proportion of testing based on internal assessment modes. The document has also touched upon the grading system used and to be considered. It also focuses on the moderation process and important aspects to be considered for conduct of moderation during evaluation process.

Question banks provide an attempt to integrate both teaching and evaluation. The document stresses on the implementation of the question bank system as collaborative efforts of many experts will lead to setting of good quality question papers. Technology has provided us ways to enable lifelong learning and technology has the potential to augment traditional classroom practices and revolutionize learning and evaluation methods. Use of technology both as a learning management system and the administrative conduct of examination process has been recommended.

It is hoped that this document will serve as a useful guideline in taking an important step towards evaluation reforms.

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Glossary of Terms

- **Assessment:** is the process of collecting, recording, scoring, describing and interpreting information about learning.
- **Certificate/ Diploma/ Degree:** A title/ qualification awarded after satisfactory completion of and achievement in a program.
- **Course Learning Outcomes (CLOs):** These are the outcomes/knowledge which every student is expected to gain at the end of completion of each course (subject).
- **Credit:** Unit of measure of course work. Each course may be allotted credits in proportion to the time expected to be devoted by the student for that course.
- **Course:** A basic unit of education and/or training. A course or collection of courses forms a program of study.
- **Cumulative Grade Point Average (CGPA):** Weighted average of the grade points obtained in all courses registered by the student across semesters.
- **Difficulty Index:** (of a question) A measure of the proportion of examinees who answered the question correctly.
- **Discrimination Index:** (of a question) A measure of how well the question is able to distinguish between students who are knowledgeable and those who are not.
- **Evaluation** is the process of making judgments based on evidences and interpretations gathered through examination and assessment and on the basis of agreed upon criteria.
- **Examination** is a quantitative measure of learners' performance and is usually held at the end of the academic session or semester.
- **Fair Assessment:** An assessment which does not give advantage or disadvantage to any student.
- **Grade Point:** Numeric weightage attached to each letter grade.
- **Grade Point Average (GPA):** A system of calculating academic achievement based on an average, calculated by multiplying the numerical grade point received in each course by the number of credits.
- **Graduate Attributes (GAs)** is a set of individually assessable outcomes that are indicative of the graduate's potential to acquire competencies in that programme.
- **Learning Outcome Based Education (LOBE):** Adherence to student-centric learning approach to measure students' performance based on pre-determined set of outcomes.
- **Letter Grade:** Index of performance resulting from the transformation of actual marks obtained by a student in a course.
- **Outcomes:** Intended results of education in higher educational institution: What students are supposed to know and be able to do?

- **Programme:** A collection of courses in which a student enrolls and which contributes to meeting the requirements for the awarding of one or more Certificates/ Diplomas/ Degrees.
- **Programme Education Objectives (PEOs):** Broad statements that described what graduates are expected to attend within few years of graduation.
- **Programme Learning Outcomes (PLOs):** They represent the knowledge, skills and attitudes a student should at the end of the programme.
- **Question Bank:** A repository of quality questions on a subject.
- **Re-evaluation:** A recheck of an already corrected answer script.
- **Registration:** Process through which students select courses to be taken during a semester or module.
- **Result:** Outcome of an assessment/ evaluation which may be expressed in different forms such as marks, letter grade, GPA, etc.
- **Reliable Assessment:** Ensures consistency in the assessment made by the same and/or other assessors with respect to the same learning outcome for a course or a program.
- **Rubric (Assessment Rubric):** A rubric for assessment, also called a scoring guide, is a tool used to interpret and grade students' on any kind of work against criteria and standards.
- **Semester Grade Point Average (SGPA):** Performance of a student in a given semester.
- **Student:** A person admitted and registered under University regulations.
- **Syllabus:** An outline of topics covered in an academic course.
- **Transcript:** A certified copy of a student's educational record.

Background of the Committee

The University Grants Commission (UGC) in order to achieve outcome based evaluation proposes that the existing examination system has to be reformed. As a result, the UGC at its 532nd meeting held on 24-05-2018 has constituted a committee with the following experts to recommend the Examination Reforms:

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|----|--|-------------|
| 1. | Prof. M. M. Salunkhe
Vice Chancellor
Bharati Vidyapeeth
(Deemed to be University), Pune | Chairperson |
| 2. | Prof. V. K. Jain,
Vice Chancellor
Tezpur University, Tezpur
Assam | Co-Chairman |
| 3. | Prof. Furqan Qamar
Secretary General
Association of Indian Universities, New Delhi | Member |
| 4. | Prof. Jaspal Singh Sandhu,
Vice Chancellor,
Guru Nanak Dev University,
Amritsar | Member |
| 5. | Prof. Tankeshwar Kumar,
Vice Chancellor,
Guru Jambheshwar University of Science & Technology,
Hisar | Member |
| 6. | Dr. Prem Kumar Katra,
Director,
Dayalbagh Educational Institute, Agra | Member |
| 7. | Prof. K. Biswal,
Dept. of Educational Management
Information System, NIEPA, New Delhi | Member |

- | | | |
|-----|--|-----------------------|
| 8. | Dr. K. P. Upadhyay
Ex-Controller of Examination,
Banaras Hindu University, Varanasi | Member |
| 9. | Dr. Shashi Nijhawan,
Principal,
Shivaji College, New Delhi | Member |
| 10. | Dr. (Mrs.) Renu Batra,
Additional Secretary,
University Grants Commission, New Delhi | Co-ordinating Officer |

Ms. Megha Kaushik, Education Officer, UGC assisted the Committee.

Introduction

Amidst rapid demands of constant change put forth by a globalised economy, the higher education sector in India is going through its transformation stage. The current pace of accelerated growth of Indian economy, significantly accompanied by surge in growth in certain sectors, primarily services, puts tremendous pressure on the need for human resources to keep up to the momentum and pace of change and growth. The challenge then to the higher education system in the country is to create a skilled resource of the young population it has, to unleash their potential to take on the baton of change and growth. In turn, the Government has a key role to play in aiding to give impetus to provide adequate and high quality education system.

With the aim of the Government to increase the Gross Enrolment Ratio to about 30% by the next decade or so, the country will need more than double the number of 700+ universities it currently has. This will not only ensure meeting expected enrolment ratio targets but will also accommodate millions of students who will seek to pursue higher education by then.

Of foremost concern is just not the quantitative growth, but to also ensure that the students are equipped with 21st century skills for the new age enterprises and to play lead roles in sophisticated ways of conduct of business. In order to achieve this, it is imperative that both the Government and the higher education sector should focus on excellence and employability. Upon these platforms, a strong system should be built-up that takes care of needs of scale and maintenance of quality. With a robust system in place, the higher education sector should focus on being more learner-centric, be oriented to conduct and gain knowledge through research, and be in pursuit of constant improvements in quality.

Innovation and technology can be drivers that can accelerate the much needed recognition of Indian higher education. Technology as an enabler is now being introduced, albeit in its nascent form, in a manner that was unthought-of, couple of years ago. Digital learning is now harnessed upon to deliver education in smaller modules. Capacity issues can be bridged by digital learning modes and online learning modes. Parameters of testing and assessment need relook and reorientation so as to create the next generation knowledge workers. A whole new format of assessment tools using digital platforms need to be utilized to build the requisite skills that is required of a growing economy. This said, in some specific way with unified efforts, will enable all students who have enrolled in higher education programmes to attain requisite skills of higher order through the intended learning outcomes.

Current Examination System

In India, the higher education has so far been largely examination oriented. The examination pattern that currently exists in University structure, test memory learning. In most cases, the examination system is affiliating in nature with external final University-conducted examination at the end of every semester or every year; this, solely serves as the purpose of assessment. This system, more often than not, insulates students from the quest of knowledge, excitement of discovery and joy of learning.

Often the annual examination alongwith marks, percentages and division leads to insensitive cramming up of superficial discreet information. Thus, with very little focus on continuous assessment during the teaching-learning process, it renders all emphasis on the final examinations orienting all teaching and teaching pedagogy towards preparing students to work towards getting better marks. In several instances, the university certified degree holders of UG, PG or Ph.D. are subjected to another written examination before they are accepted for jobs in public or private sectors. Thus, students enrolled under the higher education system are not coming out with the desired level of knowledge and expertise.

The term-end examination is usually based on the question paper which tests only memory recall as a skill. The way a question paper is set reflects on the academic quality of the institution and its members. Thus, dependence on answering the term-end examination based on a question paper puts forward flaws of the single nature of assessment (majority of marks are dependent on performance at the term-end examination). The pattern and design of the question paper is decided by the Board of Studies for each subject, and is responsible to appoint paper setters and evaluators. Requirement of question papers by the examination department of a university is a continuous process, thus there might be issues of compromise of quality of question papers set due to its constant requirement.

The machinery of conduct of end of term examination exerts tremendous pressure on affiliating universities due to large number of examinees. The question papers which are set have to be printed and sent to various examination centres, which are at a distance requiring huge logistics support so as to ensure that the examinations are conducted simultaneously. The answer scripts of the students are then transported to designated centralized assessment centres. The marks of each subject received from the designated evaluation centres have to be integrated into the mark sheet of each individual student thereby requiring accuracy and its completion in limited time to facilitate timely declaration of results.

International Scenario

In United Kingdom (UK), the Quality Assurance Review identified student assessment as a key area of concern (QAA 2014), while UNDP Regional Bureau for Arab States reports in a quality audit of 23 universities that:

.... assessment continues to be a weakness, particularly in three respects. First, too much emphasis is placed on the memory recall of descriptive knowledge. Second, not enough is done to test higher-level cognitive skills. Third, there is virtually no moderation either internal or external to ensure the fairness and transparency of marking (UNDP/RBAS 2006:5).

Marks and grades are increasingly seen by students as commodities with a purchase price and spending power; in line with the OECD's findings, university students know that an investment in fees will generate a life time return.

Across 25 OECD countries and the partner economy Israel, individuals with university degrees and advanced research education had earnings that were at least 50% higher than individuals whose highest level of educational attainment was below the upper secondary level (OECD 2007 a:6).

In western countries, most of the universities and institutions of higher education are assessing the students wholly on internal evaluation methods following the principle "those who teach should evaluate". The system followed in the western countries has been accepted by the whole world and the students coming out of those countries are valued higher than the degree holders of the Indian universities.

Rationale for Evaluation Reforms

In India, examinations play a pivotal role and are a deciding factor of career choice of students; ability to pursue the right higher qualifications and determine the degree of knowledge possessed. The global competitive forces and the wave of disruptions in industry have brought in sweeping changes both in terms of skill requirement and the decision making capabilities of human resource, thereby exerting tremendous pressure to perform in complex situations.

However, assessment of students currently existing in the university system is a matter of concern. Committees that have been setup in the past for improvement in the examination system have recommended changes in the examination system. The same pattern exists in terms of final examination as a standard or decider of fate of millions of students, thereby rendering changes suggested to have little or minimal impact. The end of term examination, in many cases, are for three hours each and which is the sole tool to decide the future career of students.

Current examination system tests memory learning skills. Demands from profession require students not just to possess information but an individual application to every situation either routine or complex. This necessitates pressure on students to perform to the best of their capabilities. Memory learning may be required but not adequate to performs in the challenging environment that currently prevails. There is a need to assess application skills or skills of higher ability like analysis, creation, evaluation etc.

Standardisation of assessment has its flaws as every student differs in terms of intellect and ability and as such one tool of measurement is akin to "*one size fits all*", which fails to identify genuine abilities and potential of students.

Examinations, in its current form are moments of stress and anxiety for students, both pre-examination as well as post examination. Coupled to this are issues of malpractices which have impact on their credibility.

Reforms thus are much needed to ensure credibility and the outcome of the assessment system. There is a need to have more horizontal assessment modes rather than one single vertical mode that decides fate of students. Reforms in examination for all forms of education i.e. formal face to face mode, Open and distance learning mode etc., should thus aim at overall development of students in terms of their critical thinking, problem solving ability, right application of knowledge, and maintain ethics.

Discussion on Evaluation Reforms

1. Framework for Outcome based Education and Assessment

1.1 Higher Education – Some contributions towards policy development

A comprehensive Higher Education Policy has been developed by revered *Professor P.S. Satsangi*, Chairman, Advisory Committee on Education, Dayalbagh Educational Institute, in the form of the Interpretive Structural Model (ISM) of Higher Education System. It identifies 93 elements (Figure 1 and Figure 2) that cover four sub-systems in the form of a hierarchical structure with the contextual relationship 'leading to'. The policy elements form a basis for the development of a framework for outcome based education and assessment.

The Mission objective is at the top of the structure (refer structure at www.dei.ac.in), which is to develop a well-rounded person and then there are four sub-systems, namely, (1) Aims and Objects, (2) Educational-Curricular Features, (3) Organizational Policy Support, and (4) Governance Policy Support.

The first one – Aims and Objects – whose elements are detailed below, is immutable. The second sub-system namely, Educational and Curricular Features, which is less subject to change, consists of sub-systems such as Intellectual Activity, Social Activity, Physical Activity and the Curriculum which is integrated, broad-based and interdisciplinary. Any student who joins the undergraduate class has to go through not only the regular curriculum but also become aware of democratic processes and the Indian Constitution through courses in Humanities; take core courses in Indian Culture, Comparative Study of Religion, General Knowledge, Scientific Methodology and Work Experience; and participate in co-curricular activities consisting of Social Services, Games and Sports, Cultural and Literary Activities. Different educational activities lead not only to the fulfillment of Academic Objectives, but also inculcate Moral and Spiritual Values and develop social sensibilities among students. High performance standards are set up for monitoring quality of the system against the aims and objects laid down by the policy and then making suitable changes based on this feedback so as to achieve the objective of evolving a well-rounded complete person. There is an emphasis on fundamental principles and there is continuous evaluation system, semester system and grading system. There is an interaction of the system with the environment, for instance, through extension projects and industry-institute interactions. Thus, learning takes place through these means. Students are encouraged to also familiarize themselves with one other modern Indian language – Telugu, Tamil, Oriya, Bengali, or even one of the foreign languages like Russian, French, German.

The third sub-system - Organizational Policy Support - may be subject to greater variation. There are policies for organizing student participation in co-curricular and extra-curricular activities and for remedial teaching. Emphasis is on learning through seminars, paper reading, group discussions etc. There is a system of formal learning or formal education by introducing major academic subjects, subjects with 50% weightage and electives. There is also provision of lateral entry of moving from one level of education to the other for better qualified students. There is also non-formal and private education. Non-formal education will improve distance education and private education will improve virtual education or cyber-education.

The fourth sub-system - Governance Policy Support - where systems and procedures are to be implemented at higher education institutions to meet the outcomes expected, effectively and efficiently.

Infrastructure for learning is provided in terms of well-equipped laboratories, science center, hobby center, teaching-aids center and modern library. Student welfare measures are provided in terms of free or affordable education and assistance. The training and motivation of staff is through in-service training programs and by providing conducive physical and psychological environment. Also, there is vocational guidance and counselling for students and training and placement cells. There is a provision of attachment of a university to below university institutions, both technical as well as general educational institutions and this provides backward linkage and helps in preparing students in these below university institutions for entering into a university as well as facilitates experimental work in these below university institutions to be undertaken by the higher level educational sub-systems. Special efforts are available for disadvantaged persons as well as weaker sections of community and for gifted students.

ISM for Higher Education Policy System

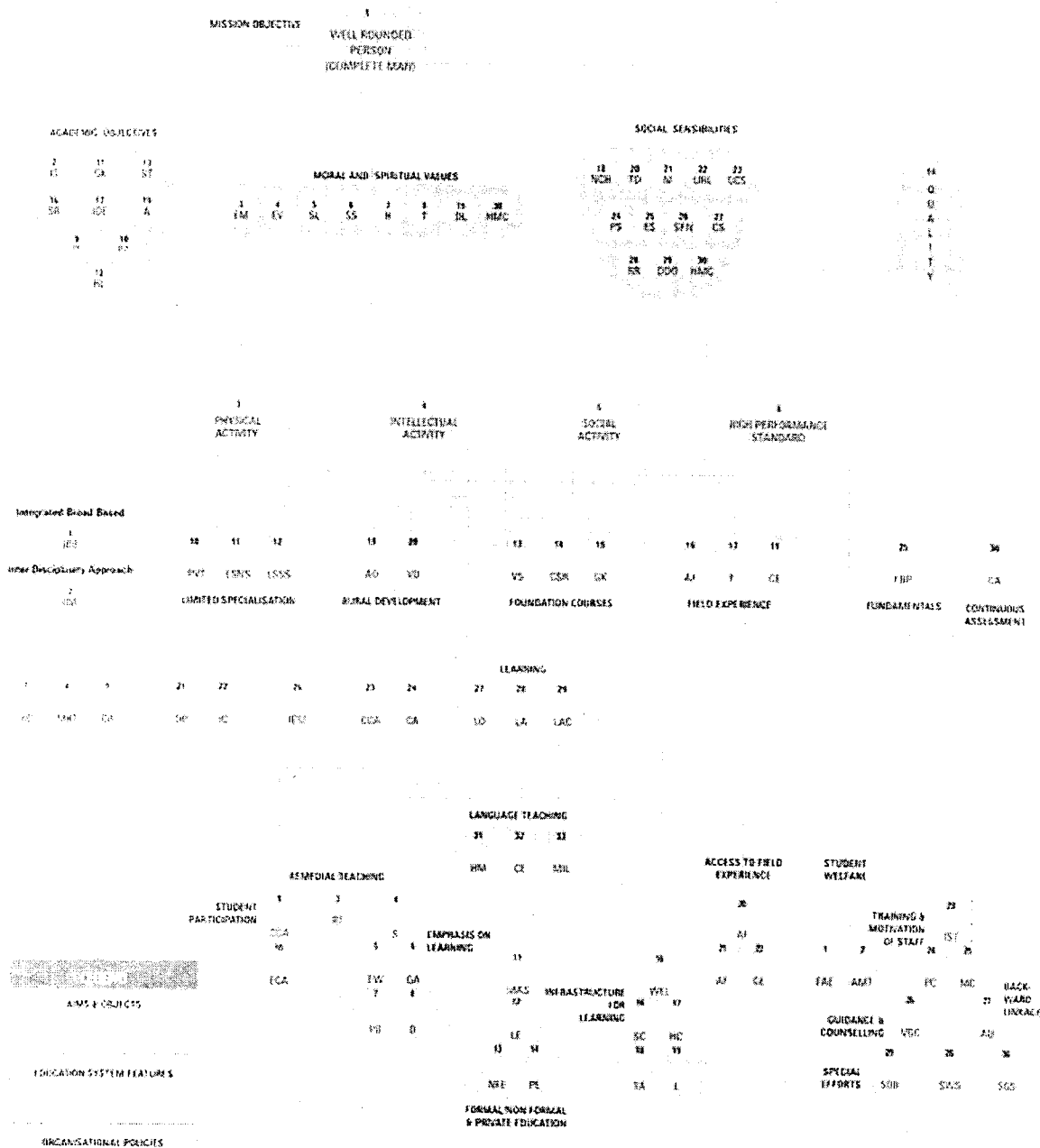


Figure-1 : ISM for Higher Education Policy System
(Figure-1 continued to next page)

Legend

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Integration of all Aims and Objects finally leads to the objective of developing a well-rounded person. The 30 Elements of Aims and Objects can be considered under four aspects as follows:

A. Academic Objectives	B. Moral and Spiritual Values
1. <i>Intellectual Strength</i>	10. <i>Emotional Maturity</i>
2. <i>General Knowledge</i>	11. <i>Ethical Values</i>
3. <i>Scientific Temper</i>	12. <i>Simple Living</i>
4. <i>Self Reliance</i>	13. <i>Selfless Service</i>
5. <i>Inter Disciplinary Exposure</i>	14. <i>Humility</i>
6. <i>Aptitude</i>	15. <i>Truthfulness</i>
7. <i>Independent Thinking</i>	16. <i>Dignity of Labour</i>
8. <i>Reasoning Ability</i>	17. <i>High Moral Character</i>
9. <i>Habit of Learning</i>	
C. Social Sensibilities	D. Quality
18. <i>National Culture & Heritage</i>	30. <i>Quality of Education</i>
19. <i>Tolerance for Diversity</i>	
20. <i>National Integration</i>	
21. <i>Understanding Rural Life</i>	
22. <i>Class-less & Caste-less Society</i>	
23. <i>Political System</i>	
24. <i>Economic System</i>	
25. <i>Social Forces & Needs</i>	
26. <i>Civic Sense</i>	
27. <i>Respect for Rights</i>	
28. <i>Duties & Discharge of Obligations</i>	
29. <i>High Moral Character</i>	

Figure-2: Elements of Aims and Objects

1.2 Learning Outcome Based Education and Assessment

Learning Outcome Based Education (LOBE) advocates the importance of establishing a “clear picture of what is important for students to be able to do, organizing the curriculum, instruction, and assessment to make sure that learning ultimately happens.” Important action points under the LOBE approach include:

- Define exit outcomes through active participation of all stakeholder groups
- Redefine performance and standards to provide regular reports on actual student learning levels in all key outcome areas
- Redesign of future-focused curriculum, with a problem and issue-based content focus and continuous development of student abilities alongwith all major competence dimensions

- Develop "high engagement/high activity" classrooms staffed by a variety of internal and external experts with continuous emphasis on multimodality active learning by individuals and learning teams.
- Encourage learning by performing in authentic and real-world settings and promote extensive use of high technology tools and applications
- Promote use of focused learning and resource centers with expanded access to facilities, materials, and learning resources.

The Learning Outcome Based Education (LOBE) model put forward by Spadys (1988) emphasizes on the importance of Program Learning Outcomes (PLOs) that serves as a critical factor to design curriculum and steer direction of all levels of outcome, i.e. course outcomes, unit outcomes, and lesson outcomes. Learning Outcome Based Education approach, helps to focus on utilization of appropriate instruction and pedagogy, helps organize teaching and learning processes around career advancement and placement of students, helps in selection and design of appropriate assessment modes and that programmes are awarded based on demonstrated achievement of outcomes. The core philosophy of Learning Outcome Based Education rests in adhering to student-centric learning approach used to measure students' performance based on pre-determined set of outcomes. Among others, of significant advantage of Learning Outcome Based Education is in bringing out reforms in curriculum framework that has to be outcome based; constant up gradation of academic resources; raising quality of research and teaching; technology integration in the teaching-learning processes; bringing out clarity among students as to what is expected from them after completion of the programme and for teachers in bringing focus on what to teach, how to teach and evaluate.

Since, Program Learning Outcomes provide direction in curriculum design, instruction/delivery and conduct of assessment, its measurement can be done through identification of related Competencies and Performance Indicators (PI). Identification of Competencies for each Program Learning Outcome is essential as it helps to understand what students should achieve. For each Competency, Performance Indicators (PI) have to be defined which are statement of expectations of students learning. It acts as tools of assessment and provides clarity of the extent of attainment of outcomes. The strategy and plan of assessment thus, need to be mapped to the Performance Indicators which are an attempt to achieve both Course Learning Outcomes and Program Learning Outcomes. However, it is imperative for institutions to set the Program Education Objectives, Program Learning Outcomes, Course Learning Outcomes, Competencies and Indicators consistent with its Vision and Mission statements. The Program Education Objectives and the Program Learning Outcomes

should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. For instance, each discipline / domain along with core and elective courses should work towards solving problems and challenges faced by society at global or local levels. A review of the goals and outcomes on a regular basis forms an essential step.

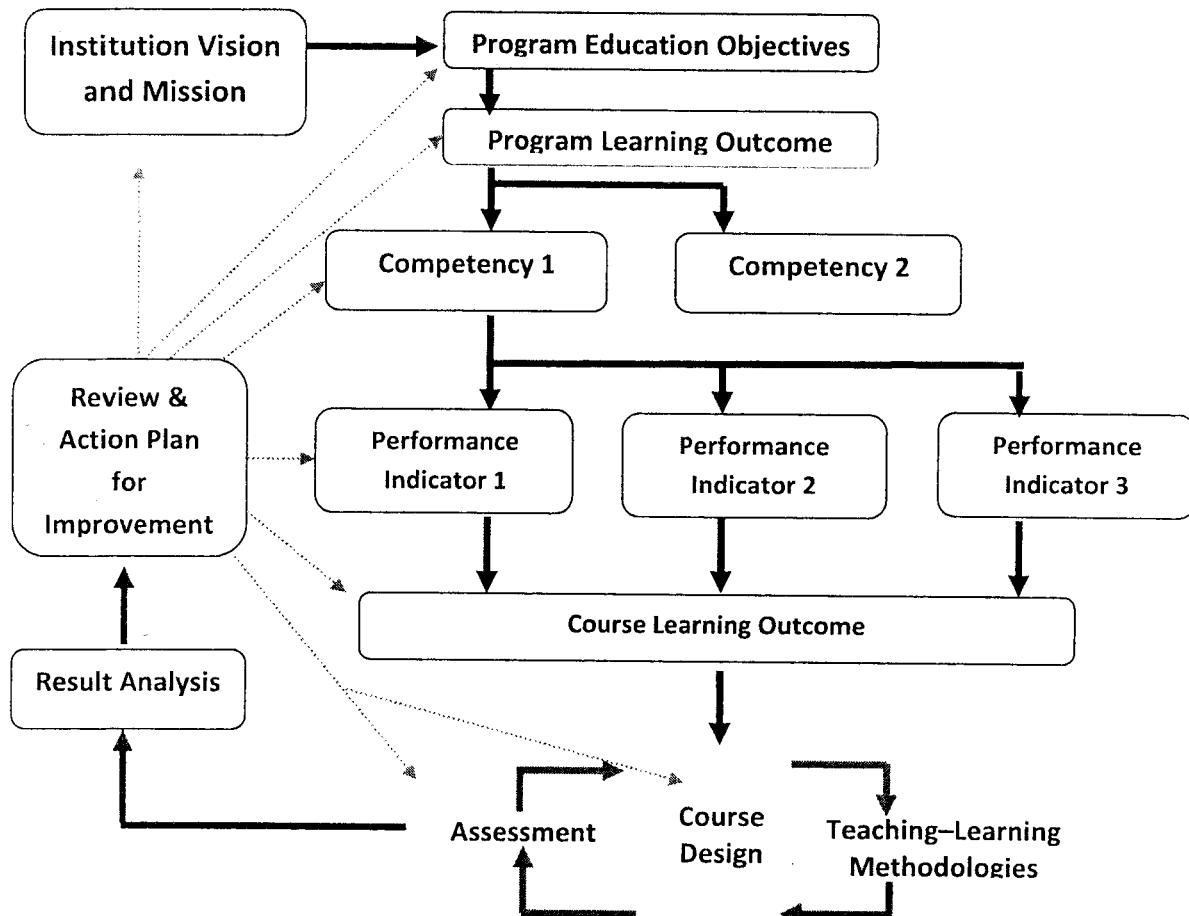


Figure-3 : Vision, Mission and Outcomes

The Learning Performance Pyramid describes an iterative model where the organizational characteristics (goals) drive the organizational objectives and objectives further lead to organizational outcomes.

The first step in developing the Program Education Outcomes is to develop clear Program Education Objectives (PEOs). Program Education Objectives depend upon the goals, mission and vision statements of the institution/organization along with the inputs from all its stakeholders like parents, students, society, environment, regional and national interests as illustrated in Figure-4.

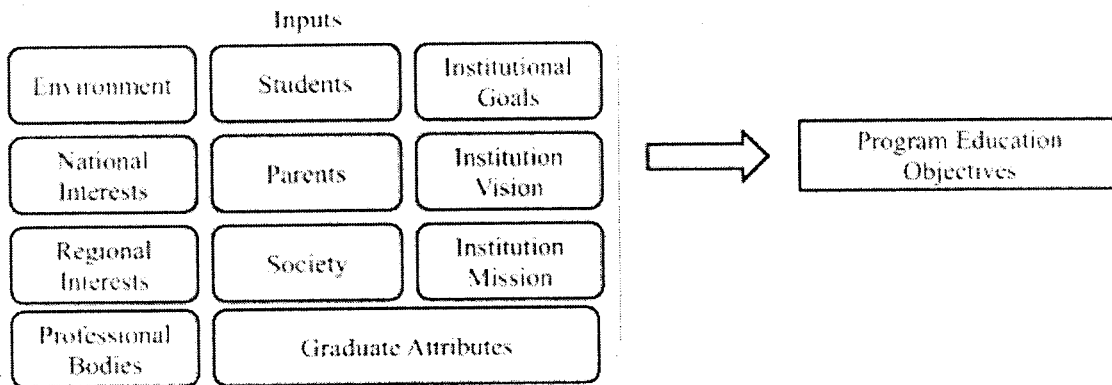


Figure-4 : Organizational Inputs to Program Education Objectives

LOBE is a dynamic and flexible framework, which allows organizations/institutions to design their institutional specific program education objectives to evolve continuously along with the evolution of social systems, ever changing national and regional interests.

Once an institution defines program education objectives, these objectives will lead to the development of Program Learning Outcomes. Program Learning Outcomes lead to the identification of competencies and from competencies one may derive multiple indicators or measurable components to assess competencies objectively.

Program Learning Outcomes also lead to design and development of a curriculum containing multiple courses with specific objectives. Course Learning Outcomes and respective course competencies and its indicators are further derived from course objectives.

A Program Learning Outcome may lead to one or many different competencies and each competency may have one or more measurable components called Indicators/Performance Indicators. The figure below describes the linkages between Program Learning Outcomes and Competencies and its Indicators.

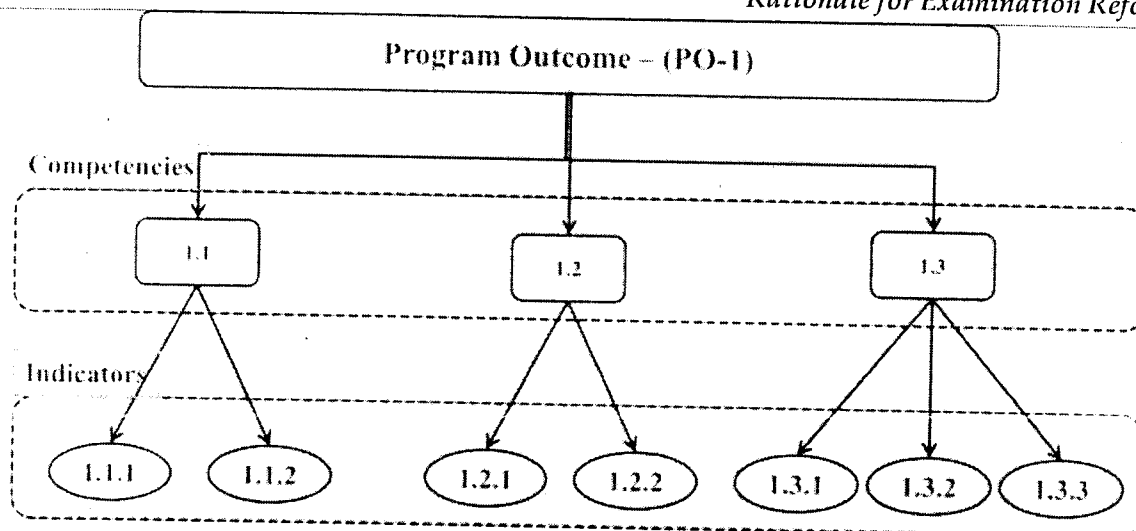


Figure-5 : Traceability of Program Learning Outcomes to Competencies & its Indicators

Competencies describe how to demonstrate the ability to perform a specific activity such as Designing, Synthesizing, Evaluating etc. However it is important to note that not all the competencies identified may be measurable. Hence, it is necessary to define the Competency, Performance Indicators that may represent a specific and measurable characteristic of a competence. An indicative illustration is provided under appendix 2 at 2.6 which mentions Program Learning Outcome, Competencies and associated Performance Indicators for B.Com. /B.A. (Economics)/B.Sc. (Chemistry) programmes.

Applying the systems approach, a Systems Engineering Process Model for LOBE may be designed which not only describes the phases and traceability elements, but also describes the importance of assessments after the course curriculum has been implemented. The process model outlined below is a V-shaped model in which the work flow is from the left, top to bottom, to the right, bottom to top.

Systems Engineering Process Model for LOBE

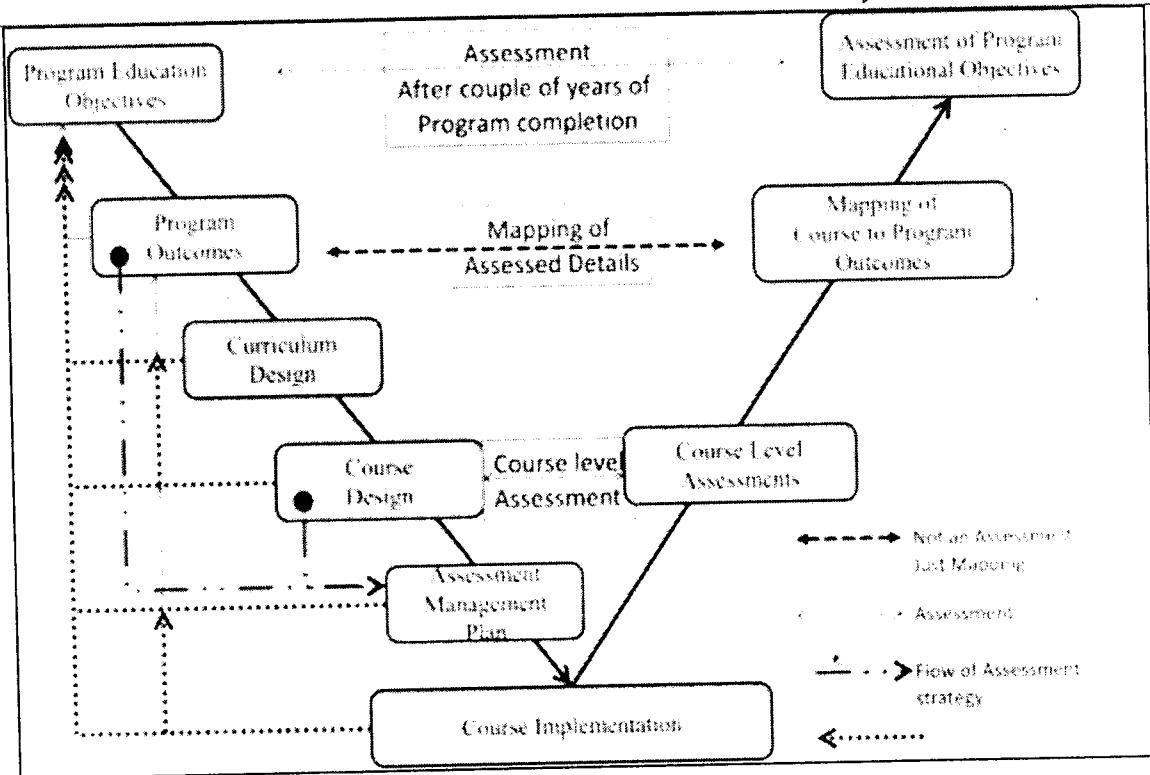


Figure-6: Systems Engineering Process Model for LOBE

In figure 6 above, the left half illustrates different phases as well as set of deliverable work products each of which is traceable to the work product generated from the previous phase; for instance, the traceability of Course Learning Outcomes to Program Learning Outcomes and Program Learning Outcomes to Program Education Objectives. Iteration between phases is necessary for refinement. All deliverables may be verified by an internal program administration committee. The right half of the Process Model details the assessment activities as per the assessment management plan. In the initial phase, assessments are performed at the course level. The assessment results are mapped to the program level and the performance is reported in an appropriate format. In the last phase, assessment is performed over few years after graduation. This assessment is performed based on feedback from students who have graduated from the university, from employers and from stakeholders dependent on the Program Learning Outcomes. The phases in the V-model are described in the following sections.

1.2.1 Program Education Objectives (PEOs)

To encourage and facilitate the adoption of the LOBE model across all disciplines, a list of Generic Program Education objectives has been identified from the higher education policy and mentioned at *Appendix-1*.

Following factors are to be considered while framing the PEOs.

- The PEOs should be consistent with the mission of the institution.
- All the stakeholders should participate in the process of framing PEOs.
- The number of PEOs should be manageable.
- It should be based on the needs of the stakeholders.
- It should be achievable by the programme.
- It should be specific to the programme and not too broad.
- It should not be too narrow and similar to the PLOs.

1.2.2 Program Learning Outcomes (PLOs)

PLOs shall be based on Graduates Attributes (GAs) of the programme. GA is a set of individually assessable outcomes that are indicative of the graduate's potential to acquire competencies in that programme. The GAs are the attributes expected of a graduate from a programme in terms of knowledge, skills, attitude and values. The graduate attributes include capabilities that help to strengthen one's abilities in terms of widening and gaining knowledge and skills, undertaking higher studies, enhancing performance in chosen field and being socially responsive.

Prepared on the basis of the Washington Accord's Program Learning Outcomes, the list mentioned in *Appendix-1* is drawn from the program education objectives. A matrix has been outlined under *appendix-1* linking Program Learning Outcomes to Program Education Objectives. The Competencies and their Performance Indicators of the Program Learning Outcome need to be developed after which it is important to determine assessment types. A comprehensive assessment strategy may be outlined using the revised Bloom's taxonomy levels (*refer illustration at Appendix-2 , 2.1*).

1.2.3 Curriculum Design and Course Development

Next, keeping in view the Program Learning Outcomes, a curriculum must be designed and courses developed. The curriculum must be linked to the program objectives and outcomes and further the course level assessment strategies must be linked to identified program level assessment strategies. (*framework for mapping Program Learning Outcomes to Course Learning Outcomes and the course assessment strategy is provided in Appendix 2 and also under 2.3 of Appendix 2*).

1.2.4 Course Learning Outcomes (CLOs):

These are the outcomes/knowledge which every student is expected to gain at the end of completion of each course (subject). These are listed and based on them the course curriculum is finalized. Course Learning Outcomes are narrower statements that describe what students are expected to know, and be able to do at the end of each course. Course Learning Outcomes should reflect what level of knowledge students gained, skills acquired and attributes developed upon successful completion of the course; CLOs must be measurable, attainable and manageable in number. CLOs should contribute to attain PLOs in such a way that each CLO should address at least one of the PLOs and also each PLO must be reasonably addressed by adequate number of CLOs.

1.2.5 Assessment Management Plan

An assessment management plan should be prepared that details the assessment strategy both for the program and the course levels. In the assessment plan, it is important to identify type of assessment for each course and the timelines. Choosing type of assessment, needs consideration of characteristics learning attributes, its mapping to revised Bloom's taxonomy and assessment rubrics (refer 2.4 under Appendix-2), which gives a clear picture of the right assessment mix for a particular course. Any assessment should be finally implemented using an assessment rubric. The assessment rubric relates to the actual evaluation used for every course and is a tool to interpret and grade students.

1.2.6 Timelining Assessments

Assessments must be continuous to include both formative and summative components in a timely fashion for continuous feedback. An illustration is provided in the figure below:

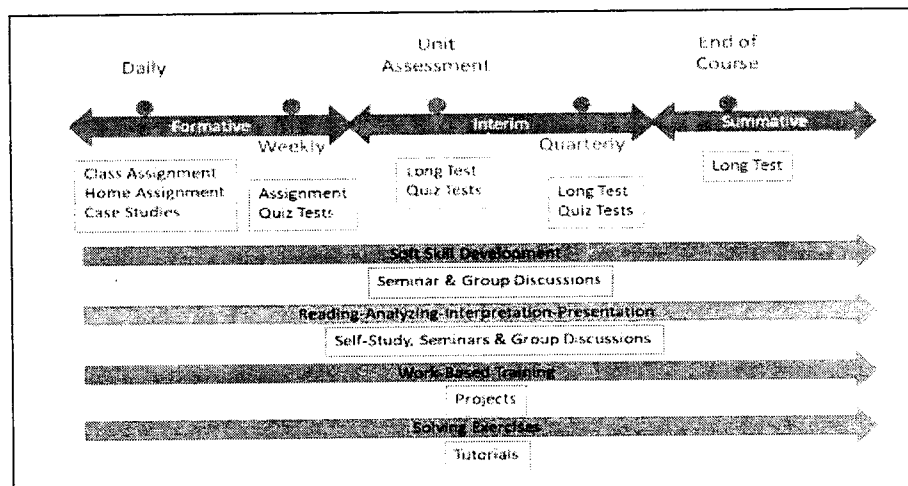


Figure-7 : Continuum of Assessments.

In essence, Programme Learning Outcomes need to be developed with a broad perspective. Achievement of learning outcomes does not solely depend upon one single type of assessment at the end of the term. It is an integration of strong learning culture, identification of competencies, appropriate teaching pedagogy, design of holistic learning experiences and choice of assessment in the form of continuous internal evaluation that is formative in nature. The system of assessment to be adopted needs to be inherently linked to programme/curriculum goals as one can objectively assess student performance by relating assessment type to Program Learning Outcomes and Program Education Objectives. Course Learning Outcomes (CLOs) should also be set for every course of the program and a process may be prepared to measure the attainment of Program Learning Outcomes (PLOs) and Program Educational Objectives (PEOs). Assessment methods and its questions must be mapped to each CLO and every CLO must be mapped to a PLO. Each question of the internal assessment modes as well as the external examination should be linked to the CLO, hence the student performance for each question must be monitored to measure the attainment of CLO.

The assessment tools (internal and external) for each course must be mapped to the revised Bloom's taxonomy action verbs (refer <http://thesecondprinciple.com/teaching-essentials/beyond-bloom-cognitive-taxonomy-revised/>) to help measure student performance. A detailed process of attainment of Program Education Objectives is mentioned at *appendix 2 under 2.5*.

The goal of learning is in achievement of the programme/curriculum goals and not just focusing on syllabus completion. The programme/curriculum goals, its expectations and achievement of competencies must be clearly understood and explained by teachers to the learners. Based on programme/curriculum/course goals, teachers should:

- a) Design appropriate teaching pedagogy,
- b) Provide learning material and resources or links to such resources, and
- c) Choose right assessment type/s appropriate to each course.

If an HEI can perform a qualitative assessment using the well-defined LOBE framework discussed above, then the HEI will be able to provide a holistic assessment and healthy performance report to the students.

2. Assessment Types

Student understanding must be built on and assessed for a wide range of learning activities, which would include different approaches and are classified along several bases such as :

Based on Purpose: Assessment types include i) Summative (evaluation of students learning at end of instructional unit) and ii) Formative (informal and formal tests administered during the learning process).

Based on Nature of Data : i) Quantitative evaluation is mainly concerned with scholastic achievement in subject-based performance whereas ii) Qualitative is chiefly about evaluating the non-scholastic and probably more important, aspects of the student's personality involving social, emotional, attitudinal and moral/ethical assessment.

Based on Domain: Assessment types include i) Scholastic achievement (assessment of curriculum related classroom teaching and learning) and ii) non-scholastic achievement (assessment of students behavior, values attitude, emotional stability during co-curricular activities and other structured or unstructured situations inside or outside the classroom).

Based on Measuring Standard: i) Criterion-referenced (uses test score to generate a statement about the behaviour that can be expected of a person with that score), ii) Norm-referenced (Standardized) (whether test takers performed better or not than a hypothetical average student) and iii) Self-referenced (Ipsative) Evaluation (assessment of a person's performance is compared with their own earlier performance to identify improvements , if any).

A further classification is based on *direct* and *indirect* measurement of learning. A direct method which is based on a sample of actual student work, including reports, exams, demonstrations, performances, and completed works, requires students to produce work so that teacher can assess how well students meet expectations. An indirect method is based upon a report of perceived student learning. These include surveys, exit interviews, and focus groups.

The assessment must be designed with learner attributes in mind. These attributes, which have clear linkages to Program Education Objectives and Outcomes, stem from the taxonomy. A critical overview of Assessment Types along with learner attributes is given in *Appendix-3*.

A wide range of assessment types for evaluating students is available for the teachers/institutions to use. Each assessment type has its distinct utility, advantages and limitations. A suitable compendium of such types needs to be carefully chosen for a particular program depending on its nature, objectives and available resources. An overview of some of the significant tools alongwith their advantages and limitations is presented below :

Written Mode	Oral Mode	Practical Mode	Integrated Mode
1. Exams	1. Viva/ Oral exam	1. Lab work	1. Paper
2. Class Tests	2. Group discussion / Fishbowl technique	2. Computer simulations / Virtual Labs	Presentations / Seminars
3. Open Book Exams / Tests	3. Role play	3. Craft work	2. SWOC Analysis
4. Open Notes Exams / Tests / CA	4. Authentic Problem Solving	4. Co-Curriculars	3. Authentic Problem solving
5. Self-Test/Online Test	5. WSQ (Watch Summarise question)	5. Work Experience	4. Field Assignments
6. Essay/ Article Writing	6. One Question Quiz		5. Poster Presentations
7. Quizzes/ Objective Tests	7. End of the class quiz		6. Portfolios
8. Class Assignment	8. Think-Pair-Share		
9. Home Assignment	9. Socratic Seminar		
10. Annotated Bibliographies	10. Rapid Fire Questions		
11. Reports	11. KWL (Know - Want To Know - Learned)		
12. Portfolios			
13. Dissertations			
14. Book Review			
15. Article Review			
16. Journal Writing			
17. Case Studies			

Written Mode

Assessment Type	Examinations
Nature	Traditionally essay type, time- constrained, external exams
Advantage	Relatively economical; No chance of plagiarism; Familiarity to students and staff; Fixed date forces students to learn; Chance for in depth & planned preparation; Provides overview of attainment in the entire course.
Limitations	Tests memory most of the times more than higher level thinking; No feedback to students as the course is over by exam time; Can encourage surface learning; Sampling of content not comprehensive; Element of chance; 'Halo effect': the level of the long answer just marked can change expectations of the next answer; External examiners may not do their job sincerely as there is no accountability to students.

Rationale for Examination Reforms

Assessment Type	Examinations
Suggested Frequency	Term-end, (preferably semester- end not annual)
Suggested Usage	Include all types of questions-essay, short answer, objective; Design to test all levels of cognitive domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Rubrics (with detailed indicators of level-wise performance) & Model Answers for marking essay type ques. for minimizing subjectivity; Marking Criteria made known to students; Answer copies should be code numbered; Examiners with good track record from well-rated universities be selected; Provision for improvement of scores & make up in cases of established emergency.

Assessment Type	Class Tests
Nature	Traditionally essay type, time- constrained, internal exams
Advantage	Relatively economical; Less chance of plagiarism; Familiarity to students and staff; Fixed date forces students to learn; Chance for in depth & planned preparation
Limitations	Tests memory more than higher level thinking; Delayed feedback to students as correction needs time; Can encourage surface learning; Sampling of content not comprehensive; Element of chance; 'Halo effect'
Suggested Frequency	2-3 times in a semester including make-up test
Suggested Usage	Include all types of questions-essay, short answer, objective; Design to test all levels of cognitive domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Rubrics (with detailed indicators of level-wise performance) & Model Answers for marking essay type ques. for minimizing subjectivity; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.

Assessment Type	Open Book Exams / Tests
Nature	Students allowed to get books of their choice for reference
Advantage	Less stress on memory; Slower writers not penalized; Measures what students can do with resources not just what they can remember
Limitations	Not everyone might have access to same quality book(s); Difficult to run in teaching rooms as more desk space is required
Suggested Frequency	One of the class tests or some class assignments (say 30%) could be of this type
Suggested	Questions be based not simply on retrieval of information but creative

Assessment Type	Open Book Exams / Tests
Usage	synthesizing, critically assessing and organizing it too; Students be trained in reference reading; Consultation of several text books be encouraged during teaching; Library should have good stock of books; Book Banks can be maintained.

Assessment Type	Open Notes Exams / Tests / CA
Advantage	Helps encourage good note taking;
Limitations	Students need to get used to the system; Bad note taking penalized; Can discourage use of memory; Needs larger desk space
Suggested Frequency	One of the class tests or some class assignments could be of this type & even combined with Open Book Test
Suggested Usage	Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

Assessment Type	Self-Test (Online or Conventional)
Nature	For all types of subjective & objective items
Advantage	Flexible timing (according to need & readiness of learner); Self/Automated checking; No bias or subjectivity; No fear of ridicule; Mastery learning occurs if proper feedback and follow up is embedded
Limitations	Less motivated students may not opt for it unless mandatory
Suggested Frequency	Available at all times for self-improvement
Suggested Usage	Available for a specified duration (if course requirement) or at all times (if for self-improvement); Topic-wise questions could be uploaded on MOOCs/LMS. Test could be auto generated according to need; Could be compulsory or optional.

Assessment Type	Article/ Essay Writing
Nature	Individual long, written assignment
Advantage	Scope for individual expression & creativity; Can show depth of learning; Comprehensive test of written communication; Examine students' ability to form coherent arguments; Can show breadth of student knowledge and understanding; Plagiarism can be difficult to detect; Useful later for students' research activities and develop critical skills for students to a wide range of material
Limitations	Some students may not be able to show their abilities in the essay format due to not having been well trained in essay writing; Very time consuming

Rationale for Examination Reforms

Assessment Type	Article/ Essay Writing
	to mark objectively; 'Halo effect': the level of the essay just marked can change expectations of the essay about to be marked; Essays are time consuming to write and so cannot test all of the syllabus; Students can be rewarded for simply regurgitating 'all they know' on a topic; grading can vary from marker to marker so grades can be subjective
Suggested Frequency	One per course per semester
Suggested Usage	Topics be well selected to test critical, reflective thinking, and extended reading; Rubrics for marking be developed & shared with students; Variety of topics for same and different learner levels be prepared; Students must be first oriented to essay writing skills according to UG/PG level.

Assessment Type	Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) / Recall Type -Filling Blanks; One word / Phrase Answers
Nature	Structured Tests; short duration
Advantage	Can be very reliable; Excellent validity as greater syllabus coverage; Can show how fast students think; Can be carried out quickly; Requires less effort in correction; Can be used to test interpretation and decision skills
Limitations	Students may be guessing; Takes skill to design good questions - especially questions to test high level learning outcomes; Needs careful planning to ensure the answer choices are clear; Risk of hacking; Risk of impersonators; Not always available to students with certain disabilities
Suggested Frequency	4 per semester including 1 Makeup & 1 Surprise Quiz; Also valuable as 'End of the class quiz'
Suggested Usage	Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Balance between recognition and recall types; Go beyond factual information to HOT Skills.

Assessment Type	Annotated Bibliographies
Nature	Individual or group assignment
Advantage	Good test of students' abilities to scan and evaluate literature; Can stimulate higher order thinking skills as students review; stimulates group work and discussion; Good preparatory skill for research
Limitations	The material for review may not be available to the student; The range of material may vary in relevance and degree of difficulty
Suggested Frequency	Once in a semester in 1- 2 courses
Suggested Usage	Topics should be based on students' interests and course requirements; Referencing skills be first taught to students.

Assessment Type	Reports
Nature	Of activity performed or event observed
Advantage	Develop a key transferable skill; Reports can involve a wide range of skills that are otherwise hard to directly assess
Limitations	Can be very time consuming for students; Using the same format and structure for a range of reports may decrease their effectiveness
Suggested Frequency	1 per Semester (mostly in practical courses)
Suggested Usage	Important to first teach report writing requirements and process.

Assessment Type	Portfolios
Nature	Usually in practical courses to display an overview of the sessional work or some creative endeavour
Advantage	Can contain evidence of a wide range of skills and attributes; Can be very effective in combination with a quick viva exam; portfolios can demonstrate progress in learning; Portfolios can reflect students' attitudes and individual strengths
Limitations	Looking through portfolios can be time consuming; Hard to mark objectively; Authenticity of evidence can sometimes be questioned
Suggested Frequency	1 per Semester
Suggested Usage	Can be of various formats; Course instructor should specify some basic requirements for objectivity in assessment.

Assessment Type	Dissertations
Nature	Detailed research based report
Advantage	Individual work, allowing a student to demonstrate their understanding, creativity and research skills
Limitations	Assessment takes a long time; Subjectivity may creep in; Issues of structure and style may overshadow assessment of the work
Suggested Frequency	1 per semester or year depending on the program level & credits (UG/PG)
Suggested Usage	Should be assessed periodically as the work progresses; Assessment should include presentation followed by discussion & constructive suggestions before a panel and others interested; External exam may be in the form of a viva or presentation.

Assessment Type	a)Book Review b)Article Review, portal reviews etc
Nature	a) PG level b) UG / PG levels
Advantage	Requires interpretation and evaluation; Opportunity to understand how experts proceed; individual work allowing a student to demonstrate their understanding
Limitations	Students need to be taught how to review; Difficult to find appropriate articles
Suggested Frequency	Once in a semester in 1-2 courses
Suggested Usage	Topics should be based on students' interests and usefulness; Students should be first exposed to good reviews and the basic requirements.

Assessment Type	Self -Status Assessment Tools KWL (Know - Want to Know - Learned); Reflective Journals
Nature	KWL are simple formats to be filled up by students before the lesson (KW) and after it (L); Reflective journals are maintained as dairies to fill up Ones experience after each class or lesson
Advantage	Help the learner and teacher assess the learning resulting from every lesson; Help develop Meta- cognitive and HOT skills among students; Help the teacher to discover the hidden and individualized aspects of the lessons
Limitations	Time consuming and difficult to collect and collate the students writings in every class
Suggested Frequency	Every Day/ Every lesson/ every week
Suggested Usage	KWL could be carried out as team work to reduce compilation; Journal writings could be utilized for keeping cumulative records of students and 'ipsative' assessment.

Assessment Type	Case Studies
Nature	Students analyse a given case (real or fictional) and come to solutions regarding some given issues or questions
Advantage	Valuable technique for assessing Higher order thinking , Values & Attitudes; Promoting creative and innovative solutions; Can develop team values if attempted in a group
Limitations	Difficult to frame or find case studies for assessing the whole range of cognitive, affective and social skills
Suggested Frequency	As part of Regular tests/exams or Assignments
Suggested Usage	Sometimes Students may be asked to get cases for relevant skills on which they may be assessed as well.

Oral Mode

Assessment Type	Viva/ Oral exam
Nature	Conducted individually or in small group; usually accompanying practical test
Advantage	High degree of authenticity; Good for isolating areas or skills; Good practical experience towards later interview situations
Limitations	Not all candidates perform well in viva; The use of the same questions may lead to later candidates being prepared for the questions; Questions can get tougher as the day goes; Can only deal with a narrow range of skills; Exams are not anonymous
Suggested Frequency	2-3 times / semester with 1 make-up & 1 term end in certain Courses
Suggested Usage	For PG level can be conducted by a panel of experts; Marking criteria should be known to evaluators and students.

Assessment Type	Group Tasks Group Discussion/ Fishbowl Technique / Role Play / Authentic Problem Solving
Nature	Small groups of 2-5; Members work on a joint task
Advantage	Communication of ideas; Encourages team work (collaboration and co-operation); Opportunity for authentic skill development; Opportunity to develop & assess multiple personality domains- cognitive, affective (values, attitudes, etc.) Social, psychomotor ; Assess higher order thinking skill
Limitations	Difficult to assess individual input; Time consuming for students to organize; Some students might overshadow others; others might be a pull-back
Suggested Frequency	Once every semester with one make up and one term-end in certain courses
Suggested Usage	Groups formed must be roughly equivalent; Problems assigned should be equivalent; Each team member must have a specific role; Rubrics for marking must be mutually decided including all domains of education

Assessment Type	Rapid Fire Questions
Nature	Questions on a topic asked very quickly and also answered very fast
Advantage	Good practice and evaluation of students' level of understanding; Raises the level of cognitive challenge
Limitations	Shy students may not freely participate; May be difficult to assess on the spot
Suggested Frequency	May be embedded in classroom teaching as required

Assessment Type	Rapid Fire Questions
Suggested Usage	Students should be told the criteria of a good question; May be assessed by two evaluators for greater objectivity; May be recorded for closer assessment.

Assessment Type	Other Lesson- embedded Techniques WSQ (Watch- Summarise- question)/ One Question Quiz / Think-Pair- Share/ Socratic
Nature	These are interspersed within a regular lesson to provide formative feedback
Advantage	Excellent for formative assessment; Cumulative output can be used for grading purposes as well; Make students alert and active in the class
Limitations	Require additional class time
Suggested Frequency	Every lesson as per need

Integrated Mode

Assessment Type	Field Assignments
Nature	Field visit with report
Advantage	Authentic form of assessment; Develops observation and recording skills; Requires organisation skill
Limitations	Costly to supervise; Difficult to timetable; Need to consider ethical and safety issues
Suggested Frequency	Once in a Semester
Suggested Usage	Students must be exposed to note taking and report writing skills; If visiting different sites reports may be presented in class for sharing of experiences & learning

Assessment Type	Seminar/Paper Presentations
Nature	Group or individual work depending on class strength
Advantage	No doubt regarding authenticity of presenter; Students take presentations seriously; Can be used for individual or group work; Questions and answer sessions as follow ups can help develop important skills; Students learn from their own and everyone else's presentations; Opportunities of peer feedback
Limitations	Can be time consuming (especially in a large group); Unfamiliarity of our students with giving presentations; Appeals regarding grading of presentations can be hard to deal with; Presentations cannot be anonymous; Students with some disabilities may find presentations difficult

Assessment Type	Seminar/Paper Presentations
Suggested Frequency	1 per semester in all major courses
Suggested Usage	Students must be oriented in seminar writing, presentation & questioning skills; It must be mandatory for all students to participate in questioning and discussion; Marking criteria should be specified for all components, e.g. presentation, discussion, questioning, written paper, etc.

Assessment Type	Poster Presentations
Advantage	Add visual dimension to assessment tools; Peer to peer/teacher interaction; Students can learn from each other's posters; Develop research, creativity and discussion skills
Limitations	There could be possibility of subjectivity in grading
Suggested Frequency	Once in a Semester
Suggested Usage	Students should be exposed to various formats of posters; Display should be accompanied by discussion; Grading criteria must be known to students and teachers

Practical Mode

Assessment Type	Lab work, Computer simulations / Virtual Labs, Craft work, Work Experience
Nature	All the tasks involve a major component of working with one's hands. Used as a complement to theory
Advantage	Keeps students 'on the task'; Formative in nature as there are opportunities for students and teachers for on the spot feedback; Provide opportunities for 'Process Assessment'; Encourage application, translation and interpretation of concepts learnt
Limitations	Require careful planning and supervision
Suggested Frequency	Formatively in the class itself; Along with regular tests and exams (monthly, end- semester)
Suggested Usage	Must be preceded by adequate demos and practice; Grading criteria must be known to students and teachers.

3. Assessment Rubrics

3.1 Introduction

A rubric for assessment, also called a scoring guide, is a tool used to interpret and grade students' on any kind of work against criteria and standards.

An assessment rubric provides the means to increase objectivity in assessment and reduce subjectivity; presents a clear expectation on the assessments, and relates it to learning outcomes; ensures consistency, transparency and fairness in the marking process across course instructors for the same assessment type; efficiently grades or marks many assessments for a large group of students; defines clear guidelines for moderation; and provides more objective data for analytics.

3.2 Structure of a Rubric

Usually in the form of a grid, a grading/ marking/ scoring rubric combines the elements of performance, criteria and descriptors to create an assessment tool for the course instructor

Rubric Title			
Criteria	Level of Performance		
	Score 1	Score 2	Score 3
Criterion 1			
Criterion 2	Descriptors		
Criterion 3			

The assessment criteria define the characteristics or traits to be judged which should be derived from the course learning outcomes and indicate what is expected to be demonstrated.

Level of performance is the rating or measure on the degree of achievement on a particular criterion as specified by the rubric, i.e. excellent/good/satisfactory/poor etc.

Descriptors identify the qualities required to demonstrate achievement of each level of performance for each criterion. Listed in the form of short explanations, they provide guidance on the actual judgement on the assessment to match students' performance.

An illustration below provides a few criteria, levels of performance and descriptors

Criteria	Performance (Marks)		
	5	3	1
Content	The material presented was complete, precise and well supported by facts and figures	The material presented was partially complete and was off-topic at some places	The material presented was incomplete and largely off-topic
Knowledge & Understanding	Seminar demonstrated thorough knowledge and applicability of facts, terms and concepts	Seminar demonstrated moderate knowledge and applicability of facts, terms and concepts	Seminar demonstrated limited knowledge and applicability of facts, terms and concepts
Discussion	The student actively participated in the discussion and was able to give a convincing reply to questions	The student had a moderate participation in the discussion and was able to give a convincing reply to some questions	The student did not participate in the discussion and was not able to give a convincing reply to most questions

Figure-8 : Seminar Presentation Rubric

3.3 Types of Assessment Rubrics

Holistic Rubric : assumes that the work must be evaluated as a whole rather being treated as a sum total of different criteria. The focus is on overall assessment of a specific content or skills. Only one score is given for the entire work/ task. It is generally useful for simple tasks. For instance, a short essay may be graded by considering all the criteria together.

Analytic Rubric : features a grid of criteria and levels of achievement. They provide specific feedback along several criteria. It is suited for tasks that must be assessed against several criteria.

3.4 Developing a Rubric

The steps to be followed are:

- Identify learning outcomes for the assessment
- Decide on criteria based on learning outcomes, i.e., the characteristics on which to judge student's performance.
- Select levels of performance i.e. an appropriate scoring method must be chosen depending on the nature of the assessment and chosen scale.
- Write descriptors, i.e., describe the expected achievement on each characteristic for each level of performance. The descriptions should be specific, clear and consistent.
- The rubric should be tested on a sample of student's assessments before implementation.

4. External and Continuous Internal Assessment Modes

4.1 Current Examination System

Current examination systems traditionally rely on external University examinations which have remained unchanged for several decades now. The ability of a student is decided by the end of the term (semester/annual) examination; hence scoring more marks in this final examination is the only aim of the student. The existing system does exert undue stress on the students as they have to score higher to pursue a job or higher education career. However, we are witnessing the fact that some higher educational institutions conduct their own tests to choose students thus showing little faith on the marks obtained from such final examinations. This situation also questions the reliability of the so called final examinations. In addition, society in India has their expectations from students who appear for final examinations of current coveted degrees. If a student scores high marks, they are adored, on the other hand if a student fails to score high marks, they are labeled as low performers or are looked down upon. Truth is that students who are able to secure a job have to perform well by and improvising their job/practical/application skills and acumen. Focus on mere academic scores will definitely not improvise such practical skills.

Designing assessment systems solely based on recall of information will not help in the current scenario; rather focus needs to be on active participation of learners. It is important to emphasize that memorization should be discouraged. Improvement in a system is possible only when the right blend of internal and external evaluation is done. Though harder to evaluate, assessment modes should bring out abilities of students in terms of being creative, original and add new knowledge and as such, modes of assessment have to be more self-regulatory.

Teaching pedagogy that embodies and emphasizes on internal assessment modes can empower both teachers and students to perform to full potential and ability. Apart from other skills, focus on building critical thinking, problem solving approach and project based learning is of immense importance. These will assist in transformation of the teaching learning process.

4.2 Models of Assessment

Based on the types of assessment and triangulation of assessments, various models of implementation are suggested for both theory as well as practical courses. All the models focus on continuous assessments, mixing types, so that an ongoing feedback is obtained for both the teacher and the student. It is possible to administer many of one type of assessment at regular intervals or choose the best out of the many. This will encourage a student to improve on skills and performance.

Rationale for Examination Reforms

Model 1 (for Theory Course)		Model 2 (for Theory Course)	
Internal- 70% (140 marks), External- 30%(60 marks)		Internal- 70% (140 marks), External- 30%(60 marks)	
Internal Assessment Modes		Internal Assessment Modes	
Class test (best 2 out of 3)	2 x 35marks	Class test + Daily Home Assignment 1 (best 2 out of the 3)	2 x 35marks
Quiz (best 3 out of 4)	3 x 10 marks	Daily Home Assignment 2 (compulsory)	40 marks
S & GD / Active Learning	10 marks	S & GD / Tutorial/Active Learning/Additional Assignment	20 marks
Home Assignment	10 marks	Attendance	10 marks
Class Assignment	10 marks	External (End of semester)	60 marks
Attendance	10 marks		
External (End of semester)	60 marks		

Model 3 (for Theory Course)		Model 4 (for Theory Course)	
Internal- 70% (140 marks), External- 30%(60 marks)		Internal- 70% (140 marks), External- 30%(60 marks)	
Internal Assessment Modes		Internal Assessment Modes	
Weekly Home Assignments	40 marks	Weekly Home Assignments	30 marks
Class tests	2 x 35marks	Review of Bibliography/essay/Poster presentation	2 x 10marks
Quiz/S & GD / Tutorial/Active Learning/Additional Assignment	20 marks	Class test	2 x 30 marks
Attendance	10 marks	Quiz/S & GD / Tutorial/Active Learning/Additional Assignment	20 marks
External (End of semester)	60 marks	Attendance	10 marks
		External (End of semester)	60 marks

Model for Practical Course		Model for Project / Self Study Assessment	
Internal- 70% (140 marks), External- 30% (60 marks)		Internal- 70% (140 marks), External- 30% (60 marks)	
Internal Assessment Modes		Internal Assessment Modes	
Lab work assessment (best 2 out of 3)	2 x 25 marks	Project Assessment (best 3 out of 4)	3 x 40 marks
Viva Voce / Lab Quiz (best 2 out of 3)	2 x 40 marks	Participation in discussion	10 marks
Attendance	10 marks	Attendance	10 marks
End of course Long practical test and viva	60 marks	External (End of semester)	60 marks

Model for Work Experience Course Assessment	
Internal- 100% (200 marks)	
Objective test (best 2 out of 3)	2 x 25 marks
Practical cum Viva Voce (best 2 out of 3)	2 x 40 marks
Comprehensive (open assessment multiple types)	50 marks
Attendance	20 marks

4.3 Some Guidelines for Internal Assessment

In order to assess the skills, values and knowledge gained by the student, the concerned faculty member has to conduct internal assessment. The internal assessment may comprise of the following :

- i. All the undergraduate, postgraduate, M.Phil. and Ph.D. programmes offered by the University are to have specified components for internal evaluation. For example, Essays, Tutorials, Home Assignments, Seminars, Presentations, Laboratory Work, Unit Tests, Workshop, Project based learning, peer reviews, quizzes, other elements of participatory learning may be used.
- ii. The schedule and pattern of continuous assessment/evaluation should be decided by the concerned institution in advance and publicized to all students and faculty through the institutional regulations and the student's information brochure. The components of internal assessment/evaluation are to have a time frame for completion by students with concurrent and continuous evaluation of faculty members. Following the principle of "those who teach should evaluate", the continuous internal assessment/evaluation have to be conducted by the teacher and the evaluation outcome should be expressed by pre-determined marks or by grades. Tests that are prepared by teachers and conducted during academic teaching are considered of high value as opposed to the end of term tests that are

- more threatening in nature. However, teachers have to include elements of self-assessment or peer-assessment during construction of such tests.
- iii. In order to ensure transparency, fair-play and accountability, the evaluation report submitted by all the faculty members are to be reviewed from time to time by a committee of the institution constituted by the appropriate authority.
 - iv. The outcome of the internal evaluation reviewed by the committee is to be announced and displayed on the notice board as per the time frame of the academic calendar.
 - v. The proportion of Internal evaluation (IE) to External Evaluation (EE) should be specified for UG (30:70) and for PG (40:60). The proportion of IE can be low to start with . It can be raised progressively in a phased manner to 50% depending on the outcome of the experience. Though this may be accepted in principle, putting it into practice needs issues to be addressed and weeded out.

However, care has to be taken that schemes of internal assessment should not adhere to a standard system or mode or type. Relevant types of internal assessment have to be developed suiting the needs and requirement of each specific subject. There is no one size that fits all. Teachers need continued support and training through workshops to successfully implement such internal assessment schemes otherwise an improper handling will lead to perception by students doubting its integrity and impartiality.

5. Credit System and Grading

5.1 Introduction

The UGC had issued guidelines to all Universities in 2015 for implementation of the choice based credit system with a view to offer students' choice of courses within a programme with a flexibility to complete the programme by earning credits at a pace decided by the students themselves. The system allowed students to choose interdisciplinary, intra-disciplinary courses according to their learning needs, interest and aptitude. It was considered as a cafeteria approach and was expected to provide mobility to students.

Current credit system practiced in institutions needs comprehensive reforms as they offer very little flexibility, choice and are less learner-centric. Degrees offered today are more self-contained focusing on a specialization area and depend a lot on knowledge available with the faculty from the department only. Though the most requisite credit system does exist, wherein students are given a wide choice and flexibility, these exist as small islands in the vast ocean of thousands of educational institutes in India. In such institutions, the curriculum is frequently designed which is learner centric and offering a wide specialization area for students to pick and choose courses from.

The institutions shall make attempts wherein the design of the credit system and the teaching and evaluation modes shall be the responsibility of individual course teachers. The students should have the freedom to opt for courses from other specializations and not just from their core specialization. For this there has to be stronger collaborations between departments of the University and outside.

5.2 Grading system

Most institutions follow the absolute grading system which is a simple procedure wherein the marks obtained by students correspond to a specific grade and grade point. It reflects the individual performance in a particular subject without any reference to the group/class. The absolute grading system has limitations and may be susceptible to some inconsistencies.

The relative grading system on the other hand provides relative performance of a student to a group/class wherein the student is ranked in a group/class on basis of relative level of achievement. In this system decisions are made in advance by the faculty members as to what proportion of students would be awarded a particular grade on the basis of their relative performance and which is done by assigning grades on basis of a normal curve. This facilitates comparative performance and eliminates negative effect of pass or fail.

Relative grading system may be used if the number of students registered for the course is at least 30. For a class of smaller size, an absolute grading scheme may be used. The statistical method may be used with adjustments to calculate the mean (M), median (Md) and standard deviation (SD) of the total marks (TM) obtained by the students registered for the course. If the mean and median coincide, the mean may be used for further computations, otherwise the median may be used. If suppose the mean is used, then the letter grades may be awarded based on the ranges specified in table below:

Ranges for Relative Grading

Letter Grade	Range
A	$TM \geq M+1.75 SD$
A-	$M+1.25 SD \leq TM < M+1.75 SD$
B	$M+0.75 SD \leq TM < M+1.25 SD$
B-	$M+0.25 SD \leq TM < M+0.75 SD$
C	$M-0.25 SD \leq TM < M-0.25 SD$
C-	$M-0.75 SD \leq TM < M-0.25 SD$
D	$M-1.25 SD \leq TM < M-0.75 SD$
D-	$M-1.75 SD \leq TM < M-1.25 SD$
E	$M-2.0 SD \leq TM < M-1.75 SD$
E-	$M-2.25 SD \leq TM < M-2.0 SD$
F	$M-2.25 SD > TM$

Letter grades may be improved based on the following scheme: Use the table above to determine grade boundaries. Look for natural gaps in the neighborhood of grade boundaries. Choose the largest gap in the neighborhood and make this as the grade boundary.

An 'E', 'E-' and 'F' grade may not be a purely relative grade. These may be assigned on the following basis:

- A minimum, say 30/100, may be set as pass marks for the course. A fail grade may then be awarded only if the Total Marks for the course are less than 30. Otherwise the students may be awarded the Just Pass Grade D-.
- A fail grade may be awarded to students whose marks are below the prescribed minimum even if the table above leads to a pass grade.

Similarly, a lower limit may be set for the A grade also, for instance greater than or equal to 86. Students not achieving the prescribed minimum may be awarded a lower letter grade even if the table above indicates otherwise. A pass grade may be made mandatory for both internal as well as external examinations

In the case of a separate internal and external assessment,

- a. Internal and External marks may be summed up with appropriate weightages to compute a total out of 100 marks. The letter grade may be assigned on this computed total.
- b. Internal and external marks may be graded separately and then the assigned grade points may be used, with appropriate weightages, to compute a final grade point and letter grade.

Grading in the case of Re-evaluations, Retests and Remedial Examinations may be based on the following guidelines:

- a. The ranges of marks once computed for awarding letter grades the first time, called the First Distribution (FD), will not be modified.
- b. If a re-evaluation leads to a change in marks, then FD will be used to award an appropriate letter grade.
- c. A retest may be permitted if
 - i. A student gets a letter grade of E or E-. In this case, irrespective of the marks obtained, at most D grade may be awarded.
 - ii. A student is unable to complete course requirements because of certified illness or tragedy. In this case FD will be used to award an appropriate letter grade.

The use of relative grading system may be recommended in autonomous institutions, institutes of national importance and institutions with high ranking. The results of the relative grading system may be shared by such institutions later with other interested institutions to implement the same.

5.3 Credit Transfer Policy

Facilitation of credit transfers is a must to support the continuation of learning and should enable the students to gain the qualification in minimal time provided they meet all minimum standards and requirements. Credit transfers should also facilitate mobility of students among institutions.

Students who have completed course-work, at least first year, at some university other than the university to which transfer is sought (may request for transfer of admission to this university. A student may be granted admission only through an admission process that will follow the same policy as for fresh admissions. However, a uniform credit system must be followed by all universities to effect transfer of credits.

Credit Transfer request can be submitted only after the student has been admitted in the concerned program and the following conditions are met:

-
- i. The course work has been completed at a UGC approved and accredited University through fulltime formal learning mode.
 - ii. The university accreditation grade/ ranking is not lower than that of the university to which the transfer is sought.
 - iii. The courses prescribe to the common minimum syllabus under UGC CBCS system.
 - iv. The letter grade obtained in the courses is "B" or better.
 - v. The number of credits to be transferred does not exceed the prescribed limit.
 - vi. The program in question must have a similar credit system, in particular, modular or semester and the same numeric and letter grading system along with common meaning of the term 'credit' in numerical terms.

The aspect of shelf life of courses needs to be taken into account while accepting credits as obsolescence of knowledge of certain field in terms of its current relevance needs to be looked into. The time lapsed between successful completion of certain courses of the program and the admission to which program transfer is sought needs to be considered. The maximum number of credit points that may be considered under a credit transfer needs to be specified. Contextual variables such as teaching-learning approach adopted, learning facilities offered, use of evaluation modes may also be considered while preparing the credit transfer policy.

A comprehensive policy on credit transfers will have to be framed by each university.

6. Question Bank

6.1 Need of Question Bank

Teaching and evaluation complement each other, hence changes are not only required of the evaluation aspect, rather changes need to be effected both in teaching and evaluation. Question banks, thus is an attempt to integrate both teaching and evaluation. Preparation of question bank makes use of accumulated experience of teachers which renders effective examining of students.

The need for setting of question paper through the question bank system is felt due to an increasing number of students enrolling for higher education programmes thus increasing the load which the existing pattern of examining must bear; curriculum revisions; inter-disciplinary nature of subjects due to integration of course contents from diverse courses; and need for increasing involvement of teachers in the evaluation process. Consequently, there is a constant need for development of standards and quality of examination along with demand for fair and just evaluation process.

The question papers that are set using the traditional paper setting procedure by calling experts may lead to repetition of questions and that they just test information recall, whereas, there is a need to test analytical skills of students. Question banks lead to setting of better quality questions that are valid and appropriate to test the abilities desired of students.

Setting of Question Papers through the Question Bank System is a much needed reform in the examination system. It reduces administrative mechanisms for conduct of paper setting process. A pool of experts of the concerned subject shall be contributors to an exhaustive question bank. The question bank system provides a platform for a wider participation of academicians with active collaboration in setting questions based on revised Blooms taxonomy. The involvement of many experts from different institutions will lead to setting of paper of good quality as teachers with known expertise on a particular unit/module can set questions only on the said topic/module. Well-developed question banks, as a matter of fact lead to and influence curriculum development.

To be effective, it is necessary that the question bank must have a large number of questions of a particular course. With the use of ICT based system the question paper sets can be drawn within minutes. However the system requires an approved standard format/pattern of the question paper.

6.2 Important Considerations

The question bank system should also take into consideration the following:

- a) That questions are drawn from each unit of the syllabus
- b) That the questions drawn meet the Programme Objectives and Outcomes of the course
- c) Questions should span all difficulty levels and each question be marked with its difficulty level
- d) Should include questions of every type as per Section such as Long Answer, Short Answer and Very Short Answer Questions must specify the expected length and suggested time for completion. Objective items must include Recognition Type and Supply Type of items. The probability of making blind guesses should be reduced.
- e) Answer key should be provided
- f) Each question may be appended with suitable codes to indicate the learning outcome mapped to, the topic in the syllabus that it examines, the difficulty level and the discrimination ability.

Institutions are advised to conduct workshops to be attended by subject matter experts who shall pool their expertise to generate questions. Question banks that are prepared should be subject to proof reading of text by forming an appropriate committee. Procedure for regular (yearly) revision of the question bank must be undertaken to increase its validity. About 20 % of the questions must be changed every year either to keep pace with changes in domain areas or due to syllabus revisions. Faculty members have to be trained in preparation of question banks.

6.3 Procedure

The following procedure may be adopted to develop a question bank:

- Specifying Objectives/ Learning Outcomes to be tested. It should cover the entire hierarchy of learning objectives as specified by Bloom and Anderson.
- Deciding the question format
- Writing or pooling of questions by panel of experts
- Review of questions
- Sample group testing/ pilot test
- Assessment of difficulty and discrimination ability of the questions
- Final selection of questions for the Question Bank

7. Moderation

Moderation of assessment is an organized procedure which ensures use of valid assessment material and consistent application of criteria, to provide fair academic judgment and reliable outcome in the form of marks or grades. It assures appropriate designing and implementation of assessment activities along with generation of valid and reliable results.

Integration of moderation process with assessment system is imperative for the development of academic quality in higher educational institutions as :

- It addresses any difference in individual judgments of different evaluators.
- It ensures that all achievements in the form of marks and grades across courses reflect achievement of same level of standard.
- It is also carried out to develop a common understanding of the standards and criteria and to recognize performance which demonstrates that standard or fulfils that criteria.

Moderation may be conducted in case there are large number of fail grades or high grades, or when large numbers of students who have received the same grade or clustering of students on letter grades, or when there are discrepancies between grades allocated to individual students in different courses, or to find out the difficulty level of the question paper or whether the assessments modes used cover the entire syllabus or not.

Applicability - Moderation should be made applicable to both external and internal modes of assessment. All programs and courses should indicate, as part of their statements on assessment, arrangements for the moderation of assessed work. This can be done through formulation of a moderation policy and implemented across all programs and courses of instruction and delivery, i.e. even those programs delivered *via* distance or online mode. The time frame for the moderation should be linked with the time frame for assessment.

In the event a moderation is triggered, an evaluation should begin with a discussion on the following (though not exhaustive) lines:

- a. What are the rubrics used for each of the different types of assessment in the course? Is a standardized/ prescribed rubric used or has the instructor developed his/ her own rubric. If the instructor is using a personally framed rubric, or if there is no identified rubric, then how does the assessment map to learning outcomes?
- b. The difficulty level of the questions included in the assessments, i.e., is the difficulty level on the extremes, very easy or very hard.

- c. The manner of awarding marks, i.e., has the correction been at the extremes, liberal or tough.

Each department should establish a committee and designate roles and responsibilities at different levels for smooth working of the moderation process. In order to maintain neutrality, it should be ensured that moderator should not be the assessor. Staff members should be trained professionally in assessment techniques and moderation procedures. All assessment material produced by learner including examination sheets, assignments, project reports, research reports etc. should be examined.

Higher educational institutions should be encouraged to make the moderation process online. In this system, assessment plans, moderation plans, assessment tools, samples of which may be submitted online. Moderation reports should be generated online so that progress can be tracked.

The moderation should not be restricted to just assessment but also include moderation of content and assessment design.

8. Use of Technological Interventions

With the proliferation of different types of access devices, especially mobile access devices, technology has the potential to augment traditional classroom practices and revolutionize learning and evaluation methods. Technology, in fact can be an important driver to enable lifelong learning. Learning and engagement of students is facilitated by use of technology through several modes such as synchronous learning, semi-synchronous learning, blended learning, collaborative learning, flipped classroom etc. MOOC's, especially provided through SWAYAM, are a window of opportunity for lifelong learning and are offered through technology based platforms. Learning management systems (LMS) are used by institutions to integrate the entire teaching, learning and evaluation process. The Learning Management System may be used by higher educational institutions to deliver academic content in blended form and to assess learning through thesis, assignments etc. Open source learning management systems such as Moodle, Edmodo may be used for posting content in the form of videos, audios, e-learning modules, live class sessions etc. Use of plagiarism detection software is highly recommended in order to check originality of content.

In the conduct of examinations, universities face tremendous challenges such as need for trained manpower, distribution of question paper without delays and errors, delays in evaluation of answer scripts, lack of infrastructure to conduct examinations at a large scale, non-availability of faculty members for assessment, security issues faced during paper setting and paper distribution, tampering of certificates and answer scripts etc.

For a typical examination department of an institution, automation is required right from registration of student to convocation through an integrated system. In fact, steps must be taken to implement a complete examination management system that considers the complete life cycle of examination process. The use of technology will reduce dependency on human intervention and be error free. The following functions have to be automated:

- i. registration of students and generating unique PRN,
- ii. filling up of examination form,
- iii. generation of seat numbers and admit cards/hall tickets,
- iv. preparation of list of paper setter,
- v. use of question bank system to draw question sets, question paper generation,
- vi. online distribution of question papers on the day of examination with system of encryption,
- vii. barcode system for answer books (this will eliminate issues related to errors, avoid malpractices etc.),
- viii. digitization of answer scripts and onscreen evaluation of answer sheets,

- ix. tracking of students performance,
- x. Marks submission through online software,
- xi. viewing of result through online system,
- xii. online verification and revaluation system,
- xiii. digitization of certificates and marksheets (to avoid tampering and easy retrieval),
- xiv. certificate authentication system,
- xv. Submission of various other applications through online system.

The above will lead to conduct of functions of the examination system in an efficient and transparent manner and timely availability of information to students.

On-Demand Examination:

On-Demand Examination may provide flexibility to the students, especially those enrolled under open and distance education mode. This system works on the principle of flexibility where assessment can take place when the learner consider themselves ready to appear. Thus readiness depends on learner and not on the institutions. An advantage of this system may result in reduced number of failures in examination, reduced, mal-practices in examination etc.

To facilitate the system of on-demand examination, a large question bank needs to be developed to generate different sets of question papers with the same level of difficulty. The question bank may contain various types of questions such as multiple choice questions, short questions, long questions so as to test skill knowledge and application.

9. Result Declaration

Declaration of results is a crucial element of the educational system of a higher educational institute on which rests its credibility and reputation. In order to strengthen the process of result declaration it is important to incorporate the following features:

- 1) Timeliness of declaration of result
- 2) Clarity of interpretation of the Result Card
- 3) Comprehensive Format
- 4) Accessibility
- 5) Verifiability

9.1 Timeliness of the Result Declaration

Timeliness is essential in case of both internal and external components of evaluation. The following table shows a suggested timeline for formative, internal, assessments and summative assessments.

Formative Assessment (Internal)	
Daily Tasks	Before the next task
Weekly Tasks	Before the next task
Unit End Tests	One week
Summative Assessment (External/ Internal)	
External Components	20-30 days
Internal Components	7-10 days

9.2 Clarity of Interpretation

In the final result, having both internal and external components, it is desirable that both should be mentioned separately, followed by the overall grade. The result should be easy to comprehend. This becomes more important if educational institutes have varying grading and credit system. It is thus essential to include at the back of the result, information about the grading and credit system, interpretation of grades, and conversion of grades to percentage.

9.3 Comprehensive Format of the Report

Results reflect the achievement and competency of learners across all dimensions. A single grade, percentage or score cannot depict the entire range of achievements of a learner. The result should be comprehensive and include all aspects of learning outcomes, i.e. Academic, Social, Moral and Spiritual. HEIs should evolve a format and granularity to suit their assessment profiles and display achievement of learners in respective areas.

9.4 Accessibility

Semester end results should be declared online for both internal as well as external components. This could be in the form of awarded letter grades only. A provision should be made in the website through an automated system whereby students can view their mark sheet through individual logins. To make the system secure, the details such as PRN, seat number should be necessary fields to view results. This will enhance the accessibility and transparency of the evaluation process and will also give the flexibility to present details of evaluation on different learning outcomes. There should be a provision to access results of preceding semesters also. The results on completion of the program should be accessible to external agencies, e.g., potential employers, other higher educational institutions, for verification of student credentials. Transcripts should be made available as and when requested.

9.5 Verifiability

Results and Academic Awards should be valid, comprehensive and verifiable by external agencies as they have significant link with the entire career path of the students. The verifiability of results by prospective employers, HEIs and other agencies should be managed through the National Academic Depository (NAD) (<http://nad.gov.in/>).

As per the NAD Website, NAD is a 24X7 online store house of all academic awards i.e., certificates, diplomas, degrees, marksheets etc. duly digitized and lodged by academic institutions / boards / eligibility assessment bodies. NAD not only ensures easy access to and retrieval of an academic award but also validates and guarantees its authenticity and safe storage. This will enable educational institutions, students and employers online access/retrieval/verification of digitized academic awards and shall eliminate fraudulent practices such as forging of certificates and mark-sheets.

Recommendations

UGC has taken various initiatives to bring in Academic Reforms in Higher Education Institutions (HEI's). Evaluation Reforms is one of the major task initiated in this direction. The UGC had placed a Public Notice on UGC website inviting suggestions from teachers, students, controller of examinations and experts from the field. Many people have responded to the Public Notice dated 7th June, 2018 and submitted various suggestions.

The UGC has also constituted a committee to make recommendations. Based on the suggestions received, a discussion paper was prepared and a consultative meeting on Examination Reforms was held on 6th September, 2018.

In nutshell, all the observations, suggestions and discussions during the Consultative Meeting can be summarized as follows:

- a) The students passing out from UG/PG courses are unemployable.
- b) In order to prepare employable students, learning outcome based curriculum should be prepared.
- c) The examination and evaluation should test the learning outcome, knowledge gained, attitude developed and skills matered through it.
- d) At present students learn only to achieve marks in the examination which should be changed and the learning should be to enrich the knowledge, attitude and skill.
- e) Evaluation process needs to be made more flexible and the quality of evaluation should be brought out.
- f) The available 13 lakh teachers should be involved to create data base of questions.
- g) Atleast 40% evaluation should be through internal and continuous assessment and the remaining 60% should be through the terminal examination.

The committee considered all the above points while making the recommendations.

- India being a vast country, having different types of Universities - Central Universities, State Universities, Deemed Universities, Private Universities, Open Universities, and Standalone Institutions - a rigid system of examination cannot be followed. However, the aims and objectives of conducting the examination must be to assess the outcome of the level of learning of the student; it is necessary that a framework has to be decided with some flexibility. This will

bring uniformity in the examination system and the relative merit of the candidates based on their learning outcome can be seen.

- The Committee has also considered the various initiatives taken by the Hon'ble Prime Minister of India, Hon'ble Minister of Human Resource Development, Government of India and University Grants Commission in the Education domain such as extending the reach of higher education, technological innovation to measure wider range of skills and knowledge, digitalization of programmes, transfer of knowledge to enrich rural India and ICT learning.

Keeping the above in view the Committee makes the following recommendations:

1. **Objectives of Examination System, Models of Examination System which can be followed in India and Structural and Procedural Changes needed in the examination system:**
 - 1.1 Learning Outcome Based Education Framework needs to be implemented at HEIs to structure and link evaluation right up to Institutional goals. The attainment of Program Education Objectives, Programme Learning Outcomes and Course Learning Outcomes may be worked out at the university / institute level for each programme as mentioned under 2.5 at *Annexure-2*.
 - 1.2 Separate suitable models for UG, PG, M.Phil./Ph.D. may be developed by the HEIs in the light of this Report. While need for more emphasis on Internal and Continuous Evaluation is emphasized, taking into consideration the ground realities, the HEIs can begin with the proportion of I.E. to E.E. 30:70 and reach 50:50 in a time bound manner, without compromising the quality and standard. In exceptionally high ranking HEIs, the ratio can be 60:40. Some flexibility may be considered, especially as the ground realities are much different at the University level and at affiliated colleges in urban areas, semi-urban and rural areas. The situation can be monitored and reviewed periodically for better implementation.
 - 1.3 To achieve the evaluation objectives, the HEIs must make use of available technology and automation in various pre-, on- and post-examination stages. Technical support for the same by the UGC / university may be required.
 - 1.4 Proper question paper setting as well as Learning Outcome Based Education are the most important part of the Examination System and is key to quality of evaluation. Guidelines, necessary for the proper paper setting as well as Learning Outcome Based Education may be discussed in Orientation and Refresher Courses for the teachers.

2. Question Paper Setting:

- 2.1 Question paper setting needs drastic reforms. While setting the QP, questions from the QB, and independently by the paper setter(s), in the pre-decided proportion (say 70:30), can be drawn with due consideration to the category of questions.
- 2.2 The composition of a QP should be such that an average student should not find it hard to get passing grade while it should pose real challenge to a good student with high scoring becoming increasingly difficult.
- 2.3 Properly and correctly worded, balanced, well-set question paper with unambiguous questions, is the key to quality and is the most important part of the examination system. Necessary guidelines to the paper setters should be provided. Workshops to sensitize the teachers and create awareness may be arranged.
- 2.4 Periodic academic audit of the QPs (as also of assessed answer books) should be conducted with an objective of quality monitoring by the respective State Council of Higher Education of concerned State.

3. Grading and Credit Transfer

- 3.1 Ensure a minimum program-wise uniformity in all HEIs w.r.t. number of Course Credits (for Core, Elective etc. courses) and Total Credits at UG & PG levels to facilitate smooth credits transfers (Refer to latest UGC guidelines for UG: http://www.ugc.ac.in/pdfnews/8023719_Guidelines-for-CBCS.pdf). For computation of Grade, Grade Points, SGPA, CGPA etc, the same guidelines to be followed.
- 3.2 Some uniformity in the broad topics in courses at first, second and third year in each major degree programs in all HEIs (with some flexibility, say 20-30%, to HEIs) can ensure smooth credit transfers, and hence horizontal mobility, for the students between HEIs. The optional subjects which normally have nominal credits may be considered for transfer of credit, through those optional subjects are not offered by the receiving university.
- 3.3 Similar guidelines by UGC for PG required.
- 3.4 While Absolute Grading is followed in most of the HEIs in which grading is used, Relative Grading system will be fairer to the students and may be followed in unitary universities and institutions of national importance to start with, which may be percolated to all other HEIs in a phased manner.

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- 3.5 Each HEI can have a Committee to determine the equivalence of the credits in cases of transfers/horizontal mobility.
- 3.6 Guidelines for such "Equivalence Committees" can be provided.
- 4. Moderation**
- 4.1 Moderation at every stage is essential to evolve fair, trust-worthy, dependable and transparent Evaluation system.
- 4.2 Moderation at different stages like paper setting, assessment, re-assessment, post-evaluation should be mandatory.
- 4.3 Assessment of the over-all procedures adopted, quality and standard of the paper-setting, assessment and evaluation system as a whole should be undertaken every 2-3 years.
- 4.4 A Examination Reforms Cell at HEI level and a Examination Reforms Committee (appropriate nomenclature can be used) at the state level can be set up for the purpose.
- 5. On-Demand Examination**
- 5.1 It is time, steps are initiated in the direction of providing On-Demand Examination facility to the students.
- 5.2 A National Board may be established to conduct Examinations On-Demand.
- 5.3 To start with, it can conduct exams for popular degree programs. Initially, on-demand examinations can be introduced for distance programs for which it is best suited.
- 5.4 Related syllabus, study material and QBs can be made available to the candidates.
- 5.5 Should be open to all; no age limit, minimum requirements of eligibility etc,
- 5.6 Extensive use of technology/automation.
- 5.7 System should ensure highest dependability, openness, reliability, transparency and recognition.

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6. **Internal Examination and External Examination**
- 6.1 Most suitable combination of IE and EE for comprehensive and continuous evaluation and assessment of the students can be evolved by the HEIs in the light of the discussion in this Report.
- 6.2 Internal Evaluation: should be such that it will not cause undue stress and pressure on students.
- 6.3 Proportion of IE and EE should be specified for UG as well as PG levels: should be flexible to some extent for programs of different nature.
- 6.4 System of IE should be objective, student friendly, transparent and free from personal bias or influence.
- 6.5 The results of IE should be made known to the students soon after the IE.
- 6.6 Proportion of IE and EE should be specified for UG (e.g. 30:70) as well as PG levels (e.g. 40:60)
- 6.7 Proportion of IE can be low to start with. It can be raised progressively in a phased manner to 50% depending on the outcome of experience. For high ranking HEIs, it can be higher (say 50:50 or 60:40).
- 6.8 Internal assessment must be graded on a relative, not an absolute, scale and must be moderated and scaled against the marks obtained in the external exam.
7. **Malpractices**
- To ensure credibility of the examination system, it is essential to check the malpractices.
- 7.1 By protecting the identity of candidates and examiners from each other a lot of post-exam malpractice can be checked. A fool-proof system e.g. use of encrypted barcodes, which hides the identity of the student (and the centre) from not only the examiner but also exam dept. employees, may be used. This can be used in conjunction with other methods, e.g. randomizing of exam scripts given to any particular examiner.
- 7.2 A major source of cheating remains help from outside the exam hall, sometimes even through ingenious means. If candidates are not permitted to leave the exam-center in the first ninety minutes, and even thereafter not permitted to carry the question papers out with them, most of this can be nipped in the bud.
- 7.3 Transmission of QPs directly to the centres through internet just before the commencement of examination in a safe manner should be introduced.
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8. Technological Interventions / Technology based Automation

- 8.1 Areas of technological interventions and automation should be specified and must be followed by the HEIs.
- 8.2 UGC can take initiative in preparation of required software for use by HEIs (especially in the areas of registration, seating arrangement, issue of personalized hall tickets, integration of results of internal and external assessment, preparation of final results, calculation of grades etc.). These can be made available to the HEIs to expedite proper implementation of the reforms.

9. Question Bank

- 9.1 Should be given top priority.
- 9.2 QB should be prepared Course wise (Core, Elective, Ability/Skill etc.).
- 9.3 UGC can take initiative for preparation of basic QBs in major courses/subjects. These can then be adapted by the HEIs. This will ensure some minimum uniformity, quality and standard.
- 9.4 The QBs should be sufficiently large and should contain questions under various categories based on learning-outcomes.
- 9.5 Moderated QBs should be made available to the teachers and students.

10. Need for Minimum Standardized Infrastructure

- 10.1 Minimum infrastructure requirements should be prescribed. The HEIs with less than minimum required infrastructure should work towards achieving this in a time bound manner.
- 10.2 The improvement at the HEI level can be monitored by the state level Examination Reforms Committee.

11. Ability Test

- 11.1 Can be developed to assess and indicate the abilities of the students.
- 11.2 Different levels of practicals and on the spot problem solving exercise may be carried out to assess the skill of the students.

12. Result Declaration

- 12.1 Declaration of results is a crucial element of the educational system of a HEI on which rests its credibility and reputation. In order to strengthen the process of result declaration it is important to incorporate the features like timeliness of declaration of result, clarity of interpretation of the Result Card, its comprehensive format, accessibility and verifiability etc.
- 12.2 The accessibility and verifiability to be ensured through NAD.

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Appendix 1

Generic Higher Education Program Education Objectives (some examples):

- 1) **Academic Objectives**
 - Intellectual Strength
 - General Knowledge
 - Scientific Temper
 - Self Reliance
 - Inter-disciplinary Exposure
 - Aptitude
 - Independent Thinking
 - Reasoning Ability
 - Habit of Learning

- 2) **Moral and Spiritual Values**
 - Emotional Maturity
 - Ethical Values
 - Simple Living
 - Selfless Service
 - Humility
 - Truthfulness
 - Dignity of Labour
 - High Moral Character
 - Physical and Mental Wellness

- 3) **Social Sensibilities**
 - National Culture and Heritage
 - Tolerance and Diversity
 - National Integration
 - Understanding Rural Life
 - Civic Sense
 - A Respect for Rights

Generic Graduate Program Learning Outcomes (some examples):

- 1) **Academic**
 Professional Knowledge
 Problem Analysis
 Design and Development of Solutions
 Conduct Investigation of Complex Problems
 Innovation and Entrepreneurship
 Individual and Team Work
 Communication
 Vocational and Industry Exposure
 Life-long Learning
- 2) **Moral and Spiritual Values**
 Professional Ethics
 Integrated Value System
 Physical and Mental Wellness
- 3) **Social Sensibilities**
 Education and Society
 Environment and Sustainability
 National Constitution, Culture and Heritage
 Social Sensibilities and Rural Development

Traceability Matrix of Generic Program Learning Outcomes with Generic Program Education Objectives

Generic Program Learning Outcomes	Generic Program Education Objectives				
PLO-1: Disciplinary/ Professional Knowledge	Intellectual Strength	Inter Disciplinary exposure			
PLO-2: Problem Analysis	Intellectual Strength	Reasoning Ability	Aptitude		
PLO-3: Design and Development of Solutions/ Policies	Intellectual Strength	Scientific Temper	Self Reliance		
PLO-4: Conduct Investigations of Complex problems	Scientific Temper	Independent thinking	Self Reliance		
PLO-5: Modern Usage tools	Intellectual Strength	Aptitude			

Generic Program Learning Outcomes	Generic Program Education Objectives				
PLO-6: Inter and Trans disciplinary Development	Independent thinking	Inter Disciplinary exposure	Self Reliance		
PLO-7: Jugaad Innovation and Entrepreneurship	Intellectual Strength	Independent thinking	Inter-Disciplinary exposure		
PLO-8: Ethics	Tolerance for Diversity	Ethical Values	Truthfulness		
PLO-9: Individual and Team Work	Tolerance for Diversity	Ethical Values	Truthfulness		
PLO-10: Communication	Intellectual Strength	Reasoning Ability	Self Reliance		
PLO-11: Project Management and Finance	Intellectual Strength	Reasoning Ability			
PLO-12: Vocational and Industry Exposure	Intellectual Strength	Independent thinking	Scientific Temper		
PLO-13: Life-long learning	Habit of learning				
PLO-14: The Education and Society	Selfless Service	Independent thinking	Inter Disciplinary exposure	General knowledge	
PLO-15: Environment and sustainability	National Culture and Heritage	Independent thinking	Inter Disciplinary exposure	General knowledge	
PLO-16: Social Sensitivities and Rural Development	Dignity of Labor	Understanding Rural Life	Selfless Service	High Moral Character	Inter Disciplinary exposure
PLO-19: National Constitution, Culture and Heritage	National Culture and Heritage	National Integration	Selfless Service	A respect for rights	General knowledge
PLO-18: Physical and Psychological Fitness	Physical and Mental Wellness				
PLO-17: Integrated Value System	Tolerance for Diversity	Emotional Maturity	Truthfulness	High Moral Character	

Appendix 2

2.1: Assessment strategy of each Program Indicator based on Revised Bloom's taxonomy

PLO-1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.				Assessment Based on revised Blooms Taxonomy					
C.S. No	Competency	I.S. No	Indicators	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
1.1	Demonstrate competence in mathematical modeling	1.1.1	Apply mathematical techniques such as calculus, linear algebra, and statistics to solve problems						
		1.1.2	Apply advanced mathematical techniques to model and solve mechanical engineering problems						

Appendix-2

2.2: Mapping of Program Learning Outcomes to Course Learning Outcomes along with assessment strategy

PLO-1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.		Assessment Based on revised Blooms Taxonomy						CLO-1: Engineering Mathematics - 1: Application of fundamental principles of Calculus to solve real world problems						Assessment Based on revised Blooms Taxonomy					
CS. No	IS. No	Apply mathematical techniques such as calculus, linear and algebra, statistics to solve problems	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating	CS. No	Course Competency	IS. No	Course Performance Indicators	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating	
1.1	1.1.1	Demonstrate competence in mathematical modeling							1.1	Demonstrate the ability to solve real world problems using Calculus	1.1.1	Apply Calculus to compute motion of a particle in Physics - Velocity, Acceleration and Distance travelled.							
											1.1.2	Apply optimization techniques to solve real world problems in economics and Engineering optimization problems.							
										Demonstrate the ability to solve real world problems using Differential Equations		Apply Laplace transformation to							
	1.1.2	Apply advanced mathematical techniques to model and solve mechanical engineering problems																	

2.3: A Framework for linking Program Learning Outcomes and Course Learning Outcomes using Bloom's taxonomy

Program Learning Outcomes	Program Competency	Program Indicator	Assessment based on revised Blooms Taxonomy	Course -1		
				Course Competency		
				1.1 Indicator		1.2
PO 1	1.1	1.1.1	Remembering		X	
			Understanding	X	X	X
			Applying	X	X	X
			Analysis		X	
			Evaluation			
Create						

2.4: Mapping Assessment Types to Revised Bloom's Taxonomy Levels for Courses related to the Academic Discipline

Assessment Type for Academic Activities	Remembering	Understand	Applying	Analyzing	Evaluating	Creating
Daily Home Assignment - Objective						
Daily Home Assignment - Subjective						
Class Assignment						
Seminar and GD						
LAB Quiz						
Project						
Term Exam						

2.5: Attainment of Program Education Objectives (PEOs):

Since these are the accomplishments of a graduate, they are assessed after 3-4 years of graduation. The attainment is decided based on the feedback from stakeholders.

Stakeholders are

1. Alumni
2. Parent
3. Employer
4. Industries
5. Peers

A questionnaire is prepared based on the PEOs and percentage of satisfactory feedback is decided. If the defined expected level is achieved, PEO is said to be attained.

Following procedure is adopted for attainment of PLOs.

- List the courses contributing to each PLO.
- Map the CLOs of each course with PLOs.
- Find the weightage of each course in attainment of PLO.
- Using Direct and Indirect methods of assessment, compute attainment of CLOs.
- Direct Method of Assessment is based on performance of student in University examination, internal assessment, assignments, term work and oral/practical examinations.
- Indirect Method of Assessment is based on periodical feedback from stake holders at the end of each course.
- Weightage of direct and indirect assessment in computation of attainment of each course outcome may vary from programme to programme. Generally, it is recommended as 70% for direct assessment and 30% for indirect assessment. (Attainment= 0.7 D+ 0.3 I).
- Find attainment of all courses contributing to the respective PLOs.
- Based on weightage of each course, attainment using direct assessment of that PLO is computed.
- Attainment of PLO using indirect assessment is computed based on Exit feedback.
- Apportioning appropriate weightage (0.7 D+ 0.3 I) final attainment of PLO is computed.

Suggested PEOs, Graduate Attributes, PLOs for Under Graduate Programme - Bachelor of Science. (B.Sc.)

A) PEOs

- PEO1: To prepare students for career in basic science and its applications in professional career.
- PEO 2: To develop the student to cope up with the advancements in respective science field.

B) The Graduate Attributes

- a. **Knowledge of science:** Apply the knowledge of mathematics, science and fundamentals to the solution of problems with different applications.

- b. **Problem analysis:** Identify, formulate, research literature, and analyse various research and application problems reaching substantiated conclusions using first principles of mathematics, natural sciences.
- c. **Design and development of solutions for complex problems:** Design system reactions or processes that meet the specified needs with appropriate consideration for the public health and safety, and the societal, and environmental considerations.
- d. **Conduct investigations of complex problems:** The problems that cannot be solved by straightforward application of knowledge, theories and techniques; that may not have a unique solution, which need to be defined (modeled) within appropriate mathematical framework or scientific derivation.
- e. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern tools including prediction and formulation of various reactions with an understanding of the limitations.
- f. **Environment and sustainability:** Understand the impact of the scientific applications and solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- g. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities and norms of the scientific and sustainable development.
- h. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- i. **Communication:** Communicate effectively on complex activities with the community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- j. **Project management and finance:** Demonstrate knowledge and understanding of the management principles and apply these to one's own work, as a member and leader in a team, to manage research and application projects and in multidisciplinary environments.
- k. **Life-long learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of scientific change.

Programme Learning Outcomes(PLOs)

The Graduates will be able to

1. Apply possessed knowledge of fundamental subjects to solve different problems.
2. Analyse various research and scientific problems.

3. Design system reactions with appropriate consideration to safety, economy, health and environmental considerations.
4. Solve complex scientific problems by conducting scientific derivations or mathematical simulations.
5. Use modern tools, resources and software.
6. Apply their responsibilities in societal and environmental contexts.
7. Exhibit professional ethics and norms of scientific development
8. Function individually and in teamwork.
9. Communicate effectively in both verbal and written forms.
10. Manage the work and finance of a research, application projects.
11. Practice the use of lifelong learning.

Following Table shows how the PLOs are aligned with the Graduate Attributes (GAs)

PLOs	Graduate Attributes										
	a	b	c	d	E	f	g	h	i	j	K
1	X										
2		X									
3			X								
4				X							
5					X						
6						X					
7							X				
8								X			
9									X		
10										X	
11											X

Mapping of PLOs with GAs

Note: The PEOs, PLOs and Graduate Attributes defined above are examples/samples for an under graduate programme in Science education. On the basis of experience, study, requirements and feedback from various stake holders, Institutions/ departments can define /rewrite PEOs/PLO/CLOs/GAs. Further, on similar grounds institutions/departments can write PEOs/PLO/CLOs/GAs for other programmes, such as Arts/Commerce etc.

Sample computation of Attainment of PLOs for Under Graduate Programme- Bachelor of Science. (B.Sc.)

Name of the Programme: **B.Sc. (Chemistry)**

1. List the courses of the programme (Sem I to VI) contributing to each PLO
2. Write CLOs of each course and map with PLOs.

Here the example of course Physical Chemistry is taken

CLOs of the said course are mapped with PLO1 of the programme. Following is the Sample Mapping of Course outcomes of the said course with PLO1 of the programme.

Course Code -

|

Course Title: **Physical Chemistry (Sem III)**

CLOs	PLOs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	H	-	-	-	H	-	-	-	H	-	-	M
2	H	-	-	-	H	-	-	-	-	-	-	M
3	H	-	-	-	H	-	-	-	-	-	-	H
4	H	H	-	-	H	-	-	-	-	-	-	H
5	H	H	-	-	H	-	-	-	-	-	-	H
6	H	-	-	-	H	-	-	-	M	-	-	H

The co-relation between Course Learning Outcomes with the Program Learning Outcomes can be defined by three levels using letter grade such as H, M, L. Meaning of it is as

L (Low) : indicates range of contribution of CLO with respective PLO is between 1 to 30%.

M (Medium) : indicates range of contribution of CLO with respective PLO is between 31-70%

H (High) : indicates range of contribution of CLO with respective PLO is between 71-100%.

On the similar basis, mapping of courses of all years/semesters is done with PLOs and correlation is defined in terms of letter grades.

3. Computation of relative weightage and percentage of contribution of each course in attainment of respective PLOs.

The concept of Six -Sigma is used for calculating weighted percentage of contribution of each course in attainment of respective PLOs. The tool used for the same is called as Six Sigma Tool - Cause and Effect Matrix. As per Six- Sigma Concept, the weightage of H, M and L is 9, 3 and 1 respectively. Sample Calculations shown below:

Weightage of course Physical Chemistry in attainment of PLO1 with reference to correlation between course outcomes of the course 'physical Chemistry' (number of H, M and L and its weightages as per six sigma tool) = $6H = 6 \times 9 = 54$
 Weighted Percentage of the course 'Physical Chemistry' in attainment of PLO1 = $\text{Weightage of the course} / \text{total weightage of all courses} = 54 / 1548 = 3.48\%$. Here 1548 is total of weightage of all courses contributing PLO1 computed based on correlation between Course Learning Outcomes with the Program Learning Outcomes and Six Sigma tool.

Title of the Course	L	M	H	Weightage	Weighted percentage of contribution of the course in attainment of PLO1
Physical Chemistry	0	0	6	54	3.48

Similarly compute weighted percentage of contribution of each course in attainment of PLO1.

Attainment of CLOs

Attainment of CLOs is computed using Direct and Indirect Assessment methods. Direct Method of assessment is based on performance of student in university examination, internal assessment, assignments, term work and oral/practical examinations and Indirect Method of assessment is based on periodical feedback from stake holders at the end of each course.

A) CLO attainment by Direct Assessment tools:

- 1) **Assessment of CLOs from End Semester Exam** : Based on the result of End Semester Exam, the number of students scoring more than 60% in every subject are found out. (Percentage of marks can be changed).
- 2) **Assessment of CLOs from Term-work & Oral / Practical Exam** : Based on the result of Term-work & Oral / Practical Exam, the number of students scoring more than 60% in every subject is found out. This also includes the marks of the Term-work

which are based on Continuous assessment of the student for the entire semester. This covers his performance in punctuality (timely submission), presentation and understanding in every lab work / assignments / drawing sheets.

- 3) **Assessment of CLOs from Unit Test Exam :** While framing the syllabus, care is taken to frame the unit in such a manner that each

CLO is covered in teaching when a particular unit is covered in the teaching process. Three Unit Tests are conducted; the syllabus of each unit test is well defined stating the Unit numbers that will be assessed in that unit test. Care is taken to set the questions on specific units while setting the paper of each unit test. By knowing the results of three-unit tests, marks obtained by the student in each unit of the syllabus is known.

If a student scores 60% marks in a question, it is considered that he has understood that unit to the required extent and corresponding CLO is attained. Average of all CLO attainments of a student considering all the three unit tests, represents the performance of the student in Unit Tests.

Following table shows the sample attainment of calculation of attainment of CLOs based on the performance in Unit Tests.

Attainment of CLOs based on performance in Unit Tests

Sr. No.	Course	Percentage Attainment in Unit Test						
		CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	Avg.
1	Physical Chemistry	88.88	94.11	88.57	46.66	19.60	74.28	68.68

Combining the assessment by all performance indicators:

The assessment by combining all the performance indicators is done by giving due weightage to the scheme of assessment.

To find out this combining assessment following equations are used

- 1) For first year courses (having only Term work), direct assessment is calculated as below

$$\frac{80}{125}x + \frac{20}{125}y + \frac{25}{125}z$$

Where,

x = percentage assessment of theory end semester examination

where x is calculated as the percentage of students who scored more than 60% in the end semester examination

y = percentage assessment of Unit Test Examination

where y is calculated based on the performance of students in each Unit test, percentage of students scored more than 60% in the Unit Test

z = percentage assessment of Termwork

where z is calculated based on the performance of students in Termwork, it is the percentage of students scored more than 60% in Termwork + oral or Termwork + practical examination

- 2) For course having only Theory Examination, Direct assessment is calculated as below

$$\frac{80}{100}x + \frac{20}{100}y$$

Where,

x = percentage assessment of theory end semester examination

where x is calculated as the percentage of students who scored more than 60% in the end semester examination

y = percentage assessment of Unit Test Examination

where y is calculated based on the performance of students in each Unit test, percentage of students scored more than 60% in the Unit Test

- 3) For course having Theory and Termwork + oral or Termwork + Practical Examination, Direct assessment is calculated as below

$$\frac{80}{150}x + \frac{20}{150}y + \frac{50}{150}z$$

Where,

x = percentage assessment of theory end semester examination

where x is calculated as the percentage of students who scored more than 60% in the end semester examination

y = percentage assessment of Unit Test Examination

where y is calculated based on the performance of students in each Unit test, percentage of students scored more than 60% in the Unit Test

z = percentage assessment of Termwork + oral or Termwork + practical examination

where z is calculated based on the performance of students in Termwork + oral or Termwork + practical examination, it is the percentage of students scored more than 60% in Termwork + oral or Termwork + practical examination

Based on the above formulas, total direct attainment is calculated for CLO. The following table shows the sample calculations for the same

CLO Attainment
Academic Year 2014-15

Sr. No.	Course	Heads of Passing (Percentage Attainment)							
		Theory			TW + Oral Or TW+ Practical			Unit Test	Average % Attainment
		(1)	(2)	(3)	(4)	(5)	(6)		
1	Physical Chemistry	55	36	65.45	55	45	81.82	68.68	71.34

Column no (1), (4) ----- No. of Students Appeared

Column no (2), (5) ---No. of students scored more than 60%

Column no (3), (6) --- - Percentage attainment

Sample Calculations:

Course Name: Physical Chemistry

Following formula is used to compute attainment of CLO

$$\frac{80}{150}x + \frac{20}{150}y + \frac{50}{150}z$$

According to above table, $x = 65.45$, $y = 68.68$, $z = 81.82$

Using the formula

$$\begin{aligned} & \frac{80}{150} \times 65.45 + \frac{20}{150} \times 68.68 + \frac{50}{150} \times 81.82 \\ & = 71.34 \end{aligned}$$

The CLO attainment of Course Physical Chemistry is 71.34

CLO Attainment by Indirect Assessment tools:

The course outcome feedback is conducted at the end of every term of Academic Year by distributing structured feedback questionnaire to the students. The analysis of this feedback questionnaire is done on the following scale. The feedback forms were sorted with various scales and feedbacks having scale more than 5.5 are considered as satisfactory level for calculations for indirect attainment. Following table shows the sample indirect assessment showing average assessment of every course.

A- 10-8.5 B- 8.4-7.0 C- 6.9-5.5 D- 5.4- 4.0 E- 3.9-0

Table 1: Indirect Attainment of CLOs

Academic Year 2014-15

No. of Students given feedback 50

Name of course: - Advanced surveying

Sr. No	Course Learning Outcome	A	B	C	D	E	Avg(A+B+C)	Percentage	Average
1	CLO1	28	20	2	0	0	50	100.00	98.66
2	CLO2	16	28	6	0	0	50	100.00	
3	CLO3	22	16	12	0	0	25	100.00	
4	CLO4	24	18	6	2	0	50	96.00	
5	CLO5	20	22	8	0	0	50	100.00	
6	CLO6	30	12	6	0	2	48	96.00	

Attainment of each course = $0.7D + 0.3I$ **Final Assessment of CLO Attainment**

Academic Year 2014-15

Sr. No.	Course	% Attainment		Average Course Attainment $0.7D + 0.3I$
		Direct (D)	Indirect (I)	
1	Physical Chemistry	71.34	98.66	79.54

Assessment of PLO attainment by Direct Assessment tools:

The percentage shown in front of each subject represents the percentage contribution of that subject in attainment of PLO1.

Sample Calculations shown below

Weighted Contribution of the course in attainment of PLO1

	L	M	H	Weightage	Weighted percentage of contribution of the course in attainment of PLO1 (a)	Average Course Attainment (b)	Weighted Contribution of the course in attainment of PLO1 $(axb)/100$
AS	0	0	6	54	3.48	79.54	2.77*

* 2.77 is Weighted Contribution of the course Physical Chemistry in attainment PLO1
Assessment of PLO attainment by Indirect assessment tools:

Indirect Attainment of PLO1: Graduate Exit Survey was carried out.

Indirect Attainment of PLO1

PLO 1:

Question asked	*Response Received	Satisfaction Number	% attainment
How well can you apply the knowledge of Physical Chemistry for professional carrier development?*	52	50	96.15

* Question can be modified.

*Number of Students giving feedback

Satisfaction Number: Number of students given feedback which is more than 5.5 on a scale of 10

A- 10-8.5

B- 8.4-7.0

C- 6.9-5.5

D- 5.4- 4.0

E- 3.9-0

Based on the direct and indirect method of assessment of PLO 1, final attainment of each PLO 1 is decided.

Following table shows the final attainment of PLO1.

Final Attainment (%) = 70 % Direct attainment + 30% indirect attainment

Final PLO1 attainment

PLO	Direct Attainment (D)	Indirect Attainment (I)	Final Attainment (0.7D+0.3I)
1	70.81	96.15	78.41

On the similar basis, the assessment of all PLOs attainment is carried out.

Notes:

- 1) All PEOs/PLO/CLO/GA mentioned here are for Under graduate programme in Science faculty. Similarly, one can write PEOs/PLO/CLO/GA for other programmes such as Arts, Commerce and PG Programmes.
- 2) Direct assessment shown in sample calculations is based on total marks obtained in the said course in university examinations and internal assessment. Further refinement is possible in direct assessment by using question wise marks in university marks and mapping of questions with CLOs.

2.6 Suggested Program Learning Outcomes, Competencies and associated Performance Indicators for either B.Com/B.A (Economics)/B.Sc (Chemistry) (table below is indicative)

Program Learning Outcomes (PLOs) 1: Knowledge of Commerce : Possess and apply knowledge of Accounting, Finance, Taxation and Business principles and concepts to complex business situation and problems			
	Competency		Indicators
1.1	<u>B.Com</u> - Demonstrate competence in Accounting system	1.1.1	Understand and apply accounting concepts in preparation of journal, ledger, balance sheet, cash book etc
		1.1.2	Apply knowledge to prepare final accounts of firms
		1.1.3	Apply various methods of depreciation for accounting purpose Apply computational techniques to solve quantitative financial accounting problems
1.1	<u>B.A.(Economics)</u> - Demonstrate competence in Micro Economics and its system	1.1.1	Understand and apply concepts supply and demand; and working of the market structure.
		1.1.2	Apply knowledge of inputs of firms, pricing etc for profit maximization of firms.
1.1	<u>B.Sc (Chemistry)</u> - Demonstrate competence in basic concepts of Chemistry	1.1.1	Apply knowledge of chemical bonding, thermodynamics and atomic structure in the field of chemistry
		1.1.2	Practically demonstrate and conduct experiments regarding reactions and identify inferring radicals
1.2	<u>B.Com</u> - Demonstrate competence in Financial Management concepts	1.2.1	Apply knowledge of financial accounting standards in business
		1.2.2	Apply knowledge of capital budgeting, cost of capital, cash flow etc in business firms
1.2	<u>B.A.(Economics)</u> - Have sound knowledge of macro-economic concepts	1.2.1	Apply knowledge of GDP, Income, Expenditure etc to national income accounting.
		1.2.2	Apply knowledge of money supply and inflation to analyse and understand impact of monetary policy
1.2	<u>B.Sc (Chemistry)</u> - Have knowledge of allied disciplines related to Chemistry	1.2.1	Apply numerical techniques, equations, calculus and trigonometry in the discipline
		1.2.2	Understand and demonstrate knowledge of concepts of matter, electricity and magnetism to chemistry
1.3	<u>B.Com</u> - Demonstrate competence in taxation policies and system	1.3.1	Apply knowledge of taxation system for purpose of corporate taxation and individual tax

Program Learning Outcomes (PLOs) 1: Knowledge of Commerce : Possess and apply knowledge of Accounting, Finance, Taxation and Business principles and concepts to complex business situation and problems			
	Competency		Indicators
1.3	B.A.(Economics)- Demonstrate competence in application of mathematical and statistical models for economics	1.3.1	Understand and apply concepts differential equation, geometry and linear algebra in the field of economics
		1.3.2	Apply various concepts of probability, variables, sampling and statistical tools to the field of economics.
1.3	B.Sc (Chemistry)- Demonstrate competence in Analytical and organic chemistry		Employ spectroscopic techniques for structural identity of organic molecules and apply spectrophotometric techniques for chemical analysis Apply and conduct experiments with knowledge of purification and separation techniques
1.4	B.Com - Demonstrate competence in business management concepts	1.4.1	Apply concepts of planning, organizing and coordinating and decision making to solve business problems
		1.4.2	Apply principles of scientific management to conduct of business operations in firms

Program Learning Outcomes (PLOs) 2: Analytical Skills: Recognize, analyze and reach to conclusions of problems using the principles of accounting and finance			
	Competency		Indicators
2.1	Demonstrate an ability to identify problems in Accounting and finance for firms	2.1.1	Articulate problem statements and identify objectives
		2.1.2	Identify appropriate concepts and systems in an attempt to solve problems.
2.2	Demonstrate an ability to formulate, analyse and interpret systems and concepts	2.2.1	Combine principles and applicable concepts to formulate a process suitable to existing requirement / problem
		2.2.2	Identify changes in practice/system and processes in an attempt to provide alternatives to existing processes and systems
2.3	Demonstrate an ability to analyse results, defend position and arrive at conclusions.	2.3.1	Produce and validate results by applying existing suitable principles
		2.3.2	Identify sources of error in the process
		2.3.3	Prepare conclusions that are consistent to analysis conducted with deep understanding so as to defend the conclusions arrived at.

Program Learning Outcomes (PLOs) 3: Critical Thinking Skills: Critically assess; generate creativity and apply knowledge gained to solve complex problems			
	Competency		Indicators
3.1	Demonstrate an ability to discover and process information in the field.	3.1.1	Construct concepts as an ordered system of relationships
		3.1.2	Seek clear understanding of concepts and ideas that shape reasoning.
3.2	Demonstrate an ability to consider a wide variety of viewpoints, clarify and solve problems	3.2.1	Has developed a multi-dimensional thought process to consider multiple relevant viewpoints.
		3.2.2	Formulate purpose and goals that are clear, realistic and reasonable
		3.2.3	Seek clear understanding of the question/situation under consideration to be solved.
		3.2.4	Has built a broad perspective in understanding issues and facts.
3.3	Demonstrate an ability to transfer ideas to new context, examine assumptions, assess facts, and explore implications and consequences.	3.3.1	Make inferences, discern, evaluate situations within context.
		3.3.2	Question facts with clear understanding through exploration and consideration of its complexities.
		3.3.3	Distinguish between assumptions that are justifiable with those that are not.
		3.3.4	Arrive at results logically, with sound assessment and within constraints.
		3.3.5	Seek clear understanding of implications of their thoughts or ideas and the consequences thereof
		3.3.6	

Program Learning Outcomes (PLOs) 4: Employability Skills: possess knowledge, skill and abilities so as to realize potential for employment or meet requirements of industry.			
	Competency		Indicators
4.1	Have good communication and demonstrates team working skills	4.1.1	Demonstrates effective communication skills.
		4.1.2	Has interpersonal skills and works effectively in teams/groups.
		4.1.3	Appreciates the value of diversity in teams
		4.1.4	Demonstrates ability towards conflict resolution
4.2	Demonstrate and ability to be adaptable and have a positive attitude	4.2.1	Application of positive attitude to situations and complexities
		4.2.2	Understands and takes directions and maintains composure in difficulties
		4.2.3	Accepts responsibility for consequence of actions
4.3	Demonstrate an ability to execute solutions to industry requirements	4.3.1	Presents information and concepts with deep understanding and insights.
		4.3.2	Possesses knowledge in the field of study

Program Learning Outcomes (PLOs) 4: Employability Skills: possess knowledge, skill and abilities so as to realize potential for employment or meet requirements of industry.			
	Competency		Indicators
		4.3.3	Has updated knowledge of job related requirements
		4.3.4	
		4.3.5	Has understanding of business environment and systems
		4.3.6	Synthesizes industry requirements and provides solutions by identifying suitable criteria of evaluation
		4.3.7	Equips with entrepreneurial and consultancy skills

Program Learning Outcomes (PLOs) 5: Ethics: apply ethical principles and commits to professional ethics and norms of the practice.			
	Competency		Indicators
5.1	Demonstrate an ability to understand ethical codes and practices	5.1.1	Identify ethical code of conduct of the practice and requirements.
5.2	Demonstrate and ability to apply ethical principles	5.2.1	Examines ethical principles and applies in conduct of tasks
		5.2.2	Identifies unethical professional conduct and suggests alternatives

Program Learning Outcomes (PLOs) 6: Lifelong Learning : recognises the need for and shall engage in lifelong learning in a changing environment. .			
	Competency		Indicators
6.1	Demonstrate an ability to find out sources of new information and its access	6.1.1	Source new information on a regular basis.
		6.1.2	Analyses sourced information from a feasibility approach.
6.2	Demonstrate and ability to keep abreast of latest developments in the field	6.2.1	Recognizes the need and importance of impact of new developments on current practices
		6.2.2	Use of latest developments in project work and assignments
6.3	Demonstrate and ability to find gaps in knowledge and seek to address the gaps	6.3.1	Identify gaps and finds relevant information to address the gaps
		6.3.2	Analyses and synthesizes the information that may likely address gaps

Course Learning Outcomes

An indication of course learning outcomes relating to courses of B.Sc (Chemistry) programme is provided below:

Physical Chemistry and Inorganic Chemistry - I

- Explain the concept of chemical kinetics and its scope
- Develop skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
- Explain how reaction rates are measured
- Apply rules of logarithms in solving numerical problems in the field of chemistry
- Understand the application of distribution laws in metallurgical operations
- Know and recall the fundamental principles of organic chemistry that include mole concept and stoichiometry
- Acquire deep understanding of methods of expressing concentrations, strength, normality etc
- Prepare standard solutions of acids and bases and predict reaction between acids and bases
- Explain in detail the concept of oxidation and reduction chemical reaction and its changes in oxidation number of molecules, atoms and ions

Organic Chemistry

- To know and understand the structure, nomenclature and application of organic compounds
- Identify weak and strong acids and bases through inductive, resonance, hyper conjugative and steric effects
- Recognize the different types of reactants i.e. electrophile, nucleophile etc
- State and describe chemistry related to alkanes, alkenes, alkylhalides etc and their derivatives, apply them in analysis and synthesis and understand reaction mechanisms.
- Predict the outcome and mechanism of some simple organic reactions using basic understanding of reactivity

Appendix 3

Direct Assessment Types and their Mapping to Characteristic Attributes

Type of Assessment	Category	Nature of Questions	Evaluated Attributes															
			Disciplinary	Critical Thinking	Problem Solving	Analytical Reasoning	Scientific Reasoning	Reflective Thinking	Research Related Skills	Self-Directed Learning	Digital Literacy	Communication Skills	Cooperative/Team Work	Leadership Qualities	Moral and Ethical Values	Lifelong Learning	Multicultural Competence	Fostering Innovation
Daily Home Assignment	Formative	MCQ/ Fill in the Blanks/ Short Answer	✓		✓		✓		✓		✓							
Weekly Home Assignment	Formative	Project Based	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						✓
End of Lecture Class Assignment	Summative	MCQ, short answer	✓		✓	✓												
Spontaneous Challenge Inquiry	Formative	Fill in the blanks, True- False, MCQ, matching		✓	✓	✓												✓
Surprise Quiz	Formative	Fill in the blanks, True-False, MCQ, matching	✓															
Rapid Fire Quiz	Formative	Oral questions in quick succession	✓	✓		✓												

Appendix-3

Type of Assessment	Category	Nature of Questions	Evaluated Attributes															
			Disciplinary	Critical Thinking	Problem Solving	Analytical Reasoning	Scientific Reasoning	Reflective Thinking	Research Related Skills	Self-Directed Learning	Digital Literacy	Communication Skills	Cooperative/Team Work	Leadership Qualities	Moral and Ethical Values	Lifelong Learning	Multicultural Competence	Fostering Innovation
Quarter Term Quiz	Formative	Fill in the blanks, True-False, MCQ, matching	✓		✓													
Problem/ Case based Scenarios	Formative/ Summative	Application of concept(s)	✓	✓	✓	✓	✓	✓	✓								✓	
One Minute Paper (class summary)	Formative	On short paragraph on concepts learned during the class	✓	✓												✓		
Application Article	Formative	A note on the application of concept learnt to a real-world problem	✓	✓						✓	✓							
Mid Term Written Test	Formative	Mixed Short and Long Answers	✓	✓	✓	✓	✓											
End of Term Written Test	Summative	Mixed Short and Long Answers	✓	✓	✓	✓	✓											
Full Term Project	Summative	Real World, Local Problem	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Seminar & Group Discussion	Summative	Research oriented Study																

Type of Assessment	Category	Nature of Questions	Evaluated Attributes																	
			Disciplinary	Critical Thinking	Problem Solving	Analytical Reasoning	Scientific Reasoning	Reflective Thinking	Research Related Skills	Self-Directed Learning	Digital Literacy	Communication Skills	Cooperative/ Team Work	Leadership Qualities	Moral and Ethical Values	Lifelong Learning	Multicultural Competence	Fostering Innovation		
Self-Study	Summative	Research oriented																		
Viva Voce / Oral Examination	Formative/ Summative	Oral Quiz	✓			✓														
Essays	Summative	Descriptive	✓	✓					✓											
Poster	Summative	Research presentation	✓	✓		✓			✓											✓
Pro/ Con Grid	Formative	Pros and Cons development	✓	✓		✓			✓											
Concept Maps	Formative	Concept identification	✓	✓		✓			✓											
Reviews and Annotated	Summative	Research oriented presentation	✓	✓					✓											
Peer Assessment	Formative/ Summative		✓	✓		✓			✓											
Short Term Industry	Summative	Industry Related Problem			✓				✓											✓
Full-Term Industry	Summative	Industry Related Problem			✓				✓											✓
Laboratory Assignment	Formative	Subject matter related	✓		✓				✓											✓
Undergraduate research	Formative	Year long research	✓	✓		✓			✓											✓