Proposed Methodology for Ranking of Engineering Institutions in India

(Suitable Modifications Needed for Other Disciplines to account for Discipline Specific Issues)

Executive Summary

This document presents a methodology to rank engineering institutions across the country. The methodology draws from the broad understanding arrived at by a Core Committee set up by MHRD, regarding the broad parameters for ranking various universities and institutions. The ranking parameters proposed by the Core Committee are generic, and need to be adopted for evolving a detailed methodology for discipline specific rankings.

This document focuses on engineering institutions. The main features of the methodology proposed are as follows:

1. We recommend the identification of a Core Committee, which will oversee the implementation of the ranking work for the first few years. Identification or Formation of a suitable Ranking Authority should be identified in the mean time.
2. The document identifies a set of suitable forms in which these parameters can be easily measured and verified across a variety of institutions.
3. A strategy is proposed for calculating scores to measure the performance of an institution across each such parameter. This helps obtain an overall score for obtaining the institution rank.
4. A two-category approach is proposed to ensure that an institution is compared with an appropriate peer group of institutions, and provide a level-playing field to all.
5. A system for data collection from public bodies and random sample checks is proposed for each parameter.
6. The present document has been developed for engineering and technology institutions. However, with minor changes, it could be adapted to suit other domains and disciplines.

1. Salient Features:

1.1 Methodology is based on developing a set of metrics for ranking of engineering institutions, based on the parameters agreed upon by the core committee.

1.2 These parameters are organized into five broad heads, and have been further elaborated into suitable sub-heads. Each broad head has an overall weight assigned to it. Within each head, the various sub-heads also have an appropriate weight distribution.

1.3 An attempt is made here to first identify the relevant data needed to suitably measure the performance score under-each sub-head. Emphasis here is on identifying data that is easy to generate and easily verifiable, if verification is needed. This is important in the interest of transparency.

1.4 A suitable metric is then proposed, based on this data, which computes a score under each sub-head. The sub-head scores are then added to obtain scores for each individual head. The overall score is computed based on the weights allotted to each head. The overall score can take a maximum value of 100.

1.5 The institutions can then be rank-ordered based on their scores.

2. Ranking Based on Institution Categories

2.1 In view of the huge diversity in the nature and quality of the engineering institutions in the country, it is proposed that ranking be done separately across two distinct categories.

2.2 We recommend that the Institutions be classified as “Autonomous” or “Affiliated”. This would be based on whether the institution has been granted academic autonomy (by the concerned authorities), or is an affiliated college of a university. Autonomous institutions comprise institutions of national importance

set up an act of parliament, state universities, deemed-to-be universities, private universities and other autonomous colleges. Affiliated institutions are those that are affiliated to a University and do not enjoy full academic autonomy.

2.3 Autonomous institutions would necessarily be put in Category A and Affiliated in institutions in Category B in view of their different mandates given below:

Category A: Those engaged in Research and Teaching.

Category B: Those engaged primarily in Teaching.

A Category B institution may choose to be ranked in both categories, if it so desires.

2.4 While score computations for some of the parameters is similar for both of these categories on most counts, the methodologies are somewhat different on a few parameters, to take into account the ground realities, which may be very different for the two categories. This also creates a level playing field for both categories.

2.5 Further, the weights assigned to different components have been slightly adjusted to reflect the different mandates and expectations from institutions of the two categories.

2.6 Even where the assessment metrics are similar, their computation (where percentile calculations are involved) is based on institutions of the corresponding category, for these to be relevant and fair.

2.7 If implemented in this spirit, the ranking methodology will produce two separate rankings, one for each category.

3. Data Collection

3.1 In view of the absence of a reliable and comprehensive Data-Base that could supply all relevant information at this time (as needed for computing the said scores) it is imperative that the institutions that are desirous of participating in the ranking exercise, be asked to supply the data in a given format (Annexure II).

3.2 It is also recommended that the submitted data be uploaded on their own, publicly visible website in the interest of transparency. The data should remain there in an archived form for the next 3 years to enable easy cross checking, where required. Institutions that fail to do this honestly or resort to unethical practices should be automatically debarred from participation in the future Ranking Surveys for a period of two years. An attempt should also be made by the Ranking Authority to maintain the archived form of this data for due diligence as needed.

3.3 The Ranking Authority (or Agency or Board)) should be empowered to take up a random check on the institution records and audited accounts to ensure that the principles of ethical behavior are being adhered to.

3.4 For some of the parameters, the data could be populated from internationally available Data Bases (like Scopus, Web of Science, or Google Scholar). This is indicated in the Assessment Metrics. The Ranking agency should directly access data from these resources, if necessary for a payment.

3.5 Similarly, some data can be made available through a national effort. For example, data about success in public examinations can be easily compiled, if all concerned bodies (UPSC, GATE, NET, CAT etc.) conducting such exams prepare an institution wise list providing details of the total number of aspirants and successful candidates from each institute.

3.6 Similarly universities, including affiliating ones, should be able to provide examination results data in the appropriate format to evaluate the component of Graduate Outcomes.

4. Miscellaneous Recommendations

4.1 It is recommended that the proposed metrics be presented to the core-committee (or another independent committee as deemed appropriate) for their comments and possible improvements, especially to assess the suitability of the metrics and data used for computing these.

4.2 A Ranking Board or Committee should be set up to oversee the process initially.

4.3 A few institutions from both Category A and B should be asked to fill the data from previous years to complete a mock exercise and validate the metrics proposed here.

4.4 The document has been prepared with engineering institutions in mind. But it would require only a slight tweaking to make it suitable for other domains.

5. Implementation Details

5.1 A suitable Ranking Authority/Agency should be identified and empowered. Instead of creating another organization, however, it may be visualized as a Virtual authority, authorized to outsource parts of the work (including data analytics) to various survey organizations. The entire effort could be self-supporting if the institutions desiring to participate be charged a suitable fee for this purpose. Initially, the ranking agency should be provided with a seed funding to roll out the process in a time-bound manner.

5.2 The Ranking Agency should invite institutions interested to participate in the ranking exercise to submit their applications in the given format by 1st December. The data should be submitted on an on-line facility created for this purpose.

5.3 The Ranking Agency will then extract the relevant information from this data and through software, compute the various metrics and rank institutions based on this data. As mentioned earlier, both these components of work could be outsourced suitably. This process should be completed in about 3 months, and rankings published ahead of the next year's admission schedule, say in May.

Document 1

Applicable to Category A Institutions

1. **Teaching, Learning & Resources (TLR): 100 marks**

   Ranking weight: 0.30

   Overall Assessment Metric: TLR = FSR + FQE + LL + SEC

   The component metrics are explained on the following pages.

1(a) Faculty-student ratio with emphasis on permanent faculty (FSR): 30 marks

Assessment will be based on the ratio of number of regular faculty members in the Institute and total sanctioned/approved intake considering all UG & PG Programs.

Regular appointment means faculty on full time basis with no time limit on their employment. However, faculty on contract basis for a period of not less than 3 years, on gross salary similar to those who are permanent can also be included.

Only faculty members with Ph.D or M.Tech qualifications should be counted here. Faculty members with a B.Tech (or equivalent qualification e.g., M.Sc) cannot be counted.

Visiting faculty (with a Ph.D) who are visiting the institution on a full time basis for at least one semester can be included in the count for that semester as explained below.

As per AICTE Guidelines, desirable ratio is 1:10 and minimum is 1:15. AICTE gives deficiency in case of ratio higher than 1:15.

The proposed assessment is based on variation in ratio from 1:10 to 1:20 with maximum to proportional marks respectively.
Assessment metric will be the same for Category A and Category B Institutions.

FSR = 30 × [10 × F/N)]

Here N: Total number of students studying in the institution considering all UG and PG Programs, excluding the Ph.D program.
F_1: Full time regular faculty of all UG and PG Programs in the previous year.
F_2: Eminent teachers/faculty (with Ph.D) visiting the institution for at least a semester on a full time basis can be counted (with a count of 0.5 for each such visiting faculty for a semester) in the previous year.
$F = F_1 + 0.3F_2$

Expected ratio is 1:10 to score maximum marks.
For F/N < 1: 50, FSR will be set to zero.

Data Collection: From the concerned Institutions in prescribed format on an on-line facility. As mentioned in the pre-amble, an institution will be eligible for ranking if all relevant, and up-dated data about the faculty members (in the previous three years) is available on a publicly visible website. The data will be archived and also duplicated by the ranking agency.

Data Verification: By the Ranking Agency on a Random Sample Basis.

1(b) Combined metric for Faculty with PhD and Experience (FQE) – 30 marks

It is proposed to give equal weight (15 marks each) to both qualifications and experience.

Doctoral Qualification:

This will be measured on the basis of percentage of faculty with PhD in Engineering and Technology, Science, Mathematics or Humanities, as relevant to the concerned departments. The expected percentages would be different for Category A and Category B Institutions to account for ground realities.

Assessment metric for Category A Institutions on Ph.D Qualification:

FQ = 15 × (F/95), F ≤ 95%;
FQ = 15, F > 95%.

Here F is the percentage of Faculty with Ph.D. averaged over the previous 3 years.
(Implies that the expected percentage is a minimum of 95% to score maximum score, decreasing proportionately otherwise).

Experience Metric:

Experience will be assessed based on Average regular and relevant experience of the faculty members (from first relevant employment to the present employment) Relevance here means experience in the subject area being taught by the faculty member.

More specifically,

$$E = \frac{\sum E_i}{F}$$

Here E_i denotes the experience of the i'th faculty member.

To simplify, E_i will be calculated from the age profile of the faculty members as follows:

$E_i = A_i - 30$, for $A_i \leq 45$ years.

$E_i = 15$ for $A_i \geq 45$ years.

Assessment Metric for Experience:

FE = 15 X (E/15), E ≤ 15 years;
FE = 15, E > 15 years.

Here E is the average years of experience of all faculty members as calculated above.

This implies that the expected average experience is to be 15 years to score maximum marks, decreasing proportionately otherwise.

Data Collection: Institutions to submit information in a tabular form indicating faculty name, age, qualifications (indicating the University attended for the qualifying degree) and experience under the categories academic and industrial. Updated data for the last 3 years should be available on a publicly available website, and suitably archived for consistency check in subsequent years.

Data Verification: On a random sampling basis.

Combined Metric for Faculty Qualifications and Experience:

FQE = FQ + FE.

1(c) Metric for Library, Laboratory Facility (LL) – 30 marks

It is proposed to give equal weights (15 marks each) to Library and Laboratory facilities.

Library

LI = 15 × (percentile parameter on the basis of annual expenditure (EXLI) on library resources per student)

EXLI = EXLIPS + EXLIES

EXLIPS = EXLIP/N
EXLIES = 2×EXLIE/N

EXLIP: Actual Annual Expenditure on Physical Resources, Books, Journals, etc.
EXLIPE: Actual Annual Expenditure on Electronic Resources, Books, Journals etc.
If this expenditure is below a threshold value to be determined separately for each category of institutions, EXLI = 0.

Laboratories

LB = 15 × (percentile parameter on the basis of annual expenditure (EXLB) on creation and maintenance of lab resources).

If this expenditure is below a threshold value to be determined separately for each category of institutions, EXLB = 0.

Combined Metric for Library and Lab Resources:

LL=LI + LB

1(d) Metric for Sports and Extra-Curricular facility (SEC) – 10 marks

Extra curricular activities may typically include, but not limited to Clubs/Forums, NCC, NSS etc.

Parameters to be used: sports facilities area per student (A); actual expenditure per student on Sports and EC activities (B); and number of top positions in inter-college sports and EC events (C). Each parameter to be evaluated on a percentile basis to obtain the percentile parameter p(A), p(B) and p(C). Weights assigned to the 3 components are 0.5, 0.25 and 0.25 respectively. p(C) = 1, if a college has at least 3 winners of a state level or national event.

SEC = 10×[p(A)/2 + p(B)/4 + p(C)/4].

Data Collection: To be obtained from the institutions. Only institutions who maintain these data on a publicly visible website would be eligible for this ranking.

Data Verification: By ranking agency on a random sample basis.

2. **Research, Professional Practice & Collaborative Performance (RPC): 100 marks**

   Ranking weight: 0.30

   Overall Assessment Metric: RPC = PU + CI + IPR + CP + FPPP

   The component metrics are explained on following pages.

2(a) Combined metric for Publications (PU)– 30 marks

It is proposed that Publications indexed in Scopus, Web of Science, and Google Scholar only will be counted for assessment. An average value P for the previous three years will be computed as detailed later in this item.

The Institution will submit faculty publication list as supporting information. However, the primary sources of information will be Scopus, Web of Science and Google Scholar.

Books/Monographs should have ISBN number and published by reputed publishers.

Assessment Metric for Publications:

PU = 30 × percentile (expressed as a fraction) parameter on the basis of (P/F).

P is the number of publications = weighted average of numbers given by Scopus, Web of Science and Google Scholar over the previous 3 years.

$P = 0.3PW + 0.6PS + 0.1PG$

PW: Number of publications reported in Web of Science.
PS: Number of publications reported in Scopus
PG: Number of publications reported in Google Scholar.

F is the number of regular faculty members as used in Item 1.
Explanation: Percentile parameter = (percentile value of P/F)/100.

2(b) Combined metric for Citations (CI) – 30 marks

The proposed assessment is based on the ratio of number of citations in the previous 3 years to the number of papers published during this time. An average of the numbers from the three popular data bases will be used.

Institutions will be asked to provide information in a tabular form giving relevant details. However, the primary sources will be the three standard data bases Scopus, Web of Science and Google Scholar.

Assessment Metric for Citations:

CI = 30 × percentile (expressed as a fraction) parameter on the basis of (CC/P) for Category A × percentile parameter on the basis of P.

Here CC is Total Citation Count over previous 3 years and P is total number of publications over this period as computed for 2a. CC is computed as follows

CC = 0.3CCW + 0.6CCS + 0.1CCG

2(c) IPR and Patents: Granted, Filed, Licensed (IPR) – 15 marks

Proposed marks distribution – Granted: 5 marks, Filed: 5 marks, Licensed: 5 marks

IPR will include broadly based on registered copyrights, designs and patents over the last 3 years.

Assessment method will be identical for both category of institutions; however, the indicated percentile will be calculated for the two categories separately.

IPR = PF + PG + PL

Assessment of IPR on patents (including copyrights and designs) filed:

PF = 3 × percentile parameter (expressed as a fraction) on the basis of PF/F.

PF is the number of patents, copyrights, designs filed.
F is the number of regular faculty members.

Assessment Metric for IPR on patents (including copyrights and designs) granted:

PG = 6 × percentile parameter (expressed as a fraction) on the basis of PG/F.

PG is the number of patents, copyrights, designs granted/registered.
F is the number of regular faculty members.

Assessment Metric for IPR and Patents Licensed:

PL = 2 ×I(P) + 4 × percentile parameter (expressed as a fraction) based on EP/F.

EP is the total earnings from patents etc. over the last 3 years.
I(P) = 1, if at least one patent was licensed in the previous 3 years or at least one technology transferred during this period; 0 otherwise.
F is the average number of regular faculty over this period.

Data Collection: To be made available by the concerned institutes on-line.
Data Verification: By Ranking Agency on a Random Sample Basis.

2(d) Percentage of Collaborative Publications, patents CP – 10 marks

Assessment Metric for Collaborative Publication and patents:

CP = 10 × (fraction of publications jointly with outside collaborators + fraction of patents jointly with outside collaborators).

In case this number turns out to be more than 10, the score will be restricted to this value.

Data Collection: Mainly from Data Bases like Scopus, Web of Science and Google Scholar. Could be aided by information from the institute.

2(e) Footprint of Projects and Professional Practice (FPPP) – 15 marks

FPPP = FPR + FPC

Proposed distribution: Research Funding: 10 marks, Consultancy: 5 marks

Institution will be asked to provide information in a tabular form indicating funding agency, amount, duration, Principle investigator and impact, if any.

Assessment Metric for Research Funding

FPR = 7.5 × Percentile parameter (as a fraction) based on the average value of RF for the previous 3 years.

RF is average annual research funding earnings (amount actually received in Lakhs) at institute level for the previous 3 years.

Assessment Metric for Consultancy:

FPC = 7.5 × Percentile parameter (as a fraction) based on the average value of CF for the previous 3 years.

CF is cumulative consultancy amount (amount actually received in Lakhs) at institute level, for the previous 3 years.

Although the metric is same for both categories of institutions, the percentile parameters will be calculated separately for each peer group.

3. **Graduation Outcome (GO) :100 marks**

   Ranking weight: 0.15

   Overall Assessment Metric: GO = PUE + PHE + MS

   The component metrics are explained on following pages.

3(a) Combined Performance in Public and University Examinations (PUE):30 marks

Assessment in respect of Public examination to be based on cumulative percentile of students (as a fraction of the number appearing) qualifying in public examinations (such as UPSC Conducted, State Govt., GATE, NET, CAT etc. list to be notified) from an institution, out of the cumulative number of successful students in that year. **An effort should be made to connect with examination conducting agencies to take Institute wise data.**

Assessment in respect of University examination to be based on the percentage of students clearing/complying with degree requirements in minimum time. **Data should be obtained from the Universities or the concerned colleges.**

PUE = PE + UE

Public Exam (PE) (20 Marks) + University Exam (UE) (10 Marks)

For Public Exams, we first calculate the percentile parameter p as follows:

Let f_i be the fraction of successful students from a given institution (ratio of the number successful and the number appearing) for exam i.
$f_i = 0$, when either number of appearing or successful candidates is nil.
Let t_i be the toughness parameter of exam i.

Then

$$p = \text{fraction percentile of } \sum (1 - t_i) f_i, where$$

$$t_i = \frac{\text{number of successful candidates in exam i}}{\text{number appearing in exam i}}$$

Cumulative data is thus weighted across different exams according to their toughness index, which is measured by the ratio of successful candidates to the total number appearing.

PE = 20 × cumulative percentile of students from the institution in the cumulative data of public exams.

UE = 10 × (N/80)

N is the percentage of Students (as a fraction of those admitted for the batch, averaged over the previous 3 years) qualified in university examinations in minimum time.
Expectation: At least 80% students qualify in university examinations in minimum time to score maximum marks.

Data Collection: PE data from Exam Boards and Bodies. UE data from institutions to be verified on a random sampling basis, but preferably directly from the university exam sections, if possible.

3(b) Combined Percentage for Placement, Higher Studies, and Entrepreneurship (PHE): 50 marks

Institute wise composite score will be calculated considering percentage of students placed in jobs, higher education and entrepreneurship. Institutions will be asked to maintain verifiable documentary evidence for each of the categories of placement, for verification if needed.

Entrepreneurship in Engineering and Technology will be considered on the basis of a list of successful entrepreneurs amongst its alumni over the previous ten years. Again, documentary evidence with full details needs to be maintained for verification, where needed.

N_1 = Percentage of students placed through campus placement in the previous year.

N_2 = Percentage of students who have been selected for higher studies. Ideally this data should come from admitting institutions. But initially we may encourage applicant institutions to maintain credible records of this information.

p_3 = percentile parameter for the number of entrepreneurs produced over the previous 10 year period.

Assessment Metric*:

$$\mathbf{PHE = 20 \times (N_1/100 + N_2/100) + 10p_3}$$

*In case reliable and verifiable values of N and p cannot be obtained, the metric will be simplified to

$$\mathbf{PHE = 50 \times N_1/100}$$

3(c) Mean Salary for Employment (MS): 20 marks

Institutions will be asked to submit and maintain information regarding Average salary and Highest salary.

The information will be evaluated relatively on percentile basis separately for Category A and Category B institutions.

Suggestion: In due course of time, this data should be requested from a list of chosen 100 (or 50) top employers to obtain average salary offered to students from different institutions! The bouquet of employers could be different for Tier I and Tier II institutions. The list of employers could be rotated from year to year to avoid biases of any kind.

Alternatively, this data could also be populated through outsourcing the task to a reliable market survey agency.

MS = 20 × average salary of graduates from an institution as a percentile parameter of the maximum average salary across institutions × placement percentile parameter.

Alternatively, we may attempt to obtain this data and ascertain its reliability. Once reliable data starts coming in, this metric may be used. Otherwise, we may modify the marks of various components.

4. **Outreach and Inclusivity (OI):100 marks**

   Ranking weight: 0.15

   Overall Assessment Metric: OI = CES + WS +ESCS + PCS

   The component metrics are explained on following pages.

4(a) Outreach Footprint (Continuing Education, Service) (CES) – 25 marks

Information to be sought from institutions regarding:
Names and Number of CEP courses organized with participation numbers.
Teacher Training and related outreach activities.
Participation in Technology enhanced programs like NPTEL, Virtual Labs or related activities like TEQIP etc.
Interactions with industry.
Facilitation of faculty in quality improvement.
Any other activities falling in this category.

Assessment Metric

CES = 25 × percentile parameter based on N

N: Number of participation certificates issued per year (averaged over previous 3 years) to Teachers/Industry Personnel etc. for outreach programs of 6 days or more.

Percentile parameter calculated separately for each category of institutions.

4(b) Percent Students from other states/ countries (Region Diversity RD): 25 marks

Assessment Metric:

RD = 18 × fraction of total students admitted (averaged over past 3 years) from other states + 7 × fraction of students admitted (averaged over past 3 years) from other countries.

We may also convert above fractions to percentile fractions.

4(c) Percentage of Women – 20 marks

$WS = 8 \times (N_1/50) + 8 \times (N_2/20) + 4 \times (N_3/2)$

N_1 and N_2 are the percentage of Women Students and faculty respectively. N_3 is the number of women members of eminence as Institute Head or in the Governing Board.

Expectation: 50% women students and 20% women faculty and 2 women as Institute Head or in the Governing Board expected to score maximum marks; linearly proportionate otherwise.

4(d) % Economically and Socially Challenged Students (ESCS) – 20 marks

ESCS = 20 × (N/50)

N is the percentage of economically and socially challenged Students averaged over the previous 3 years.
Expectation: 50% economically and socially challenged students should be admitted to score maximum marks.

4(e) Facilities for Physically Challenged Students (PCS) – 10 marks

PCS = 10 marks, if the Institute provides full facilities for physically challenged students.

NAAC and NBA to provide a list of such institutions.

5. **Perception (PR) – 100 marks**

   Ranking weight: 0.1

   Overall Assessment Metric: P = PR + CMP

   The component metrics are explained on following pages.

5(a) Process for Peer Rating in Category (P): 30 marks

This is to be done through a survey conducted over a large category of academics, Institution heads, HR people of employers, members of funding agencies in government, private sector, NGOs, etc.

Lists may be obtained from institutions and a comprehensive list may prepared taking into account various sectors, regions, etc.

Lists to be rotated periodically.

This will be an on-line survey carried out in a time-bound fashion.

Annexure I

Summary of Ranking Parameters Finalized by MHRD

Sr. No.	Parameter	Marks	Weightage
1	Teaching, Learning & Resources	100	0.30
2	Research, Professional Practice & Collaborative Performance	100	0.30
3	Graduation Outcome	100	0.15
4	Outreach and Inclusivity	100	0.15
5	Perception	100	0.10

Cumulative Sheet

1	**Teaching, Learning and Resources**	**(Ranking Weightage = 0.30)**
	A. Teacher Student Ratio with Emphasis on permanent faculty	30 Marks
	B. Combined metric for faculty with Ph.D. and Experience	30 Marks
	C. Metric for Library, Laboratory Facility	30 Marks
	D. Metric for Sports and Extra Curricular Facility	10 Marks
2	**Research, Professional Practice & Collaborative Performance**	**(Ranking Weightage = 0.30)**
	A. Combined metric for publication	30 Marks
	B. Combined Metric for Citations	30 Marks
	C. IPR and Patents: Granted, Filed, Licensed	15 Marks
	D. % of Collaborative Publications, Patents	10 Marks
	E. Footprint of Projects and professional Practice	15 Marks
3	**Graduation Outcome**	**(Ranking Weightage = 0.15)**
	A. Combined Performance in public and University Examination	30 Marks
	B. Combined % for Placement, higher Studies, Entrepreneurship	50 Marks
	C. Mean Salary for Employment	20 Marks
4	**Outreach and Inclusivity**	**(Ranking Weightage = 0.15)**
	A. Outreach Footprint (Continuing Education, Service)	25 Marks
	B. % Students from Other States/Countries	25 Marks
	C. %Women Students	20 Marks
	D. % Economically and Socially Challenged Students	20 Marks
	E. % Physically Challenged Students	10 Marks
5	**Perception**	**(Ranking Weightage = 0.10)**

Document 2

Applicable to Category B Institutions

1. **Teaching, Learning & Resources (TLR): 100 marks**

   Ranking weight: 0.30

   Overall Assessment Metric: TLR = FSR + FQE + LL + SEC

   The component metrics are explained on following pages.

1(a) Faculty-student ratio with emphasis on permanent faculty (FSR): 30 marks

Assessment will be based on the ratio of number of regular faculty members in the Institute and total sanctioned/approved intake considering all UG & PG Programs.

Regular appointment means faculty on full time basis with no time limit on their employment. However, faculty on contract basis for a period of not less than 3 years, on gross salary similar to those who are permanent can also be included.

Only faculty members with Ph.D or M.Tech qualifications should be counted here. Faculty members with a B.Tech (or equivalent qualification e.g., M.Sc) cannot be counted.

Visiting faculty (with a Ph.D) who are visiting the institution on a full time basis for at least one semester, can be included in the count for that semester as explained below.

As per AICTE Guidelines, desirable ratio is 1:10 and minimum is 1:15. AICTE gives deficiency in case of ratio higher than 1:15.

The proposed assessment is based on variation in ratio from 1:10 to 1:20 with maximum to proportional marks respectively.

FSR = 30 × [10 × F/N)]

Here N: Total number of students studying in the institution considering all UG and PG Programs, excluding the Ph.D program.
F_1: Full time regular faculty of all UG and PG Programs in the previous year.
F_2: Eminent teachers/faculty (with Ph.D) visiting the institution for at least a semester on a full time basis can be counted (with a count of 0.5 per semester per visiting faculty) in the previous year.
$F = F_1 + 0.3F_2$

Expected ratio is 1:10 to score maximum marks.
For F/N < 1: 50, FSR will be set to zero.

Data Collection: From the concerned Institutions in prescribed format on an on-line facility. As mentioned in the pre-amble, an institution will be eligible for ranking if all relevant, and up-dated data about the faculty members (in the previous three years) is available on a publicly visible website.

Data Verification: By the Ranking Agency on a Random Sample Basis.

1(b) Combined metric for Faculty with PhD and Experience (FQE) – 30 marks

It is proposed to give equal weight (15 marks each) to both qualifications and experience.

Doctoral Qualification:

This will be measured on the basis of percentage of faculty with PhD in Engineering and Technology, Science, Mathematics or Humanities, as relevant to the concerned departments. The expected percentages would be different for Tier I and Tier II Institutions to account for ground realities.

For Tier-II Institutions

Assessment metric for Category B Institutions on Ph.D Qualifications:

FQ = 15 × (F/30) , F ≤ 30%;
FQ = 15, F > 30%.

Here F is the percentage of Faculty with Ph.D's, averaged over the previous 3 years.
(Implies that the expected percentage is a minimum of 30% to score maximum score, decreasing proportionately otherwise).

Experience Metric:

Experience will be assessed based on Average regular and relevant experience of the faculty members (from first relevant employment to the present employment) Relevance here means experience in the subject area being taught by the faculty member.

More specifically

$$E = \frac{\sum E_i}{F}$$

Here E_i denotes the experience of the i'th faculty member.

To simplify, E_i will be calculated from the age profile of the faculty members as follows:

$E_i = A_i - 30$, for $A_i \leq 45$ years.

$E_i = 15$ for $A_i \geq 45$ years.

Assessment Metric for Experience (For both Tier I and Tier II institutions):

FE = 15 X (E/15), E ≤ 15 years;
FE = 15, E > 15 years.

Here E is the average years of experience of all faculty members as calculated above.

This implies that the expected average experience is to be 15 years to score maximum marks, decreasing proportionately otherwise.

Data Collection: Institutions to submit information in a tabular form indicating faculty name, qualifications (indicating the University attended for the qualifying degree) and experience under the categories academic and industrial. Updated data for the last 3 years should be available on a publicly available website, and suitably archived for consistency check in subsequent years.

Data Verification: On a random sampling basis.

Combined Metric for Faculty Qualifications and Experience:

FQE = (FQ + FE).

1(c) Metric for Library, Laboratory Facility (LL) – 30 marks

It is proposed to give equal weights (15 marks each) to Library and Laboratory facilities.

Minimum requirements for Library have been specified by the AICTE. A zero deficiency (ZD) report for the concerned institution should be available.

Institutions will also be asked to give Annual actual expenditure separately for books, journals, e-journals, and other library resources, which should be verifiable from audited accounts.

Assessment Metric for Library

5 marks (ZD) – Based on availability of Zero-deficiency report.
10 marks (EXLI) – Based on Actual Expenditure on Books, e-books, journals, e-journals and other library resources. If this expenditure is below a threshold value to be determined separately for the two categories of institutions, EXLI = 0.

LI = ZD + 10 × (percentile parameter on the basis of annual expenditure (EXLI) on library resources)

EXLI = EXLIPS + EXLIES

EXLIPS = EXLIP/N
EXLIES = 2×EXLIE/N

EXLIP: Actual Annual Expenditure on Physical Resources, Books, Journals, etc.
EXLIPE: Actual Annual Expenditure on Electronic Resources, Books, Journals etc.

Assessment for Laboratory

Minimum requirement has been specified by the AICTE. A zero deficiency report for the concerned institution should be available.

Institutions will also be asked to give Annual actual expenditure on purchase of new equipment and maintenance of old equipment.

5 marks (ZD) – Compliance to AICTE norms based on availability of Zero deficiency report.

10 marks (EXLB) – Based on Actual annual expenditure on purchase of new equipment, creating new lab infrastructure and maintenance. EXLB = 0 if

annual expenditure is below a certain threshold value, to be determined separately for each category of institutions.

LB = ZD + 10 × (percentile parameter on the basis of annual expenditure EXLB on creation and maintenance of lab resources).

Combined Metric for Library and Lab Resources:

LL=(LI + LB)

1(d) Metric for Sports and Extra-Curricular facility (SEC) – 10 marks

Equal weight will be given to sports facilities, sports budget and top performances, and extra curricular activities.

Extra curricular activities may typically include, but not limited to Clubs/Forums, NCC, NSS etc.

Assessment will be same for Tier I & Tier II Institutions.

Parameters to be used: sports facilities area per student (A); actual expenditure per student on Sports and EC activities (B); and number of top positions in inter-college sports and EC events (C). Each parameter to be evaluated on a percentile basis to obtain the percentile parameter p(A), p(B) and p(C). Weights assigned to the 3 components are 0.5, 0.25 and 0.25 respectively. p(C) = 1, if a college has at least 3 winners of a state level or national event.

SEC = 10×[p(A)/2 + p(B)/4 + p(C)/4].

Data Collection: To be obtained from the institutions. Only institutions who maintain these data on a publicly visible website would be eligible for this ranking.

Data Verification: By ranking agency on a random sample basis.

2. **Research, Professional Practice & Collaborative Performance (RPC): 100 marks**

   Ranking weight: 0.20

   Overall Assessment Metric: RPC = PU + CI + IPR + CP + FPPP

   The component metrics are explained on following pages.

2(a) Combined metric for Publications (PU)– 30 marks

It is proposed that Publications indexed in Scopus, Web of Science, and Google Scholar only will be counted for assessment. An average value P for the previous three years will be computed as detailed later in this item.

The Institution will submit faculty publication list as supporting information. However, the primary sources of information will be Scopus, Web of Science and Google Scholar.

Books/Monographs should have ISBN number and published by reputed publishers.

Assessment Metric for Publications (Category B):

PU = 20 × percentile (expressed as a fraction) parameter on the basis of (P/F).

P is the number of publications = average of numbers given by Scopus, Web of Science and Google Scholar over the previous 3 years.

P = 0.3PW + 0.6PS + 0.1PG

PW: Number of publications reported in Web of Science.
PS: Number of publications reported in Scopus
PG: Number of publications reported in Google Scholar.

F is the number of regular faculty members as used in Item 1.
Explanation: Percentile parameter = (percentile value of P/F)/100.

Although the formulas are identical for both categories of institutions, the percentile parameter will be computed separately for each category.

2(b) Combined metric for Citations (CI) – 30 marks

The proposed assessment is based on the ratio of number of citations in the previous 3 years to the number of papers published during this time. An average of the numbers from the three popular data bases will be used.

Institutions will be asked to provide information in a tabular form giving relevant details. However, the primary sources will be the three standard Data-Bases Scopus, Web of Science and Google Scholar.

Assessment Metric for citations (Category B):

CI = 30 × percentile (expressed as a fraction) parameter on the basis of (CC/P) for the B category × percentile parameter value on the basis of P

Here CC is Total Citation Count over previous 3 years and P is total number of publications over this period as computed in 2a. CC is computed as follows:

$CC = 0.3CCW + 0.6CCS + 0.1CCG$

2(c) IPR and Patents: Granted, Filed, Licensed (IPR) – 15 marks

Proposed marks distribution – Granted: 5 marks, Filed: 5 marks, Licensed: 5 marks

IPR will include broadly based on registered copyrights, designs and patents over the last 3 years.

Assessment method will be identical for both categories. However, the indicated percentile will be calculated for the two categories separately.

IPR = PF + PG + PL

Assessment of IPR on patents (including copyrights and designs) filed:

PF = 3 × percentile parameter (expressed as a fraction) on the basis of PF/F.

PF is the number of patents, copyrights, designs filed.
F is the number of regular faculty members.

Assessment Metric for IPR on patents (including copyrights and designs) granted:

PG = 6 × percentile parameter (expressed as a fraction) on the basis of PG/F.

PG is the number of patents, copyrights, designs granted/registered.
F is the number of regular faculty members.

Assessment Metric for IPR and Patents Licensed:

PL = 2 ×I(P) + 4 × percentile parameter (expressed as a fraction) based on EP/F.

EP is the total earnings from patents etc. over the last 3 years.
I(P) = 1, if at least one patent was licensed in the previous 3 years or at least one technology transferred during this period; 0 otherwise.
F is the average number of regular faculty over this period.

Data Collection: To be made available by the concerned institutes on-line.
Data Verification: By Ranking Agency on a Random Sample Basis.

2(d) Percentage of Collaborative Publications, patents CP – 10 marks

Assessment Metric for Collaborative Publication and patents:

CP = 10 × (fraction of publications jointly with outside collaborators + fraction of patents jointly with outside collaborators).

In case this number turns out to be more than 10, the score will be restricted to this value.

Data Collection: Mainly from Data Bases like Scopus, Web of Science and Google Scholar. Could be aided by information from the institute.

2(e) Footprint of Projects and Professional Practice (FPPP) – 15 marks

FPPP = FPR + FPC

Proposed distribution: Research Funding: 10 marks, Consultancy: 5 marks

Institution will be asked to provide information in a tabular form indicating funding agency, amount, duration, Principle investigator and impact, if any.

Assessment Metric for Research Funding:

FPR = 10 × Percentile parameter (as a fraction) based on the average value of RF for the previous 3 years.

RF is average annual research funding earnings (amount actually received in Lakhs) at institute level for the previous 3 years.

Assessment Metric for Consultancy:

FPC = 10 × Percentile parameter (as a fraction) based on the average value of CF for the previous 3 years.

CF is cumulative consultancy amount (amount actually received in Lakhs) at institute level, for the previous 3 years.

Although the metric is same for the two categories of institutions, the percentile parameters will be calculated separately.

3. **Graduation Outcome (GO) :100 marks**

   Ranking weight: 0.25

   Overall Assessment Metric: GO = PUE + PHE + MS

   The component metrics are explained on following pages.

3(a) Combined Performance in Public and University Examinations (PUE):30 marks

Assessment in respect of Public examination to be based on cumulative percentile of students (as a fraction of the number appearing) qualifying in public examinations (such as UPSC Conducted, State Govt., GATE, NET, CAT etc. list to be notified) from an institution, out of the cumulative number of successful students in that year. **An effort should be made to connect with examination conducting agencies to take Institute wise data.**

Assessment in respect of University examination to be based on the percentage of students clearing/complying with degree requirements in minimum time. **Data should be obtained from the affiliating Universities, if possible.**

It is proposed to give equal weights (15 marks each) to performance in Public exams and University exams in case of Tier I Institution. However, in case of Tier II Institutions, the weights proposed are Public exam: 10 marks and University exam: 20 marks.

PUE = PE + UE

Public Exam (PE) (10 Marks) + University Exam (UE) (20 Marks)

For Public Exams, we first calculate the percentile parameter p as follows:

Let f_i be the fraction of successful students from a given institution (ratio of the number successful and the number appearing) for exam i.
$f_i = 0$, if either the number of successful students are those appearing in the exam are nil.
Let t_i be the toughness parameter of exam i.

Then

$$p = \text{fraction percentile of } \sum (1 - t_i) f_i, where$$

$$t_i = \frac{\text{number of successful candidates in exam i}}{\text{number appearing in exam i}}$$

Cumulative data is thus weighted across different exams according to their toughness index, which is measured by the ratio of successful candidates to the total number appearing.

PE = 10 × cumulative percentile p of students (as a fraction of the number appearing) from the institution in the cumulative data of public exams.

UE = 15 × (N_1/80) + 5 × (N_2/100) ×10

N_1 is the percentage of Students (as a fraction of those admitted for the batch, averaged over the previous three years) qualified in university examinations in minimum time.

Expectation is 80% students should qualify in university examinations in minimum time to score maximum marks.

N_2 is the number of students appearing in the top 100 in the same affiliating university. A multiplier of 10 is included to give full marks for 10 % students in the top 100. For more than 10%, the second term will be truncated to 5.

3(b) Combined Percentage for Placement, Higher Studies, and Entrepreneurship (PHE): 50 marks

Institute wise composite score will be calculated considering % of students placed in jobs, higher education and entrepreneurship. Institutions will be asked to maintain verifiable documentary evidence for each of the categories of placement, for verification if needed.

Entrepreneurship in Engineering and Technology will be considered on the basis of a list of successful entrepreneurs amongst its alumni over the previous ten years. Again, documentary evidence with full details needs to be maintained for verification, where needed.

N_1 = Percentage of students placed in the previous year.

N_2 = Percentage of students who have been selected for higher studies. Ideally this data should come from admitting institutions. But initially we may encourage applicant institutions to maintain credible records of this information.

p_3 = percentile parameter for the number of entrepreneurs produced over the previous 10 year period.

Assessment Metric*:

$$\mathbf{PHE = 20 \times (N_1/100 + N_2/100) + 10p_3}$$

*In case reliable and verifiable values of N and p can not be obtained, the metric will be simplified to

$$\mathbf{PHE = 50 \times N_1/100}$$

3(c) Mean Salary for Employment (MS): 20 marks

Institutions will be asked to submit and maintain information regarding Average salary and Highest salary.

The information will be evaluated relatively on percentile basis separately for the two category of institutions.

Suggestion: In due course of time, this data should be requested from a list of chosen 100 (or 50) top employers to obtain average salary offered to students from different institutions? The bouquet of employers could be different for Tier I and Tier II institutions. The list of employers could be rotated from year to year to avoid biases of any kind.

Alternatively, this data could also be populated through outsourcing the task to a reliable market survey agency.

MS = 20 × average salary of graduates from an institution as a percentile parameter of the maximum average salary across institutions × placement percentile parameter.

Alternatively, we may attempt to obtain this data and ascertain its reliability. Once reliable data starts coming in, this metric may be used. Otherwise, we may modify the marks of various components.

4. **Outreach and Inclusivity (OI):100 marks**

   Ranking weight: 0.15

   Overall Assessment Metric: OI = CES + WS +ESCS + PCS

   The component metrics are explained on following pages.

4(a) Outreach Footprint (Continuing Education, Service) (CES) – 25 marks

Information to be sought from institutions regarding:
Names and Number of CEP courses organized with participation numbers.
Teacher Training and related outreach activities.
Participation in Technology enhanced programs like NPTEL, Virtual Labs or related activities like TEQIP etc.
Interactions with industry.
Facilitation of faculty in quality improvement.
Any other activities falling in this category.

Assessment Metric

CES = 25 × percentile parameter based on N

N: Number of participation certificates issued per year (averaged over previous 3 years) to Teachers/Industry Personnel etc. for outreach programs of 6 days or more.

Percentile parameter calculated separately for each category of institutions.

4(b) Percent Students from other states/ countries (Region Diversity RD): 25 marks

Assessment Metric:

RD = 20 × fraction of total students admitted (averaged over past 3 years) from other states + 5 × fraction of students admitted (averaged over past 3 years) from other countries.

4(c) Percentage of Women – 20 marks

$WS = 8 \times (N_1/50) + 8 \times (N_2/20) + 4 \times (N_3/2)$

N_1 and N_2 are the percentage of Women Students and faculty respectively. N_3 is the number of women members of eminence as Institute Head or in the Governing Board.

Expectation: 50% women students and 20% women faculty and 2 women as Institute Head or in the Governing Board expected to score maximum marks; linearly proportionate otherwise.

4(d) Percentage of Economically and Socially Challenged Students (ESCS) – 20 marks

ESCS = 20 × (N/50)

N is the percentage of economically and socially challenged Students averaged over the previous 3 years.
Expectation: 50% economically and socially challenged students should be admitted to score maximum marks.

4(e) Facilities for Physically Challenged Students (PCS) – 10 marks

PCS = 10 marks, if the Institute provides full facilities for physically challenged students.

NAAC and NBA to provide a list of such institutions.

5. **Perception (PR) – 100 marks**

   Ranking weight: 0.10

   Overall Assessment Metric: P = PR

   The process is explained on following pages.

5(a) Process for Peer Rating in Category (P): 30 marks

This is to be done through a survey conducted over a large category of academics, Institution heads, HR people of employers, members of funding agencies in government, private sector, NGOs, etc.

Lists may be obtained from institutions and a comprehensive list may prepared taking into account various sectors, regions, etc.

Lists to be rotated periodically.

This will be an on-line survey carried out in a time-bound fashion.

For Tier-2 institutions, the lists will have a significant number from state level academics who are knowledgeable about the institutions in the state.

Annexure I

Summary of Ranking Parameters Finalized by MHRD

Sr. No.	Parameter	Marks	Weightage
1	Teaching, Learning & Resources	100	0.30
2	Research, Professional Practice & Collaborative Performance	100	0.20
3	Graduation Outcome	100	0.25
4	Outreach and Inclusivity	100	0.15
5	Perception	100	0.10

Cumulative Sheet

1	**Teaching, Learning and Resources**	**(Ranking Weightage = 0.30)**
	A. Teacher Student Ratio with Emphasis on permanent faculty	30 Marks
	B. Combined metric for faculty with Ph.D. and Experience	30 Marks
	C. Metric for Library, Laboratory Facility	30 Marks
	D. Metric for Sports and Extra Curricular Facility	10 Marks
2	**Research, Professional Practice & Collaborative Performance**	**(Ranking Weightage = 0.20)**
	A. Combined metric for publication	30 Marks
	B. Combined Metric for Citations	30 Marks
	C. IPR and Patents: Granted, Filed, Licensed	15 Marks
	D. % of Collaborative Publications, Patents	10 Marks
	E. Footprint of Projects and professional Practice	15 Marks
3	**Graduation Outcome**	**(Ranking Weightage = 0.25)**
	A. Combined Performance in public and University Examination	30 Marks
	B. Combined % for Placement, higher Studies, Entrepreneurship	50 Marks
	C. Mean Salary for Employment	20 Marks
4	**Outreach and Inclusivity**	**(Ranking Weightage = 0.15)**
	A. Outreach Footprint (Continuing Education, Service)	25 Marks
	B. % Students from Other States/Countries	25 Marks
	C. %Women Students and faculty etc.	20 Marks
	D. % Economically and Socially Challenged Students	20 Marks
	E. Facilities for Physically Challenged Students	10 Marks
5	**Perception**	**(Ranking Weightage = 0.10)**