Research in Higher Educational Institutions in Kerala

Committee on Research in the Universities in Kerala
The Kerala State Higher Education Council

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2	Dr. R. Jayaprakash	Member, Executive Council, KSHEC	Convenor
3	Dr. Jancy James	Former Vice Chancellor, Central University, Kasaragod & MG University, Kottayam.	Member
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Preface

In early August 2014, a Committee was set up by the Kerala State Higher Education Council (KSHEC) to look into all aspects of research in our universities, with a view to improving the facilities, methods and outcomes. Even as the constitution of the Committee was being finalized to cover all the sectors and constituencies involved, an exercise was carried out to collect data from the huge bibliometric database of Thomson Reuters (Web of Science). A surprise gleaning was that the Amrita VV University's campus in Kerala is now among the top addresses for research from HEIs in Kerala. It is just behind CUSAT and Kerala University and far ahead of the other universities in Kerala. It was clear that if modern data analytical techniques had not been used, this will never have been noticed. Cross-university and cross-country comparisons of research performance in such a nuanced and fine-grained way can be possible only if bibliometric approaches are adopted using databases like Web of Science, Google Scholar or Scopus.

Beyond the top-down bibliometric/scientometric indicators approach, it was important to recognise from the ground that research in Kerala suffers from many demons. Many administrative and attitudinal reforms are needed to turn around the groove of low performance that the higher education sector in Kerala has comfortably settled in. At the same time, it was necessary not to demotivate individuals and groups that work hard in spite of the tyranny of low expectations and the administrative hurdles that they have to face in the University system.

For the bottom-up part of the study, a multi-stage approach was envisaged. First, leading researchers in the state were approached to elicit their views on the current status, achievements and highlights of academic research in the higher education sector in Kerala, as well as the problems and irritants faced by a teacher-researcher. Only one responded! An online portal was hosted to harvest views and suggestions from as broad a base as possible and a few valuable inputs were received. Various discipline-wise sub-committees were set up and mandated to produce "state reports" on their respective areas, mapping the research excellence scenario in Kerala, institution-wise and also at the level of individual excellence, but it was beyond the expertise of all concerned. Also, Kerala did not have an institutional framework which had access to proprietary databases like Web of Science or Scopus to carry out such an evaluation for all its sectors engaged in research.

Most of the inputs that came in from the ground are reported in Chapters Three and Four. We see that there is of course considerable reform needed in the administrative machinery to turn our Universities and some of our colleges into research-intensive teaching environments. Often, trivial matters or silly interpretations of rules discourage young investigators who are entering

the University system. Our study has focused on those issues and some general measures we could take to improve the system.

Chapter Five summarises the findings of the report and makes some major recommendations so that we can have a vibrant research-intensive university system that complements the traditional teaching-intensive affiliating type universities.

I will like to thank Ambassador (Rtd) Shri T P Sreenivasan and the Council for setting up this committee. My thanks also go to all those who are acknowledged in the List of Contributors for their role in providing inputs to the report. My special thanks to Dr Chitra L and her colleagues in the KSHEC for their constant and patient support over the eighteen months it took to get this exercise completed.

I will like to end with the prayer that this exercise should be repeated after a meaningful interval, maybe every five years if possible.

Dr.Gangan Prathap
Chairman

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Chapter One

Introduction

The first three universities were established in 1857 at Bombay, Calcutta and Madras as purely examining bodies [1] and continued in this manner for a very long time. India has come a long way since then, and presently about 700+ higher educational institutions are recognised but most of them remain as examining bodies with very restricted or no research functions at all. The first university in Kerala was set up in the erstwhile state of Travancore in 1937 at Trivandrum (now Thiruvananthapuram). Two of the princely states that went on to become constituent parts of Kerala, namely Cochin and Travancore were at the forefront of other states of the Indian union at the time of independence; indeed they ranked No. 1 and No. 2 in the literacy rates [1]. The need for a university of its own for the region was insistent and the University of Travancore began functioning as an affiliating type university with 10 colleges (six being Government colleges and four under private management) first for the princely state of Travancore, and in due course became the University of Kerala after the reorganization of states in 1956 for Travancore, Cochin and the Malabar District of the Madras Presidency. In 1939, the College of Engineering started functioning in Trivandrum to impart instruction in degree and diploma courses in civil, mechanical and electrical engineering [1]. Even earlier, with considerable prescience, a Department of Research was started at the University to promote research in scientific and technological fields. By 1939, this had evolved into a Central Research Institute with a mandate to engage in both theoretical and applied scientific and technological research [1]. From such auspicious beginnings, Kerala has not been able to consolidate its position as a leading destination for higher education or for research in the country although it now has 22 institutions at the tertiary level (Annexure 1). Because of the self-affiliating nature of most of the universities, most of the colleges are constituents of these universities.

Tilak [2] has argued that Kerala could not transform itself into a prosperous developed state despite high levels of literacy, near universal enrolment in elementary education, high levels of social and human development, because of the neglect of higher education in the state. Tilak [2] finds that "Kerala's higher education system has not expanded as much as one expects in a state where in elementary education is nearly universal and secondary education has expanded reasonably well."

This is clear from the statistics available in the latest ALL INDIA SURVEY ON HIGHER EDUCATION (2013-14) Provisional [3]. Among the 717 universities assigned to 32 states and union territories in India, Kerala with 18 universities ranks 19th. Out of the 36812 colleges in India, Kerala with 1125 ranks 10th among the states. The position looks better when one looks at the number of colleges per lakh of eligible population (in the age group of 18-23) – Kerala with 36 colleges per lakh of eligible population compares well with the All India average of 26 and Kerala finds itself at 6th position among the 36 states and union territories for which data is

available. When it comes to average enrolment per college, Kerala with 603 (corresponding All India average is 752) comes in the 22nd position if larger sizes are considered to be better, and at 15th position if the small is beautiful position is invoked. Kerala with a Gross Enrolment Ratio of 25.1 (All India GER is 22.6) is ranked 13th among 36 states and union territories.

In this report, we confine attention to the research activities of the higher educational sector in Kerala and the visibility of the research output in the global context. From Tables 5 and 6 of the AISHE Report [3], we find that out of 617902 students enrolled in the higher education sector in Kerala (University departments, constituent colleges and affiliated colleges), only 3772 are pursuing their PhD degrees. This is just 0.61% of the total, but this compares well with the All India figure of 0.41%.

Global ranking of academic universities was first introduced in 2003 by the Shanghai Jiao Tong University in what is now known as the Academic Ranking of World Universities [2]. Since then, in less than a decade, a large number of university rankings have emerged, the most prominent being the Times Higher Education World University Rankings (since 2004) [3]. Other well recognised efforts are the QS (Quacquarelli Symonds) World University Ranking (since 2004) and The Performance Ranking of Scientific Papers for World Universities by the Higher Education Evaluation and Accreditation Council of Taiwan, HEEACT (since 2007).These rankings, as well as many other similar rankings, e.g. the Leiden rankings (CWTS, Netherlands), the EU Assessment of University-Based Research (AUBR), the Scimago rankings are based mainly on research indicators and focus predominantly on indicators related to the research function of universities. Very few HEIs from India make it to such list, and not surprisingly, even fewer from Kerala. The most prestigious, and also the most controversial ranking is that of ARWU – only one institution from India made it to the Top 500 list, namely the Indian Institute of Science in Bangalore. The largest ranking exercise is that found in the Sci mago Institutions Rankings and in their report for 2014, out of the 2713 institutions that were ranked globally from the higher educational sector, only 156 (5.75%) were from India and of these, only seven were represented from Kerala (Appendix II).

In Chapter Two of this report we shall extensively use state of the art bibliometric indicators to study the research performance of HEIs in Kerala. Wherever possible, we try to use real numbers on a cardinal, ratio or interval scale and not indicate rankings (i.e. ordinal scale). Apart from looking at the quantum of research, we shall also indicate impact and quality, longitudinal time series and also profiles of highly cited research. We use data directly or indirectly from two databases, Scopus (an Elsevier product) and Web of Science (a Thomson Reuters product).

Chapter Two

2.1 Scimago Institutions Rankings (SIR 2014)

We shall examine the seven institutions from Kerala that are listed in the latest (2014) version of the Scimago Institutions Rankings (SIR) report [5]. The SIR is a secondary evaluation exercise using primary bibliometric data from SCOPUS but only indirect surrogate indicators are listed. We use this see the time evolution of the research indicators for seven Kerala based HEIs over a six year window (2009 to 2014). One key feature that has been introduced is called the Scientific talent pool (STP). It is the total number of authors from an institution in the total publication output of that institution during a particular period of time. This indicator is size-dependent and is a measure or proxy of the input that goes into scientific research activity.

Of the seven, only three, namely, the Cochin University of Science and Technology, the Sree Chitra Thirunal Institute of Medical Sciences and Technology and the University of Kerala appear continuously in all the report years from 2009 to 2014. Three institutions, i.e. Mahatma Gandhi University, National Institute of Technology at Calicut and Amrita University have appeared since 2012. The Kerala Veterinary and Animal Sciences University has made its appearance only in the most recent year. For each of these years, the data used to generate the indicators covers a five year period; thus, in the report for the year 2014 the results used are those for the five-year period 2008-2012. Further, the indicators have been normalized on a scale of 0 to 100 with the top institution having the 100 grade. In each year, only those institutions that have published over 100 scholarly articles indexed in the SCOPUS database during the last year of the period of time are counted.

Although SIR lists many indicators, we shall focus on only two output dimensions, quantity and quality. The quantity or size dimension is given simply by the number of articles published during the five-year window, normalized on the 0-100 scale. We indicate this normalized quantity indicator by Output *O*. For this entire cycle from 2009 to 2014, the Centre National de la Recherche Scientifique (CNRS) of France was listed as the top ranking institution in the world with the score of 100. The second dimension is quality. SIR gives several field-normalized size-independent indicators which are in varying ways proxies for this but we shall restrict attention to only one – Excellence Rate, which is the proportion (in %) of an institution's scientific output that is included into the set of the 10% of the most cited papers in their respective scientific fields and is a measure of high quality output of research institutions. Again, for each year, these values are normalized so that the highest ranking performer has a score of 100. The first position has changed hands during the 2009 to 2014 period: the Broad Institute of MIT & Harvard occupied

the top rank with an Excellence Rate score of 100 in 2009 and from 2012 to 2014, while the Whitehead Institute for Biomedical Research was credited with the 100 score in 2010 and 2011. We indicate this normalized quality indicator by q.

As already mentioned, we adopt one size-dependent input indicator, the so-called Scientific talent pool which is the total number of authors from an institution in the total publication output of that institution during a particular period of time as a meaningful measure of the input into research activities. This is also normalized in the same manner as above and again for the period from 2009 to 2014, CNRS of France was listed as the largest institution in the world with the score of 100.We indicate this normalized input indicator by STP.

For a single-valued composite outcome indicator, we computed the second-order indicator called the exergy term from the quantity and quality indicators, $X = q^2O$. Productivity is then computed as X^2/STP and this becomes a plausible performance indicator. We thus have an end-to-end performance analysis: input-output-excellence-outcome-productivity according to the following scheme:

Input – *STP*
Output – *O*
Excellence- Exc = *q*
Outcome – $X = q^2O$
Productivity – *X/STP*.

Table 1 lists the primary input and output variables for the seven institutions. In terms of the scientific talent pool (STP), CUSAT is now presumably the largest research-intensive institution of higher learning in the state (0.86 where CNRS is taken as 100). Although Amrita University shows an STP value of 0.90, this is spread out over three campuses in three states (Kerala, Tamil Nadu and Karnataka). The SLOPE function available in Excel reveals to us whether the STP is growing or diminishing. Except for SCTIMST, all the other institutions are growing as far as their scientifically active talent pool is concerned. Amrita University is the fastest growing in this regard.

How this translates into raw output in terms of number of publications over the respective five-year publication window is also found in Table 1. CUSAT's output indicator at 0.68 is significantly larger than Amrita's (at 0.37), but it is Amrita that is the fastest improving performer as far as raw output is concerned. SCTIMST is seen to be increasing its scientific output at the lowest pace when compared to the rest. This is worrying because SCTIMST is an institute of national importance funded directly by the central government.

The last section of Table 1 shows an indicator that is arguably the best indicator for the quality of the research output. Here we see that Amrita University and STMIST have made modest gains

while the remaining four on the list have registered a fall in the indicator for quality. Amrita has recorded the highest value among the institutions in this list.

Note that these relative declines have to be rationalized in term of the very high standards set by the Broad Institute of MIT & Harvard which occupied the top rank with an Excellence Rate score of 100 in 2009 and from 2012 to 2014, and the Whitehead Institute for Biomedical Research which was credited with the 100 score in 2010 and 2011.

Table 1. The primary input and output indicators from SIR 2014 are shown.

STP	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**SLOPE**
Amrita University				0.64	0.84	0.90	130.00
Cochin University of Science and Technology	0.72	0.76	0.79	0.81	0.86	0.86	29.14
Kerala Veterinary and Animal Sciences University						0.48	
Mahatma Gandhi University				0.35	0.38	0.37	10.00
National Institute of Technology Calicut				0.3	0.35	0.35	25.00
Sree Chitra Thirunal Institute for Medical Sciences and Technology	0.6	0.57	0.59	0.58	0.57	0.57	-4.57
University of Kerala	0.39	0.4	0.44	0.49	0.55	0.55	37.14
OUTPUT	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**SLOPE**
Amrita University				0.17	0.27	0.37	100.00
Cochin University of Science and Technology	0.59	0.61	0.62	0.64	0.65	0.68	16.86
Kerala Veterinary and Animal Sciences University						0.18	
Mahatma Gandhi University				0.22	0.23	0.26	20.00
National Institute of Technology Calicut				0.21	0.24	0.27	30.00
Sree Chitra Tirunal Institute for Medical Sciences and Technology	0.37	0.37	0.39	0.39	0.42	0.42	11.43
University of Kerala	0.26	0.29	0.31	0.32	0.36	0.39	24.86
Excellence	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**SLOPE**
Amrita University				19.49	22.98	22.4	1455.00
Cochin University of Science and Technology	17.98	19.78	17.41	15.81	12.66	11.55	-1574.57
Kerala Veterinary and Animal Sciences University						0.94	
Mahatma Gandhi University				15.16	13.81	12.01	-1575.00
National Institute of Technology Calicut				25.11	20.32	18.72	-3195.00
Sree Chitra Tirunal Institute for Medical Sciences and Technology	8.32	8.92	10.03	9.38	11.85	12.85	879.71
University of Kerala	18.93	20.89	19.01	19.02	16.34	14.51	-1021.14

While Table 1 lists the primary input and output variables for the seven institutions, in Table 2 we compute and display the secondary bibliometric indicators. Exergy, X, is a second-order indicator of performance, which combines quantity of output and quality into a composite value.

Thus while O is a measure for output, one can take X to be an integrated measure of outcome.

2.1.1Kerala 7 benchmarked nationally

It will be chastising to see how the seven institutions rank among the 156 in India in SIR 2014. For this, we use the integrated indicator X as the measure of performance. Table 3 shows the rankings and for comparison, the top HEI in the country is also listed. Note that the best ranking state university appears at the 68th position. To reach the IITs or IISc class, it must scale up its research activities by a factor of 10 to 20, i.e. an order or magnitude.

Table 2. The secondary higher-order outcome indicator and the productivity indicators are shown.

X	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**SLOPE**
Amrita University				64.58	142.6	185.7	40587.92
Cochin University of Science and Technology	190.7	238.7	187.9	160	104.2	90.71	-26614.60
Kerala Veterinary and Animal Sciences University						0.159	
Mahatma Gandhi University				50.56	43.86	37.5	10561.94
National Institute of Technology Calicut				132.4	99.1	94.62	25793.97
Sree Chitra Tirunal Institute for Medical Sciences and Technology	25.61	29.44	39.23	34.31	58.98	69.35	8639.69
University of Kerala	93.17	126.6	112	115.8	96.12	82.11	-4081.87
O/STP	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**SLOPE**
Amrita University				0.266	0.321	0.411	72.74
Cochin University of Science and Technology	0.819	0.803	0.785	0.79	0.756	0.791	-7.97
Kerala Veterinary and Animal Sciences University						0.375	
Mahatma Gandhi University				0.629	0.605	0.703	37.07
National Institute of Technology Calicut				0.7	0.686	0.771	35.71
Sree Chitra Tirunal Institute for Medical Sciences and Technology	0.617	0.649	0.661	0.672	0.737	0.737	25.01
University of Kerala	0.667	0.725	0.705	0.653	0.655	0.709	-1.45
X/STP	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**SLOPE**
Amrita University				100.9	169.7	206.3	52.69
Cochin University of Science and Technology	264.9	314	237.9	197.5	121.1	105.5	-40.46
Kerala Veterinary and Animal Sciences University						0.331	
Mahatma Gandhi University				144.5	115.4	101.4	-21.55
National Institute of Technology Calicut				441.4	283.1	270.3	-85.51
Sree Chitra Tirunal Institute for Medical Sciences and Technology	42.69	51.65	66.5	59.16	103.5	121.7	15.52
University of Kerala	238.9	316.4	254.6	236.3	174.8	149.3	-25.46

2.2Kerala 7 benchmarked internationally

The Republic of Slovenia, is a small nation state on the Adriatic Sea, bordering Italy to the west, Austria to the north, Croatia to the south and southeast, and Hungary to the northeast. It had a population of 2.06 million in 2013. It is therefore smaller than each of the nine most populous districts of Kerala (Malappuram with a population of 4.11 million according to the 2011 Census was the largest and Alappuzha with 2.13 million was the ninth largest district). Slovenia has one university in the ARWU Top 500, namely the University of Ljubljana. It is the oldest, the largest (61,000 students) and the best ranked university in Slovenia.

Table 3. The ranking of the seven HEIs from Kerala out of the 156 from India from SIR 2014 using the second-order outcome indicator X.

Rank	Higher Educational Institution	X
1	*Indian Institute of Science*	*2135.29*
37	Amrita University	185.65
67	National Institute of Technology Calicut	94.62
68	Cochin University of Science and Technology	90.71
73	University of Kerala	82.11
78	Sree Chitra Tirunal Institute for Medical Sciences and Technology	69.35
105	Mahatma Gandhi University	37.50
156	Kerala Veterinary and Animal Sciences University	0.16

Table 4. The seven HEIs from Kerala in SIR 2014 benchmarked against the University of Ljubljana for 2014

Benchmarking against U of Ljubljana for 2014	STP	OUTPUT	Excellence	X	O/STP	X/STP
Amrita University	0.90	0.37	22.40	185.65	0.41	206.28
Cochin University of Science and Technology	0.86	0.68	11.55	90.71	0.79	105.48
Kerala Veterinary and Animal Sciences University	0.48	0.18	0.94	0.16	0.38	0.33
Mahatma Gandhi University	0.37	0.26	12.01	37.50	0.70	101.36
National Institute of Technology Calicut	0.35	0.27	18.72	94.62	0.77	270.34
Sree Chitra Tirunal Institute for Medical Sciences and Technology	0.57	0.42	12.85	69.35	0.74	121.67

University of Kerala	0.55	0.39	14.51	82.11	0.71	149.29
Kerala 7	**4.08**	**2.57**	**14.76**	**560.11**	**0.63**	**137.28**
University of Llubljana	*4.71*	*5.55*	*20.07*	*2235.57*	*1.18*	*474.64*

During the period 2004-2013, this single university published 18,445 publications according to the Web of Science Core Collection; that is more than all the institutions in Kerala put together (15,519 records), and nearly twice as much as all higher educational institutions in Kerala (Kerala 7) taken together (9397 records). Table 4 shows how the seven HEIs from Kerala in SIR 2014 fare in comparison with the University of Ljubljana for the latest year in the SIR time series. We see that Ljubljana has a scientific talent pool that is comparable to Kerala 7, but an output productivity that is nearly twice and an outcome productivity that is nearly three and a half times as much.

2.3 Web of Science citation profiles

The following search strategy is used to collect the publication and citation profiles of all institutions in Kerala for the time period 2004-2013 from the Web of Science Core Collection:

(from Web of Science Core Collection)
You searched for: PS=kerala
Timespan: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.

It was found that 15,519 records matched this query of the 16,707,967 in the data limits selected. In the pages that follow, we shall reproduce screenshots from the WoS database to give a flavour of the highly cited research and the bibliometric indicators. From the 15,519 records, a refining strategy is used to pick out the higher educational institutions, including colleges which have published in the journals covered by the Web of Science Core Collection. In the next page, we summarize this data; About 9379 records out of the 15,519 have been generated by the higher education sector; that is a little above 60%. These 9379 records have been cited a total of 55,520 times for an average impact during this period of 5.92 citations per paper. This will serve as a benchmark to evaluate the performance of the other institutions in the state.

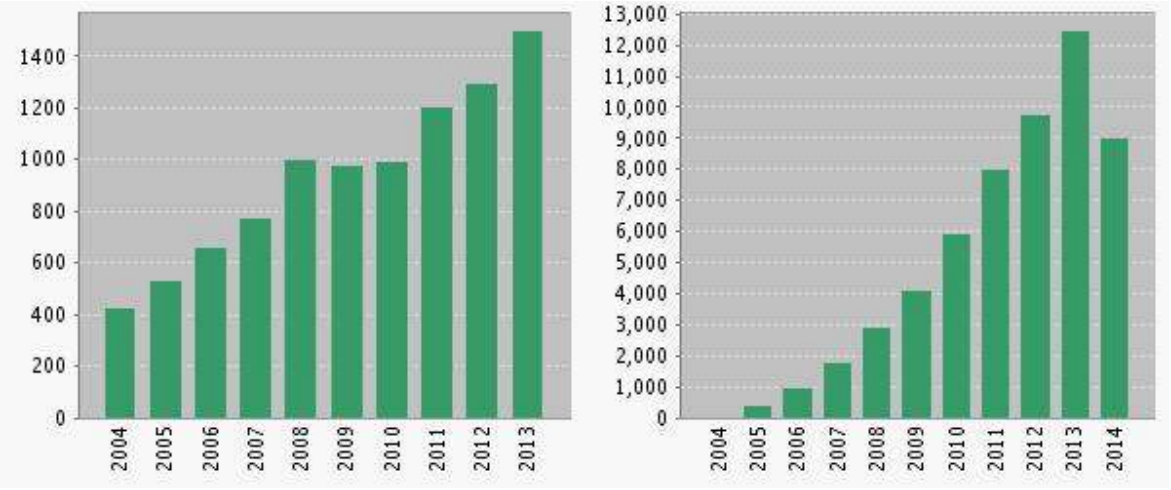
In subsequent pages, we first look closely at the records of the seven institutions that have made it to the SIR 2014 list along with an eighth institution, the Mar Ivanios College.

Sl. No.	Higher Education Institution
1	Cochin University of Science and Technology
2	Sree Chitra Thirunal Institute for Medical Sciences and Technology
3	University of Kerala
4	Mahatma Gandhi University
5	Amritha Vishwa Vidyapeetham (excl. campuses outside Kerala)
6	National Institute of Technology Calicut
7	Mar Ivanios College
8	Kerala Veterinary and Animal Sciences University

As the Medical and Technological Universities have been established only very recently, most of the research in the medical and technological fields are distributed over a large number of colleges. We also look at the citation profiles of these colleges within the higher education sector in Kerala.

All HEIs in Kerala in the Web of Science Core Collection

(from Web of Science Core Collection)
You searched for: PS=kerala
Timespan: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year **Citations in Each Year**

Results found	9379
Sum of the Times Cited	55520
Average Citations per Item	5.92

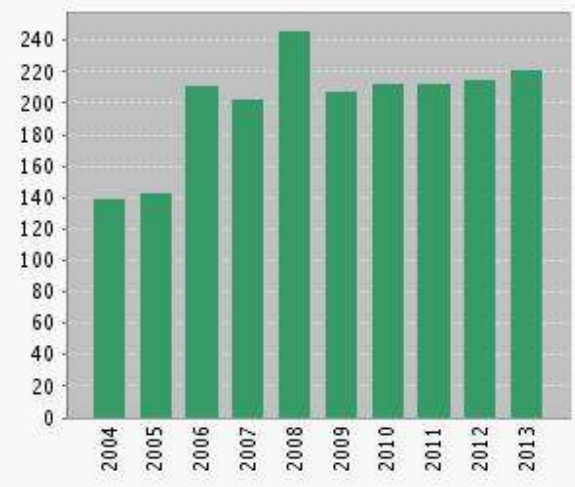
Remarks:

The advanced search option PS=kerala picks up all records with at least one institution/organization with an address in Kerala. The organizations-enhanced option along with the analysis option allows us to restrict/refine the search to cover only the higher educational institutions in the state. This is done by manual inspection and disambiguation. This has to be done carefully and the chances of error are high. For example, for COCHIN UNIVERSITY SCIENCE TECHNOLOGY (1965 records), records also are listed under CUSAT (40 records) and COCHIN UNIV SCI TECHNOL (23 records). There were 119 addresses in all which had at least 5 records during this ten year window (2004-2013).

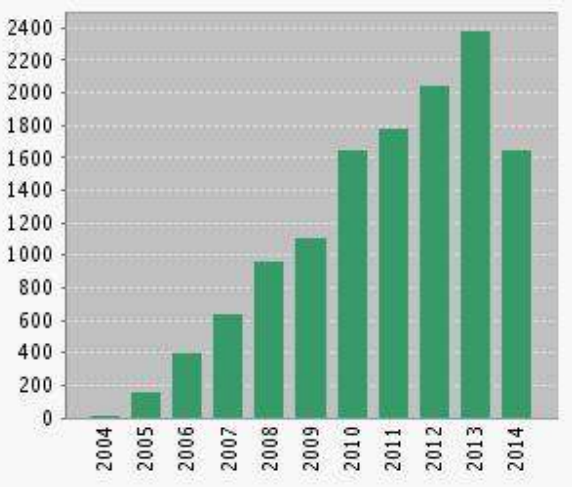
From the displayed data, we see that the number of published items increased steadily from 2004 to 2008, followed by a period of stagnation from 2008 to 2010, and since then there has been a steady increase. Currently, nearly 1500 papers are published each year from the higher education sector in Kerala.

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Citation Report: 2017
(from Web of Science Core Collection)
You searched for: PS=kerala
ORGANIZATIONS-ENHANCED: (COCHIN UNIVERSITY SCIENCE TECHNOLOGY OR CUSAT OR COCHIN UNIV SCI TECHNOL)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year



Citations in Each Year

Results found	2017
Sum of the Times Cited	12828
Average Citations per Item	6.36

Remarks:

The premier research-intensive institution in the higher education sector in Kerala is the COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY (CUSAT). There are 2017 records during the period under survey where at least one address is CUSAT. Note that this is a remarkable performance, accounting for a little more than one-fifth of the output from HEIs in Kerala. The number of published items increased steadily from 2004 to 2008, and since then there has been a worrying plateauing, and the 2008 peak has not been exceeded. As a result, now, CUSAT accounts for only about 15% of the output from HEIs in Kerala. This could imply that the output from other institutions has been increasing and that more new HEIs are now showing a presence in the research space. The impact of the research at 6.36 citations per paper is only slightly higher than the Kerala average of 5.92.

To give an idea of the top-quality research programmes which are being pursued at CUSAT, the ten most highly cited items are listed below:

Ten most highly cited papers:

No.	1
Title	Finite size effects on the structural and magnetic properties of sol-gel synthesized NiFe2O4 powders
Authors	George, M; John, AM; Nair, SS; Joy, PA; Anantharaman, MR
Source Title	JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS, 2005, 302(1), 190-195
Total Citations	135
No.	2
Title	Photocatalytic degradation of pesticide contaminants in water
Authors	Devipriya, S; Yesodharan, S
Source Title	SOLAR ENERGY MATERIALS AND SOLAR CELLS, 2005, 86(3), 309-348
Total Citations	96
No.	3
Title	NIR-FT Raman and infrared spectra and ab initio computations of glycinium oxalate
Authors	Sajan, D; Binoy, J; Pradeep, B; Krishna, KV; Kartha, VB; Joe, IH; Jayakumar, VS
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2004, 60(1-2), 173-180
Total Citations	93
No.	4
Title	New copper(II) complexes of 2-hydroxyacetophenone N(4)-substituted thiosemicarbazones and polypyridyl co-ligands: structural, electrochemical and antimicrobial studies
Authors	John, RP; Sreekanth, A; Rajakannan, V; Ajith, TA; Kurup, MRP
Source Title	POLYHEDRON, 2004, 23(16), 2549-2559
Total Citations	83
No.	5
Title	Effect of mechanical milling on the structural, magnetic and dielectric properties of coprecipitated ultrafine zinc ferrite
Authors	Shenoy, SD; Joy, PA; Anantharaman, MR

Source Title	JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS, 2004, 269(2), 217-226
Total Citations	80
No.	6
Title	Structural, antimicrobial and spectral studies of copper(II) complexes of 2-benzoylpyridine N(4)-phenyl thiosemicarbazone
Authors	Joseph, M; Kuriakose, M; Kurup, MRP; Suresh, E; Kishore, A; Bhat, SG
Source Title	POLYHEDRON, 2006, 25(1), 61-70
Total Citations	77
No.	7
Title	Bioconjugated quantum dots for cancer research: Present status, prospects and remaining issues
Authors	Biju, Vasudevanpillai; Mundayoor, Sathish; Omkumar, Ramakrishnapillai V.; Anas, Abdulaziz; Ishikawa, Mitsuru
Source Title	BIOTECHNOLOGY ADVANCES, 2010, 28(2), 199-213
Total Citations	76
No.	8
Title	Temperature stable low loss ceramic dielectrics in (1-x)ZnAl2O4-xTiO(2) system for microwave substrate applications
Authors	Surendran, KP; Santha, N; Mohanan, P; Sebastian, MT
Source Title	EUROPEAN PHYSICAL JOURNAL B, 2004, 41(3), 301-306
Total Citations	72
No.	9
Title	Carbon nanotubes induced crystallization of poly(ethylene terephthalate)
Authors	Anand, K. Anoop; Agarwal, U. S.; Joseph, Rani
Source Title	POLYMER, 2006, 47(11), 3976-3980
Total Citations	71
No.	10
Title	CuInS2/In2S3 thin film solar cell using spray pyrolysis technique having 9.5% efficiency
Authors	John, TT; Mathew, M; Kartha, CS; Vijayakumar, KP; Abe, T; Kashiwaba, Y
Source Title	SOLAR ENERGY MATERIALS AND SOLAR CELLS, 2005, 89(1), 27-36
Total Citations	71

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES TECHNOLOGY

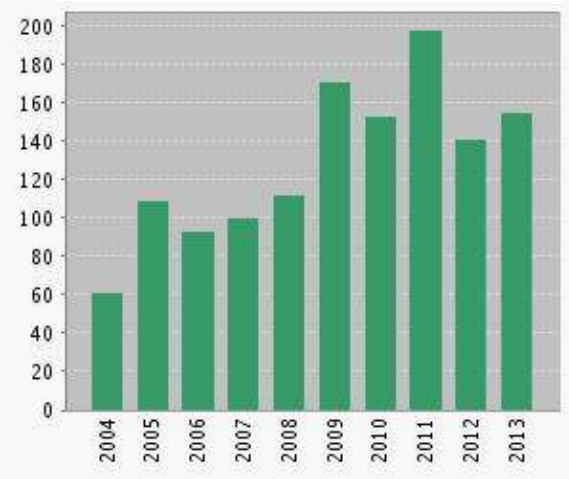
Citation Report: 1293

(from Web of Science Core Collection)

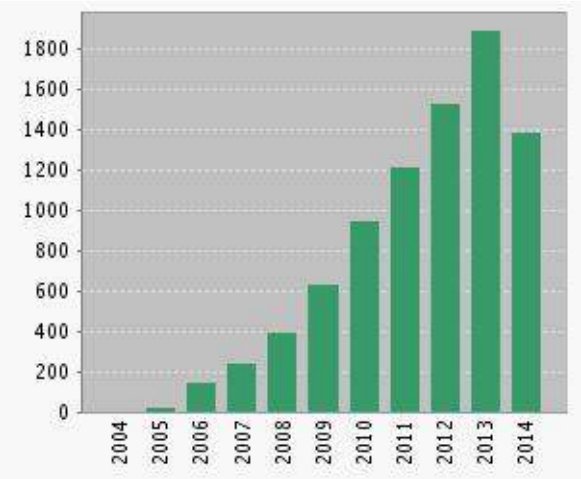
You searched for: PS=kerala

ORGANIZATIONS-ENHANCED: (SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES TECHNOLOGY OR SRI CHITRA TIRUNAL INST MED SCI TECHNOL)

Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year



Citations in Each Year

Results found	1293
Sum of the Times Cited	8418
Average Citations per Item	6.51

Remarks:

The SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY (SCTIMST) is an institution of national importance, originally founded and nurtured by the state government and now fully funded and functioning under the central government. There are 1293 records during the period under survey where at least one address is that of SCTIMST. This accounts for about one-seventh of the output from HEIs in Kerala. The number of published items increased steadily from 2004 to 2011, and since then there has been a decline. Currently, SCTIMST accounts for only about a tenth of the output from HEIs in Kerala. The impact of the research at 6.51 citations per paper, which is only slightly higher than the Kerala average of 5.92, is disappointing as internationally, institutions in the Life Sciences and Clinical Medicine areas have much higher impact relative to the average impact across disciplines.

The ten most highly cited items are listed below:

Ten most highly cited papers:

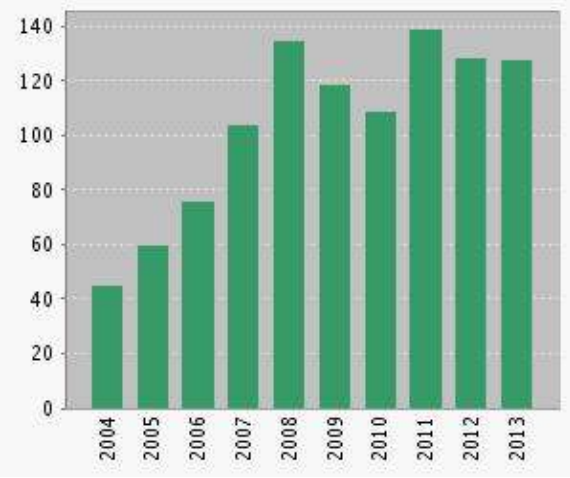
No.	1
Title	Chitin and chitosan polymers: Chemistry, solubility and fiber formation
Authors	Pillai, C. K. S.; Paul, Willi; Sharma, Chandra P.
Source Title	PROGRESS IN POLYMER SCIENCE, 2009, 34(7), 641-678
Total Citations	382
No.	2
Title	Self-cross-linking biopolymers as injectable in situ forming biodegradable scaffolds
Authors	Balakrishnan, B; Jayakrishnan, A
Source Title	BIOMATERIALS, 2005, 26(18), 3941-3951
Total Citations	202
No.	3
Title	Evaluation of an in situ forming hydrogel wound dressing based on oxidized alginate and gelatin
Authors	Balakrishnan, B; Mohanty, M; Umashankar, PR; Jayakrishnan, A
Source Title	BIOMATERIALS, 2005, 26(32), 6335-6342
Total Citations	189
No.	4
Title	Plasma surface modification of polystyrene and polyethylene
Authors	Guruvenket, S; Rao, GM; Komath, M; Raichur, AM
Source Title	APPLIED SURFACE SCIENCE, 2004, 236(1-4), 278-284
Total Citations	124
No.	5
Title	Quantitative diffusion tensor imaging in cerebral palsy due to periventricular white matter injury
Authors	Thomas, B; Eyssen, M; Peeters, R; Molenaers, G; Van Hecke, P; De Cock, P; Sunaert, S
Source Title	BRAIN, 2005, 128(11), 2562-2577
Total Citations	121
No.	6
Title	Motor and language DTI Fiber Tracking combined with intraoperative subcortical mapping for surgical removal of gliomas
Authors	Bello, Lorenzo; Gambini, Anna; Castellano, Antonella; Carrabba, Giorgio; Acerbi, Francesco; Fava, Enrica; Giussani, Carlo; Cadiolib, Marcello; Blasi, Valeria; Casarotti, Alessandra; Papagno, Costanza; Gupta, Arun K.; Gaini, Sergio; Scotti, Giuseppe; Falini, Andrea
Source Title	NEUROIMAGE, 2008, 39(1), 369-382
Total Citations	113
No.	7
Title	A common MYBPC3 (cardiac myosin binding protein C) variant associated with cardiomyopathies in South Asia
Authors	Dhandapany, Perundurai S.; Sadayappan, Sakthivel; Xue, Yali; Powell, Gareth T.; Rani, Deepa Selvi; Nallari, Prathiba; Rai, Taranjit Singh; Khullar, Madhu; Soares, Pedro; Bahl, Ajay; Tharkan, Jagan Mohan; Vaideeswar, Pradeep; Rathinavel, Andiappan; Narasimhan, Calambur; Ayapati, Dharma Rakshak; Ayub, Qasim; Mehdi, S. Qasim; Oppenheimer, Stephen; Richards, Martin B.; Price, Alkes L.; Patterson, Nick; Reich, David; Singh, Lalji; Tyler-Smith, Chris; Thangaraj, Kumarasamy
Source Title	NATURE GENETICS, 2009, 41(2), 187-191
Total Citations	91
No.	8
Title	Cyclodextrin-insulin complex encapsulated polymethacrylic acid based nanoparticles for oral insulin delivery
Authors	Sajeesh, S.; Sharma, Chandra P.
Source Title	INTERNATIONAL JOURNAL OF PHARMACEUTICS, 2006, 325(1-2), 147-154
Total Citations	86
No.	9

Title	Fluorescent gold clusters as nanosensors for copper ions in live cells
Authors	Durgadas, C. V.; Sharma, C. P.; Sreenivasan, K.
Source Title	ANALYST, 2011, 136(5), 933-940
Total Citations	74
No.	10
Title	Synthesis and evaluation of lauryl succinyl chitosan particles towards oral insulin delivery and absorption
Authors	Rekha, M. R.; Sharma, Chandra P.
Source Title	JOURNAL OF CONTROLLED RELEASE, 2009, 135(2), 144-151
Total Citations	74

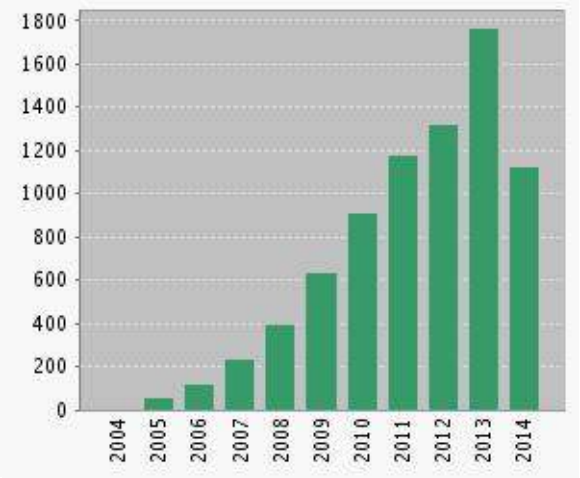
UNIVERSITY OF KERALA

Citation Report: 1044
(from Web of Science Core Collection)
You searched for: PS=kerala

ORGANIZATIONS-ENHANCED: (UNIVERSITY OF KERALA)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year



Citations in Each Year

Results found	1044
Sum of the Times Cited	7755
Average Citations per Item	7.43

Remarks:

The UNIVERSITY OF KERALA is the oldest institution in the higher education sector in the state. There are 1044 records during the period. This accounts for slightly more than one-tenth of the output from HEIs in the state. The number of published items increased steadily from 2004 to 2008, and remained stagnant after that. The impact of the research at 7.43 citations per paper, is higher than the Kerala average of 5.92.

The ten most highly cited items are listed below:

Ten most highly cited papers:

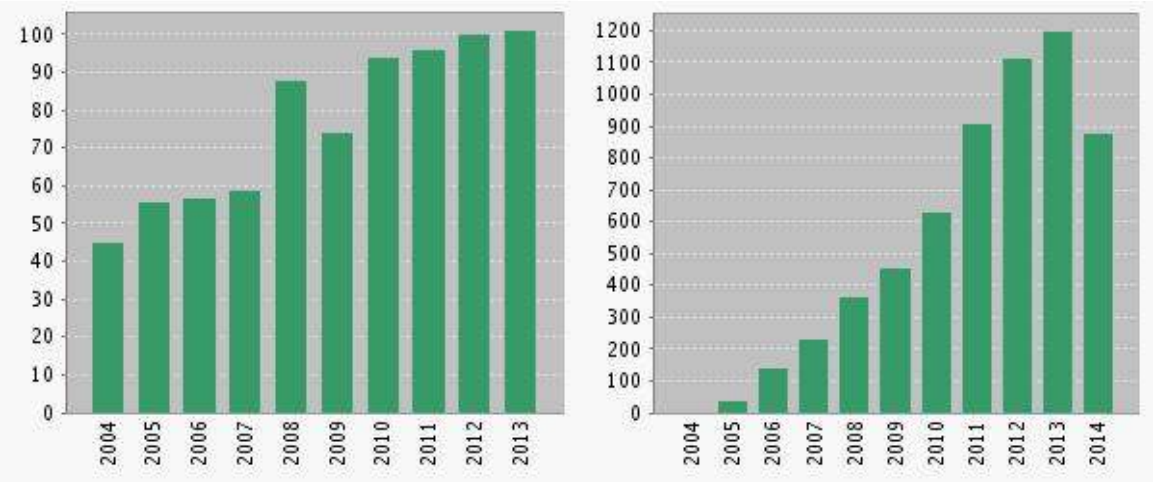
No.	1
Title	Biological activities of curcumin and its analogues (Congeners) made by man and Mother Nature
Authors	Anand, Preetha; Thomas, Sherin G.; Kunnumakkara, Ajaikumar B.; Sundaram, Chitra; Harikumar, Kuzhuvelil B.; Sung, Bokyung; Tharakan, Sheeja T.; Misra, Krishna; Priyadarsini, Indira K.; Rajasekharan, Kallikat N.; Aggarwal, Bharat B.
Source Title	BIOCHEMICAL PHARMACOLOGY, 2008, 76(11), 1590-1611
Total Citations	274
No.	2
Title	Semiconductor quantum dots and metal nanoparticles: syntheses, optical properties, and biological applications
Authors	Biju, Vasudevanpillai; Itoh, Tamitake; Anas, Abdulaziz; Sujith, Athiyanathil; Ishikawa, Mitsuru
Source Title	ANALYTICAL AND BIOANALYTICAL CHEMISTRY, 2008, 391(7), 2469-2495
Total Citations	215
No.	3
Title	Local endemism within the western Ghats-Sri Lanka biodiversity hotspot
Authors	Bossuyt, F; Meegaskumbura, M; Beenaerts, N; Gower, DJ; Pethiyagoda, R; Roelants, K; Mannaert, A; Wilkinson, M; Bahir, MM; Manamendra-Arachchi, K; Ng, PKL; Schneider, CJ; Oommen, OV; Milinkovitch, MC
Source Title	SCIENCE, 2004, 306(5695), 479-481
Total Citations	118
No.	4
Title	Phylogeny of caecilian amphibians (Gymnophiona) based on complete mitochondrial genomes and nuclear RAG1
Authors	San Mauro, D; Gower, DJ; Oommen, OV; Wilkinson, M; Zardoya, R
Source Title	MOLECULAR PHYLOGENETICS AND EVOLUTION, 2004, 33(2), 413-427
Total Citations	88
No.	5
Title	Thermodynamics and kinetics of adsorption of Cu(II) from aqueous solutions onto a new cation exchanger derived from tamarind

	fruit shell
Authors	Anirudhan, T. S.; Radhakrishnan, P. G.
Source Title	JOURNAL OF CHEMICAL THERMODYNAMICS, 2008, 40(4), 702-709
Total Citations	84
No.	6
Title	Bioconjugated quantum dots for cancer research: Present status, prospects and remaining issues
Authors	Biju, Vasudevanpillai; Mundayoor, Sathish; Omkumar, Ramakrishnapillai V.; Anas, Abdulaziz; Ishikawa, Mitsuru
Source Title	BIOTECHNOLOGY ADVANCES, 2010, 28(2), 199-213
Total Citations	76
No.	7
Title	From chemoprevention to chemotherapy: common targets and common goals
Authors	Aggarwal, BB; Takada, Y; Oommen, OV
Source Title	EXPERT OPINION ON INVESTIGATIONAL DRUGS, 2004, 13(10), 1327-1338
Total Citations	75
No.	8
Title	Photosensitized breakage and damage of DNA by CdSe-ZnS quantum dots
Authors	Anas, AbdulAziz; Akita, Hidetaka; Harashima, Hideyoshi; Itoh, Tamitake; Ishikawa, Mitsuru; Biju, Vasudevanpillai
Source Title	JOURNAL OF PHYSICAL CHEMISTRY B, 2008, 112(32), 10005-10011
Total Citations	73
No.	9
Title	Kinetic and equilibrium modelling of lead(II) sorption from water and wastewater by polymerized banana stem in a batch reactor
Authors	Noeline, BF; Manohar, DM; Anirudhan, TS
Source Title	SEPARATION AND PURIFICATION TECHNOLOGY, 2005, 45(2), 131-140
Total Citations	73
No.	10
Title	Studies on surface plasmon resonance and photoluminescence of silver nanoparticles
Authors	Smith, S. L.; Nissamudeen, K. M.; Philip, Daizy; Gopchandran, K. G.
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2008, 71(1), 186-190
Total Citations	68

MAHATMA GANDHI UNIVERSITY

Citation Report: 770
(from Web of Science Core Collection)
You searched for: PS=kerala

ORGANIZATIONS-ENHANCED: (MAHATMA GANDHI UNIVERSITY)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year **Citations in Each Year**

Results found	770
Sum of the Times Cited	5975
Average Citations per Item	7.76

Remarks:

The MAHATMA GANDHI UNIVERSITY is relatively young compared to CUSAT and University of Kerala. There are 770 records during the period under survey. The number of published items has increased steadily throughout from 2004 to 2013. The impact of the research at 7.76 citations per paper, is high when compared to its contemporaries in Kerala.

The ten most highly cited items are listed below. A remarkable feature is that nine of the most highly cited papers during this period haveSabu Thomas as a co-author.

Ten most highly cited papers:

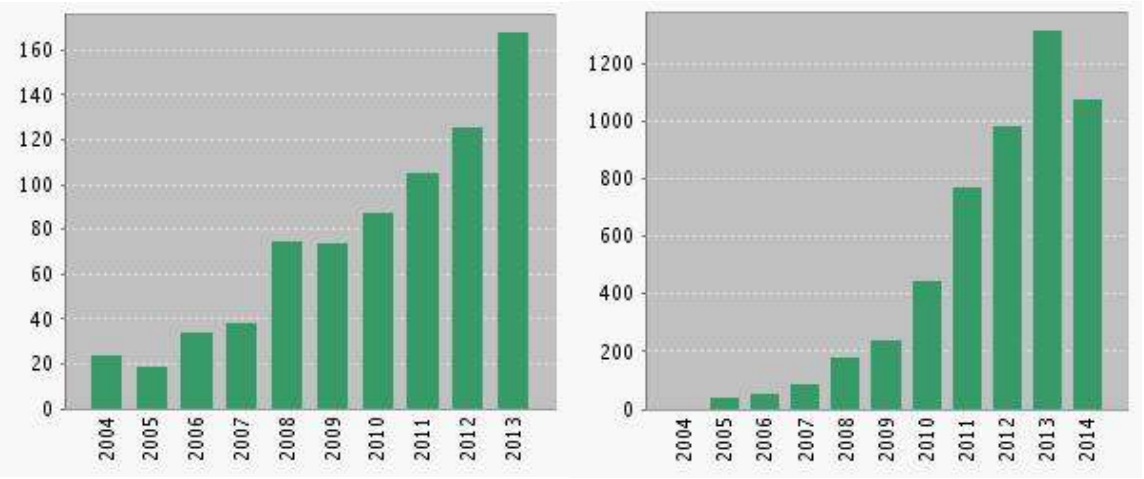
No.	1
Title	Biofibres and biocomposites
Authors	John, Maya Jacob; Thomas, Sabu
Source Title	CARBOHYDRATE POLYMERS, 2008, 71(3), 343-364
Total Citations	319
No.	2

Title	Dynamic mechanical analysis of randomly oriented intimately mixed short banana/sisal hybrid fibre reinforced polyester composites
Authors	Idicula, M; Malhotra, SK; Joseph, K; Thomas, S
Source Title	COMPOSITES SCIENCE AND TECHNOLOGY, 2005, 65(7-8), 1077-1087
Total Citations	98
No.	3
Title	Dynamic mechanical behavior of short coir fiber reinforced natural rubber composites
Authors	Geethamma, VG; Kalaprasad, G; Groeninckx, G; Thomas, S
Source Title	COMPOSITES PART A-APPLIED SCIENCE AND MANUFACTURING, 2005, 36(11), 1499-1506
Total Citations	83
No.	4
Title	Miscibility, morphology, thermal, and mechanical properties of a DGEBA based epoxy resin toughened with a liquid rubber
Authors	Thomas, Raju; Yumei, Ding; Yuelong, He; Le, Yang; Moldenaers, Paula; Weimin, Yang; Czigany, Tibor; Thomas, Sabu
Source Title	POLYMER, 2008, 49(1), 278-294
Total Citations	81
No.	5
Title	Cure kinetics, morphology and miscibility of modified DGEBA-based epoxy resin - Effects of a liquid rubber inclusion
Authors	Thomas, Raju; Durix, Sebastien; Sinturel, Christophe; Omonov, Tolib; Goossens, Sara; Groeninckx, Gabriel; Moldenaers, Paula; Thomas, Sabu
Source Title	POLYMER, 2007, 48(6),1695-1710
Total Citations	73
No.	6
Title	Compatibilizing effect of EPM-g-MA in EPDM/poly(trimethylene terephthalate) incompatible blends
Authors	Aravind, I; Albert, P; Ranganathaiah, C; Kurian, JV; Thomas, S
Source Title	POLYMER, 2004, 45(14), 4925-4937
Total Citations	70
No.	7
Title	Thermophysical properties of natural fibre reinforced polyester composites
Authors	Idicula, Maries; Boudenne, Abderrahim; Umadevi, L.; Ibos, Laurent; Candau, Yves; Thomas, Sabu
Source Title	COMPOSITES SCIENCE AND TECHNOLOGY, 2006, 66(15), 2719-2725
Total Citations	69
No.	8
Title	A novel method for the synthesis of cellulose nanofibril whiskers from banana fibers and characterization
Authors	Cherian, Bibin Mathew; Pothan, Laly A.; Nguyen-Chung, Tham; Mennig, Guenter; Kottaisamy, M.; Thomas, Sabu
Source Title	JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY, 2008, 56(14), 5617-5627
Total Citations	64
No.	9
Title	Effect of chemical modification on properties of hybrid fiber biocomposites
Authors	John, Maya Jacob; Francis, Bejoy; Varughese, K. T.; Thomas, Sabu
Source Title	COMPOSITES PART A-APPLIED SCIENCE AND MANUFACTURING, 2008, 39(2), 352-363
Total Citations	64
No.	10
Title	Energy transfer in Sm3+: Eu3+ system in zinc sodium phosphate glasses
Authors	Biju, PR; Jose, G; Thomas, V; Nampoori, VPN; Unnikrishnan, NV
Source Title	OPTICAL MATERIALS, 2004, 24(4), 671-677
Total Citations	64

AMRITA VISHWA VIDYAPEETHAM UNIVERSITY

Citation Report: 753
(from Web of Science Core Collection)
You searched for: PS=kerala

ORGANIZATIONS-ENHANCED: (AMRITA VISHWA VIDYAPEETHAM UNIVERSITY)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year **Citations in Each Year**

Results found	753
Sum of the Times Cited	5215
Average Citations per Item	6.93

Remarks:

AMRITA UNIVERSITY is a private university whose inspirational origin is Kerala but is instituted at Coimbatore with campuses at Amritapuri (in Kollam), Kochi, Coimbatore and Bangalore. A search using PS=kerala registers 753 records, which is remarkable for a very young institution. Equally remarkable is the nearly exponential growth of publications during the period under survey. The number of published items has increased steadily throughout from 2004 to

2013. The impact of the research at 6.93 citations per paper, is reasonably high when compared to its contemporaries in Kerala.

The ten most highly cited items are listed below.

Ten most highly cited papers:

No.	1
Title	Effect of intravenous corticosteroids on death within 14 days in 10008 adults with clinically significant head injury (MRC CRASH trial): randomised placebo-controlled trial
Authors	Muzha, I; Filipi, N; Lede, R; Copertari, P; Traverso, C; Copertari, A; Vergara, EA; Montenegro, C; de Huidobro, RR; Saladino, P; Surt, K; Cizlzeta, J; Lazzeri, S; Lucero, L; Pinero, G; Ciccioli, F; Videtta, W; Barboza, MF; Svampa, S; Sciuto, V; Domeniconi, G; Bustamante, M; Waschbusch, M; Gullo, MP; Posadas, A; Linares, JCA; Camputaro, L; Penna, J; Troccoli, G; Galimberti, H; Tallott, M; Horn, S; Eybner, C; Buchinger, W; Fitzal, S; Oleffe, V; Grollinger, T; Delvaux, P; Carlier, L; Braet, V; Jacques, JM; de Knoop, D; Choi, HK; Schmitt, M; Gentil, A; Nacul, F; Barrios, PB; Chen, XK; Hua, LS; Tian, HH; Cai, XD; Gualteros, W; Otero, AA; Ciro, J; Jaramillo, H; Garcia, G; Gonzalez, I; Gomez, C; Arias, A; Fonseca, M; Mora, C; Cabrera, EGL; Betancurth, JL; Munoz, P; Quinonez, JA; Castillo, MEG; Lopez, O; Yepes, RP; Cuellar, DL; Paez, G; Chaves, HD; Ordonez, PE; Plata, R; Pineda, M; Pulido, LE; Britton, T; Jaramillo, JSV; Rebolledo, C; Palma, O; Cuadrado, AS; Pastrana, I; Falero, R; Castro, AM; Perera, MD; Garcia, AA; Oliva, R; Domenech, MA; Delgado, HL; Carnero, AM; Lopez, BL; Gallardo, AL; Morales, AO; de Cespedes, CM; Lezcano, H; Lima, GA; Ferrer, MI; Enriquez, M; Bess, IZ; Canino, GR; Ruiz, EMP; Cruz, OG; Kantorova, I; Ochmann, J; Scheer, P; Kozumplik, L; Marsova, J; Edelmann, K; Chytra, I; Bosman, R; Andrejsova, H; Pachl, I; Burger, J; Kramar, F; Vernaza, L; Ulloa, MI; Gonzalez, L; Daccach, A; Ortega, A; Cevallos, S; Cueva, BZ; Arteaga, JC; Ochoa, M; Tapia, JV; Hurtado, J; Wong, MCS; Carbo, TM; Santos, R; Khamis, H; Abaza, AH; Fekry, A; El Kordy, S; Shawky, T; El-Sayed, H; Khalil, N; Negm, N; Fisal, S; Alamin, M; Shokry, H; Elhusseny, AY; Radwan, A; Rashid, M; Gogichaisvili, T; Ingorokva, G; Gongadze, N; Otarashvili, A; Moritz, E; Kleist, W; Kalkum, M; Ulrich, P; Andrews, N; Nakos, G; Karavelis, A; Archontakis, G; Myrianthefs, P; Yadav, Y; Yadav, S; Khatri, R; Baghel, A; Husain, M; Jha, D; Chhang, WH; Dhandhania, M; Fonning, C; Iyengar, SN; Gupta, S; Ravi, RR; Bopiah, KS; Herur, A; Venkataramana, NK; Satish, A; Bhavadasan, K; Morris, R; S, R; Felcry, A; Tirschenreuth, K; Gupta, S; Dewan, Y; Singh, Y; Bhagchandani, R; Bhagchandani, S; Sethurayar, VU; Ipe, S; Sreekumar, G; Panigrahi, M; Reddy, A; Khosla, V; Pillay, H; Thomas, N; Sridhar, K; Jose, B; Kurian, N; Praharaj, S; Pillai, S; Kiyawat, D; Maheshwari, K; Panikar, D; Chawla, J; Shenoy, S; Raja, A; Rupayana, Y; Reddy, S; Mohan, N; Kelkar, S; Johri, M; Golden, N; Maliawan, S; Fauzi, A; Farouk, U; Fakharian, E; Aramesh, A; Ahmadzadeh, F; Gholami, A; Eghtedari, M; Plunkett, P; Redican, C; McMahon, G; Annetta, MG; Mouchaty, H; Bruzzone, E; Harding, A; Qureshi, M; Idris, Z; Abdullah, J; Ghazali, G; Ghani, ARI; Cheah, F; Cabrera, A; Gonzalez, JLM; Loria-Castellanos, J; Jackson, S; Hutchinson, R; Komolafe, E; Adeolu, A; Komolafe, M; Adeyemi-Doro, O; Bankole, F; Danfodiyo, U; Shehu, B; Danlami, V; Odebode, O; Oluwadiya, K; Sanni, A; Giebel, H; Kumar, S; Jooma, R; Guerrero, MA; Mezquita, JE; Ovelar, CO; Gonzalez-Portillo, M; Rodriguez, D; Balica, L; Oprita, B; Sklerniacof, M; Steflea, L; Bandut, L; Danil, A; Iliescu, R; Bagdasar, D; El-Dawlafly, A; Alwatidy, S; Al-Yafi, W; El-Dawlatly, M; Krunic-Protic, R; Janosevic, V; Tan, J; Seah, C; Trenkler, S; Humenansky, M; Stajancova, T; Poprad, N; Schwendt, I; Laincz, A; Bojnice, N; Julius, Z; Maros, S; Kosice, F; Firment, J; Trebisov, N; Cifranicova, M; Saniova, B; Ruzinov, N; Kalig, K; Zamky, NN; Medekova, S; Mikulas, NL; Wiszt, R; Roosevelt, FD; Zilina, N; Macuga, I; Hartzenberg, B; du Pleissis, G; Houlie, Z; Nathoo, N; Khumalo, S; Tracey, R; Munoz-Sanchez, A; Murillo-Cabezas, F; Flores-Cordero, J; Rincon-Ferrari, D; Rubi, M; Caler, L; del Campo, MM; Laguna, LB; de Terrassa, M; Nava, JM; Trueta, J; Haya, C; Lopez, AM; Ramos-Gomez, L; de la Torre-Prados, V; Pellejero, R; Laloe, VR; Mahendran, K; Stocker, R; Ludwig, S; Zimmermann, H; Schaffhausen, K; Denzier, U; Yutthakasemsunt, S; Kittiwattanagul, W; Piyavechvirat, P; Tapsai, P; Nanmang-jan, A; Chantapimpa, U; Watanachai, C; Subsompon, P; Pussanakawatin, W; Khunjan, P; Tangchitvittaya, S; Nilapong, S; Klangsang, T; Taechakosol, W; Srinat, A; Jerbi, Z; Borsali-Falfoul, N; Rezgui, M; Cakar, N; Ssenyonjo, H; Kobusingye, O; Lomas, G; Yates, D; Lecky, F; Bleetman, A; Baldwin, A; Jenkinson, E; Pantrini, S; Stewart, J; Contractor, N; Roberts, T; Butler, J; Pinto, A; Lee, D; Brayley, N; Robbshaw, K; Dix, C; Graham, S; Pye, S; Green, M; Kellins, A; Moulton, C; Fogg, B; Cottingham, R; Funnell, S; Shanker, U; Summers, C; Malek, L; Ashcroft, C; Powell, J; Moore, S; Buckley, S; Grocutt, M; Chambers, S; Morrice, A; Marshall, H; Harris, J; Matthews, W; Tippet, J; Mardell, S; MacMillan, F; Shaw, A; Luthra, P; Dixon, G; Ahmed, M; Young, M; Mason, S; Loveday, I; Clark, C; Taylor, S; Wilson, P; Ali, K; Greenwood, S; White, M; Perez, R; Eljamel, S; Wasserberg, J; Read, C; McCarron, J; Pennell, A; Ray, G; Thurston, J; Brown, E; Jaffey, L; Graves, M; Bailey, R; Loveridge, N; Evans, G; Hughes, S; Ahmed, K; Richardson, J; Gallagher, C; 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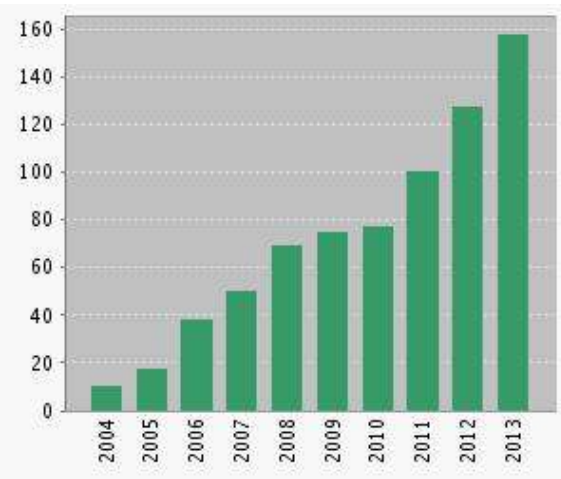
Source Title	LANCET, 2004, 364(9442), 132-1328
Total Citations	322
No.	2
Title	Novel chitin and chitosan nanofibers in biomedical applications

Authors	Jayakumar, R.; Prabaharan, M.; Nair, S. V.; Tamura, H.
Source Title	BIOTECHNOLOGY ADVANCES, 2010, 28(1), 142-150
Total Citations	220
No.	3
Title	SUMO-targeted ubiquitin ligases in genome stability
Authors	Prudden, John; Pebernard, Stephanie; Raffa, Grazia; Slavin, Daniela A.; Perry, J. Jefferson P.; Tainer, John A.; McGowan, Clare H.; Boddy, Michael N.
Source Title	EMBO JOURNAL, 2007, 26(18), 4089-4101
Total Citations	159
No.	4
Title	Biomaterials based on chitin and chitosan in wound dressing applications
Authors	Jayakumar, R.; Prabaharan, M.; Kumar, P. T. Sudheesh; Nair, S. V.; Tamura, H.
Source Title	BIOTECHNOLOGY ADVANCES, 2011, 29(3), 322-337
Total Citations	146
No.	5
Title	Alcohol-induced oxidative stress
Authors	Das, Subir Kumar; Vasudevan, D. M.
Source Title	LIFE SCIENCES, 2007, 81(3), 177-187
Total Citations	126
No.	6
Title	Novel carboxymethyl derivatives of chitin and chitosan materials and their biomedical applications
Authors	Jayakumar, R.; Prabaharan, M.; Nair, S. V.; Tokura, S.; Tamura, H.; Selvamurugan, N.
Source Title	PROGRESS IN MATERIALS SCIENCE, 2010, 55(7), 675-709
Total Citations	105
No.	7
Title	A SIM-ultaneous role for SUMO and ubiquitin
Authors	Perry, J. Jefferson P.; Tainer, John A.; Boddy, Michael N.
Source Title	TRENDS IN BIOCHEMICAL SCIENCES, 2008, 33(5), 201-208
Total Citations	101
No.	8
Title	Role of size scale of ZnO nanoparticles and microparticles on toxicity toward bacteria and osteoblast cancer cells
Authors	Nair, Shantikumar; Sasidharan, Abhilash; Rani, V. V. Divya; Menon, Deepthy; Nair, Seema; Manzoor, K.; Raina, Satish
Source Title	JOURNAL OF MATERIALS SCIENCE-MATERIALS IN MEDICINE, 2009, 20, 235-241
Total Citations	99
No.	9
Title	Luminescent Quantum Clusters of Gold in Bulk by Albumin-Induced Core Etching of Nanoparticles: Metal Ion Sensing, Metal-Enhanced Luminescence, and Biolabeling
Authors	Muhammed, Madathumpady Abubaker Habeeb; Verma, Pramod Kumar; Pal, Samir Kumar; Retnakumari, Archana; Koyakutty, Manzoor; Nair, Shantikumar; Pradeep, Thalappil
Source Title	CHEMISTRY-A EUROPEAN JOURNAL, 2010, 16(33), 10103-10112
Total Citations	83
No.	10
Title	Molecular-receptor-specific, non-toxic, near-infrared-emitting Au cluster-protein nanoconjugates for targeted cancer imaging
Authors	Retnakumari, Archana; Setua, Sonali; Menon, Deepthy; Ravindran, Prasanth; Muhammed, Habeeb; Pradeep, Thalappil; Nair, Shantikumar; Koyakutty, Manzoor
Source Title	NANOTECHNOLOGY, 2010, 21(5)
Total Citations	80

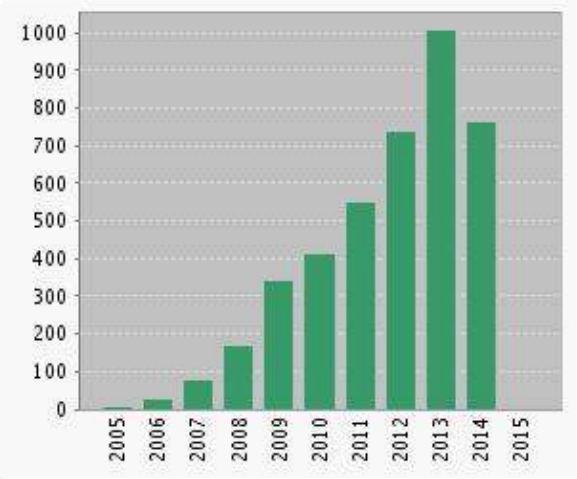
NATIONAL INSTITUTE OF TECHNOLOGY, CALICUT

Results: 729
(from Web of Science Core Collection)
You searched for: PS=kerala

Refined by: ORGANIZATIONS-ENHANCED: (NATIONAL INSTITUTE OF TECHNOLOGY CALICUT OR NATL INST TECHNOL CALICUT OR NIT CALICUT OR NATL INST TECHNOL)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year



Citations in Each Year

Results found	729
Sum of the Times Cited	4109
Average Citations per Item	5.64

Remarks:

NIT Calicut is now an institute of national importance. The number of published items has increased steadily throughout from 2004 to 2013. The impact of the research at 5.64 citations per paper, is not unreasonable in comparison with its contemporaries in Kerala due to its restricted focus on engineering and technology.

The ten most highly cited items are listed below:

Ten most highly cited papers:

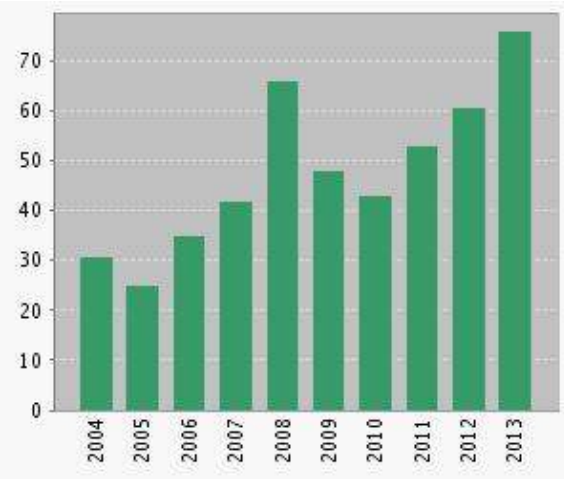
No.	1
Title	Biodiesel production from high FFA rubber seed oil
Authors	Ramadhas, AS; Jayaraj, S; Muraleedharan, C
Source Title	FUEL, 2005, 84(4), 335-340
Total Citations	357
No.	2
Title	Use of vegetable oils as IC engine fuels - A review
Authors	Ramadhas, AS; Jayaraj, S; Muraleedharan, C
Source Title	RENEWABLE ENERGY, 2004, 29(5), 727-742
Total Citations	231
No.	3
Title	Heart rate variability: a review
Authors	Acharya, U. Rajendra; Joseph, K. Paul; Kannathal, N.; Lim, Choo Min; Suri, Jasjit S.
Source Title	MEDICAL & BIOLOGICAL ENGINEERING & COMPUTING, 2006, 44(12), 1031-1051
Total Citations	212
No.	4
Title	Performance and emission evaluation of a diesel engine fueled with methyl esters of rubber seed oil
Authors	Ramadhas, AS; Muraleedharan, C; Jayaraj, S
Source Title	RENEWABLE ENERGY, 2005, 30(12),1789-1800
Total Citations	164
No.	5
Title	Characterization and effect of using rubber seed oil as fuel in the compression ignition engines
Authors	Ramadhas, AS; Jayaraj, S; Muraleedharan, C
Source Title	RENEWABLE ENERGY, 2005, 30(5),795-803
Total Citations	100
No.	6
Title	Optimised model for community-based hybrid energy system
Authors	Ashok, S.
Source Title	RENEWABLE ENERGY, 2007, 32(7), 1155-1164
Total Citations	81
No.	7
Title	A comparative study on mechanical properties of sisal-leaf fibre-reinforced polyester composites prepared by resin transfer and compression moulding techniques
Authors	Sreekumar, P. A.; Joseph, Kuruvilla; Unnikrishnan, G.; Thomas, Sabu
Source Title	COMPOSITES SCIENCE AND TECHNOLOGY, 2007, 67(3-4), 453-461
Total Citations	61
No.	8
Title	Morphology, dynamic mechanical and thermal studies on poly(styrene-co-acrylonitrile) modified epoxy resin/glass fibre composites
Authors	Hameed, Nishar; Sreekumar, P. A.; Francis, Bejoy; Yang, Weimin; Thomas, Sabu
Source Title	COMPOSITES PART A-APPLIED SCIENCE AND MANUFACTURING, 2007, 38(12), 2422-2432
Total Citations	56
No.	9
Title	Effect of fiber surface modification on the mechanical and water absorption characteristics of sisal/polyester composites fabricated by resin transfer molding
Authors	Sreekumar, P. A.; Thomas, Selvin P.; Saiter, Jean Marc; Joseph, Kuruvilla; Unnikrishnan, G.; Thomas, Sabu
Source Title	COMPOSITES PART A-APPLIED SCIENCE AND MANUFACTURING, 2009, 40(11), 1777-1784
Total	53

Citations	
No.	10
Title	Coconut oil as base oil for industrial lubricants - evaluation and modification of thermal, oxidative and low temperature properties
Authors	Jayadas, N. H.; Nair, K. Prabhakaran
Source Title	TRIBOLOGY INTERNATIONAL, 2006, 39(9), 873-878
Total Citations	44

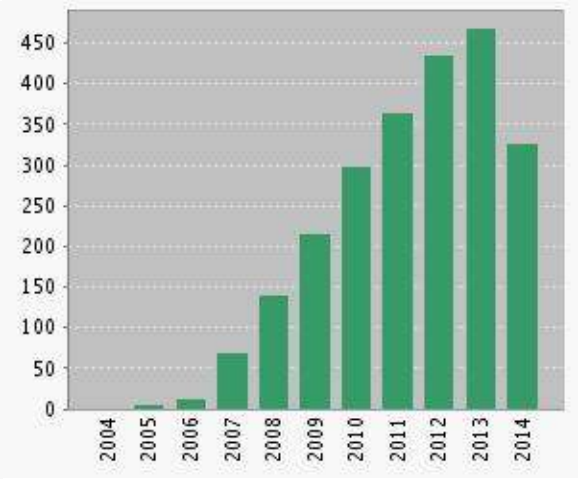
UNIVERSITY OF CALICUT

Citation Report: 480
(from Web of Science Core Collection)
You searched for: PS=kerala

ORGANIZATIONS-ENHANCED: (UNIVERSITY OF CALICUT)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year



Citations in Each Year

Results found	480
Sum of the Times Cited	2342
Average Citations per Item	4.88

Remarks:

The University of Calicut is a relatively young state run university. The number of published items has been modest (not exceeding 100 a year, the threshold to make it to the Scimago list) but this has increased steadily from 2004 to 2013. The impact of the research at 4.88 citations per paper, is low even comparison with its contemporaries in Kerala.

The ten most highly cited items are listed below:

Ten most highly cited papers:

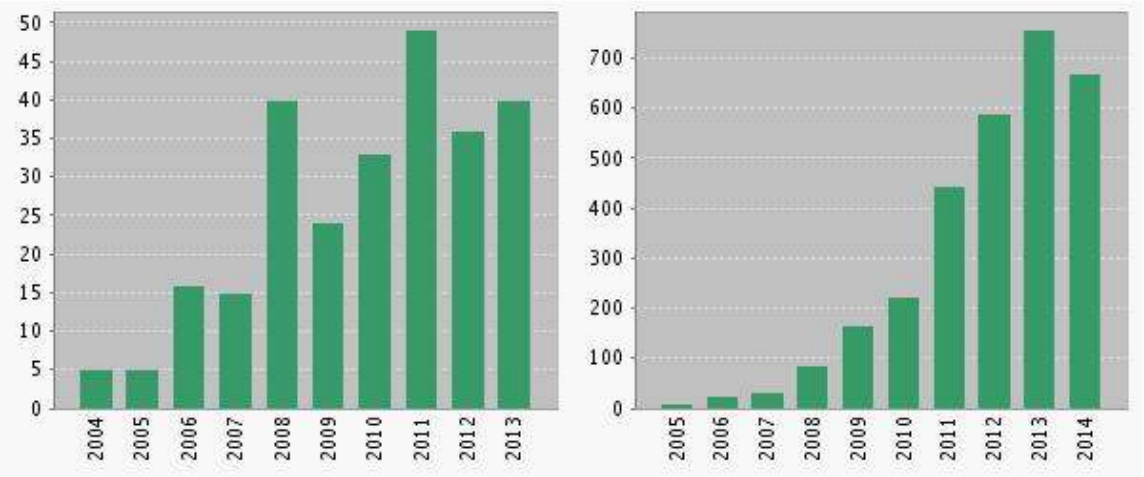
No.	1
Title	Images - III. The evolution of the near-infrared Tully-Fisher relation over the last 6 Gyr
Authors	Puech, M.; Flores, H.; Yang, Y.; Neichel, B.; Lehnert, M.; Chemin, L.; Nesvadba, N.; Epinat, B.; Amram, P.; Balkowski, C.; Cesarsky, C.; Dannerbauer, H.; Alighieri, S. di Serego; Fuentes-Carrera, I.; Guiderdoni, B.; Kembhavi, A.; Liang, Y. C.; Ostlin, G.; Pozzetti, L.; Ravikumar, C. D.; Rawat, A.; Vergani, D.; Vernet, J.; Wozniak, H.
Source Title	ASTRONOMY & ASTROPHYSICS, 2008, 484(1), 173-187
Total Citations	68
No.	2
Title	Corrosion inhibition of mild steel in hydrochloric acid solution by Schiff base furoin thiosemicarbazone
Authors	Jacob, K. Stanly; Parameswaran, Geetha
Source Title	CORROSION SCIENCE, 2010, 52(1), 224-228
Total Citations	59
No.	3
Title	IMAGES. I. Strong evolution of galaxy kinematics since z=1
Authors	Yang, Y.; Flores, H.; Hammer, F.; Neichel, B.; Puech, M.; Nesvadba, N.; Rawat, A.; Cesarsky, C.; Lehnert, M.; Pozzetti, L.; Fuentes-Carrera, I.; Amram, P.; Balkowski, C.; Dannerbauer, H.; Alighieri, S. di Serego; Guiderdoni, B.; Kembhavi, A.; Liang, Y. C.; Ostlin, G.; Ravikumar, C. D.; Vergani, D.; Vernet, J.; Wozniak, H.
Source Title	ASTRONOMY & ASTROPHYSICS, 2008, 477(3), 789-805
Total Citations	53
No.	4
Title	Conjugated linoleic acids as functional food: an insight into their health benefits
Authors	Benjamin, Sailas; Spener, Friedrich
Source Title	NUTRITION & METABOLISM, 2009, 6
Total Citations	51
No.	5
Title	Images - II. A surprisingly low fraction of undisturbed rotating spiral disks at z similar to 0.6 The morpho-kinematical relation 6 Gyr ago
Authors	Neichel, B.; Hammer, F.; Puech, M.; Flores, H.; Lehnert, M.; Rawat, A.; Yang, Y.; Delgado, R.; Amram, P.; Balkowski, C.; Cesarsky, C.; Dannerbauer, H.; Fuentes-Carrera, I.; Guiderdoni, B.; Kembhavi, A.; Liang, Y. C.; Nesvadba, N.; Ostlin, G.; Pozzetti, L.; Ravikumar, C. D.; Alighieri, S. di Serego; Vergani, D.; Vernet, J.; Wozniak, H.
Source Title	ASTRONOMY & ASTROPHYSICS, 484(1), 159-U59
Total Citations	45
No.	6
Title	A semi-empirical model for alpha and cluster radioactivity
Authors	Santhosh, K. P.; Biju, R. K.; Joseph, Antony
Source	JOURNAL OF PHYSICS G-NUCLEAR AND PARTICLE PHYSICS, 2008, 35(8)

Title	
Total Citations	40
No.	7
Title	IMAGES IV*: strong evolution of the oxygen abundance in gaseous phases of intermediate mass galaxies from z similar to 0.8
Authors	Rodrigues, M.; Hammer, F.; Flores, H.; Puech, M.; Liang, Y. C.; Fuentes-Carrera, I.; Nesvadba, N.; Lehnert, M.; Yang, Y.; Amram, P.; Balkowski, C.; Cesarsky, C.; Dannerbauer, H.; Delgado, R.; Guiderdoni, B.; Kembhavi, A.; Neichel, B.; Ostlin, G.; Pozzetti, L.; Ravikumar, C. D.; Rawat, A.; Alighieri, S. di Serego; Vergani, D.; Vernet, J.; Wozniak, H.
Source Title	ASTRONOMY & ASTROPHYSICS, 2008, 49(2), 371-388
Total Citations	37
No.	8
Title	Fission hindrance studies in Pb-200: Evaporation residue cross section and spin distribution measurements
Authors	Shidling, P. D.; Badiger, N. M.; Nath, S.; Kumar, R.; Jhingan, A.; Singh, R. P.; Sugathan, P.; Muralithar, S.; Madhavan, N.; Sinha, A. K.; Pal, Santanu; Kailas, S.; Verma, S.; Kalita, K.; Mandal, S.; Singh, R.; Behera, B. R.; Varier, K. M.; Radhakrishna, M. C.
Source Title	PHYSICAL REVIEW C, 2006, 74(6)
Total Citations	37
No.	9
Title	An efficient green MCR protocol for the stereoselective synthesis of beta-acetamido ketones catalyzed by Selectfluor (TM)
Authors	Shinu, V. S.; Sheeja, B.; Purushothaman, E.; Bahulayan, D.
Source Title	TETRAHEDRON LETTERS, 2009, 50(34), 4838-4843
Total Citations	36
No.	10
Title	Critical Issues of Current Research on the Dynamics Leading to Glass Transition
Authors	Capaccioli, S.; Thayyil, M. Shahin; Ngai, K. L.
Source Title	JOURNAL OF PHYSICAL CHEMISTRY B, 2008, 112(50), 16035-16049
Total Citations	35

MAR IVANIOS COLLEGE, THRUVANANTHAPURAM

Citation Report: 263
(from Web of Science Core Collection)
You searched for: PS=kerala

ORGANIZATIONS-ENHANCED: (MAR IVANIOS COLL)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year **Citations in Each Year**

Results found	263
Sum of the Times Cited	2999
Average Citations per Item	11.4

Remarks:

The Mar Ivanios College is a college affiliated to the University of Kerala. Yet it has an output that is larger than many of the universities in Kerala. The number of published items has been modest (not exceeding 100 a year, the threshold to make it to the Scimago list) but this has increased from 2004 to 2013. The impact of the research at 11.4 citations per paper, is remarkable, in comparison with its contemporaries in Kerala, indicating that the college makes good use of collaboration with other institutions.

Ten most highly cited papers:

No.	1
Title	Biosynthesis of Au, Ag and Au-Ag nanoparticles using edible mushroom extract
Authors	Philip, Daizy
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2009, 73(2), 374-381
Total Citations	138
No.	2
Title	Structural conformation and vibrational spectroscopic studies of 2,6-bis(p-N,N-dimethyl benzylidene) cyclohexanone using density functional theory
Authors	James, C.; Raj, A. Amal; Reghunathan, R.; Jayakumar, V. S.; Joe, I. Hubert

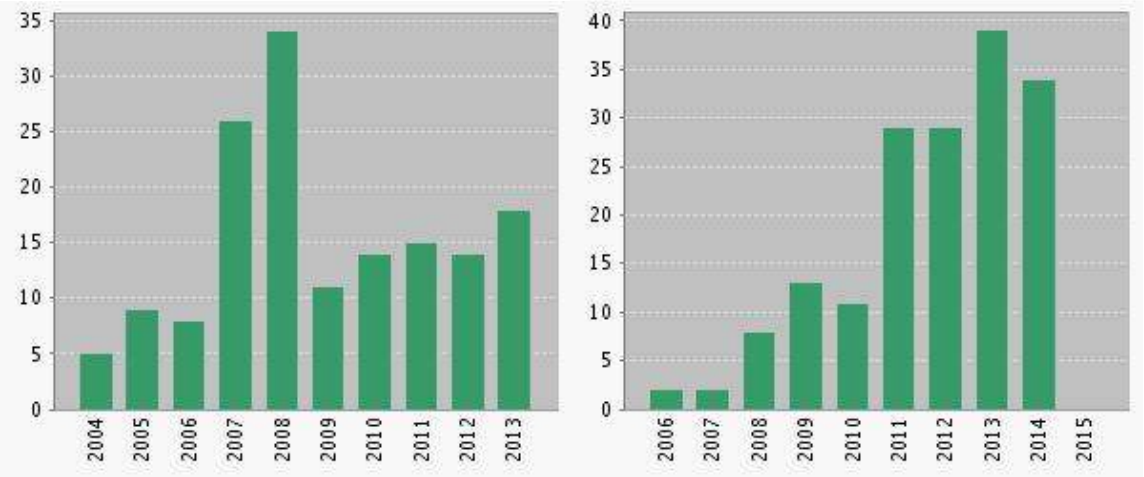
Source Title	JOURNAL OF RAMAN SPECTROSCOPY, 2006, 37(12), 1381-1392
Total Citations	133
No.	3
Title	Charge transfer interactions and nonlinear optical properties of push-pull chromophore benzaldehyde phenylhydrazone: A vibrational approach
Authors	Ravikumar, C.; Joe, I. Hubert; Jayakumar, V. S.
Source Title	CHEMICAL PHYSICS LETTERS, 2008, 460, 552-558
Total Citations	115
No.	4
Title	Efficient pi electrons delocalization in prospective push-pull non-linear optical chromophore 4-[NN-dimethylamino]-4 '-nitro stilbene (DANS): A vibrational spectroscopic study
Authors	Vijayakumar, T.; Joe, I. Hubert; Nair, C. P. Reghunadhan; Jayakumar, V. S.
Source Title	CHEMICAL PHYSICS, 2008, 343(1), 83-99
Total Citations	104
No.	5
Title	NIR-FT Raman and infrared spectra and ab initio computations of glycinium oxalate
Authors	Sajan, D; Binoy, J; Pradeep, B; Krishna, KV; Kartha, VB; Joe, IH; Jayakumar, VS
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2004, 60, 173-180
Total Citations	94
No.	6
Title	Green synthesis of gold and silver nanoparticles using Hibiscus rosa sinensis
Authors	Philip, Daizy
Source Title	PHYSICA E-LOW-DIMENSIONAL SYSTEMS & NANOSTRUCTURES, 2010, 42(5), 1417-1424
Total Citations	90
No.	7
Title	Studies on surface plasmon resonance and photoluminescence of silver nanoparticles
Authors	Smith, S. L.; Nissamudeen, K. M.; Philip, Daizy; Gopchandran, K. G.
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2008, 71(1), 186-190
Total Citations	70
No.	8
Title	Spectroscopic analysis and DFT calculations of a food additive Carmoisine
Authors	Snehalatha, M.; Ravikumar, C.; Joe, I. Hubert; Sekar, N.; Jayakumar, V. S.
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2009, 72(3), 654-662
Total Citations	68
No.	9
Title	Density functional study on the structural conformations and intramolecular charge transfer from the vibrational spectra of the anticancer drug combretastatin-A2
Authors	Padmaja, L.; Ravikumar, C.; Sajan, D.; Joe, I. Hubert; Jayakumar, V. S.; Pettit, G. R.; Nielsen, O. Faurskov
Source Title	JOURNAL OF RAMAN SPECTROSCOPY, 2009, 40(4), 414-428
Total Citations	64
No.	10
Title	Green synthesis of gold nanoparticles using Cinnamomum zeylanicum leaf broth
Authors	Smitha, S. L.; Philip, Daizy; Gopchandran, K. G.
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2009, 74(3), 735-739
Total Citations	62

KERALA VETERINARY AND ANIMAL SCIENCES UNIVERSITY

Citation Report: 154
(from Web of Science Core Collection)

ADDRESS: (Vet & Anim Sci) AND ADDRESS: (kerala)

Timespan: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year **Citations in Each Year**

Results found	154
Sum of the Times Cited	167
Average Citations per Item	1.08

Remarks:

The Kerala Veterinary and Animal Sciences University was recently formed. It has an output that is relatively small when compared to many of the universities in Kerala. The number of published items had increased from 2004 to 2008 and then has dropped dramatically. The impact of the research at 1.08 citations per paper, is very low.

The ten most highly cited items are listed below:

Ten most highly cited papers:

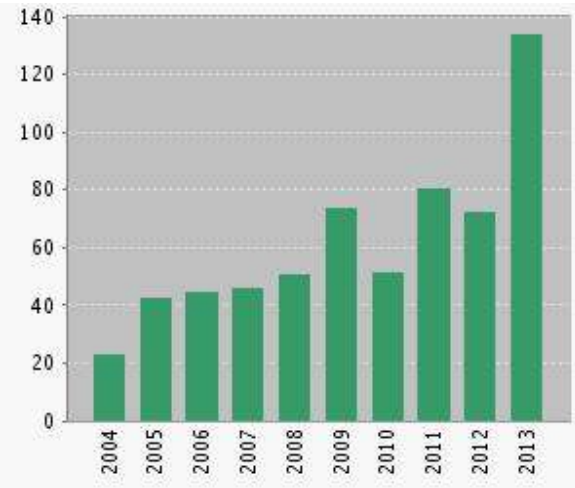
No.	1
Title	Amelioration of heat stress induced disturbances of antioxidant defense system in chicken by Brahma Rasayana
Authors	Ramnath, V.; Rekha, P. S.; Sujatha, K. S.

Source Title	EVIDENCE-BASED COMPLEMENTARY AND ALTERNATIVE MEDICINE, 2008, 5(1), 77-84
Total Citations	23
No.	2
Title	Comparison of faecal culture and IS900 PCR assay for the detection of Mycobacterium avium subsp paratuberculosis in bovine faecal samples
Authors	Soumya, M. P.; Pillai, R. M.; Antony, P. X.; Mukhopadhyay, H. K.; Rao, V. N.
Source Title	VETERINARY RESEARCH COMMUNICATIONS, 2009, 33(7), 781-791
Total Citations	10
No.	3
Title	Seroprevalence of bluetongue virus antibodies in sheep and goats in Kerala State, India
Authors	Ravishankar, C; Nair, GK; Mini, M; Jayaprakasan, V
Source Title	REVUE SCIENTIFIQUE ET TECHNIQUE-OFFICE INTERNATIONAL DES EPIZOOTIES, 2005, 24(3), 953-958
Total Citations	10
No.	4
Title	Molecular characterization of Theileria orientalis causing fatal infection in crossbred adult bovines of South India
Authors	Aparna, M.; Ravindran, Reghu; Vimalkumar, M. B.; Lakshmanan, Bindu; Rameshkumar, P.; Kumar, K. G. Ajith; Promod, K.; Ajithkumar, S.; Ravishankar, Chintu; Devada, K.; Subramanian, H.; George, Ajith Jacob; Ghosh, S.
Source Title	PARASITOLOGY INTERNATIONAL, 2011, 60(4), 524-529
Total Citations	9
No.	5
Title	Therapeutic potential of Ganoderma lucidum (Fr.) P. Karst. against the declined antioxidant status in the mitochondria of post-mitotic tissues of aged mice
Authors	Sudheesh, N. P.; Ajith, T. A.; Ramnath, V.; Janardhanan, K. K.
Source Title	CLINICAL NUTRITION, 2010, 29(3), 406-412
Total Citations	9
No.	6
Title	Eclosion blocking effect of ethanolic extract of Leucas aspera (Lamiaceae) on Rhipicephalus (Boophilus) annulatus
Authors	Ravindran, Reghu; Juliet, Sanis; Sunil, A. R.; Kumar, K. G. Ajith; Nair, Suresh N.; Amithamol, K. K.; Shynu, M.; Rawat, Ajay Kumar Singh; Ghosh, Srikanta
Source Title	VETERINARY PARASITOLOGY, 2011, 179, 287-290
Total Citations	6
No.	7
Title	Prevention of cisplatin induced nephrotoxicity by terpenes isolated from Ganoderma lucidum occurring in Southern Parts of India
Authors	Pillai, Thulasi G.; John, Mathew; Thomas, Gifty Sara
Source Title	EXPERIMENTAL AND TOXICOLOGIC PATHOLOGY, 2011, 63, 157-160
Total Citations	6
No.	8
Title	Regulation of Caspase-3 and Bcl-2 Expression in Daltons Lymphoma Ascites Cells by Abrin
Authors	Ramnath, V.; Rekha, P. S.; Kuttan, G.; Kuttan, R.
Source Title	EVIDENCE-BASED COMPLEMENTARY AND ALTERNATIVE MEDICINE, 2009, 6(2), 233-238
Total Citations	6
No.	9
Title	Evaluation and comparison of native and recombinant LipL21 protein-based ELISAs for diagnosis of bovine leptospirosis
Authors	Joseph, Siju; Thomas, Naicy; Thangapandian, E.; Singh, Vijendra P.; Verma, Rishendra; Srivastava, S. K.
Source Title	JOURNAL OF VETERINARY SCIENCE, 2012, 13(1), 99-101
Total Citations	5
No.	10
Title	Evaluation of a recombinant LigB protein of Leptospira interrogans serovar Canicola in an enzyme-linked immunosorbent assay for the serodiagnosis of bovine leptospirosis

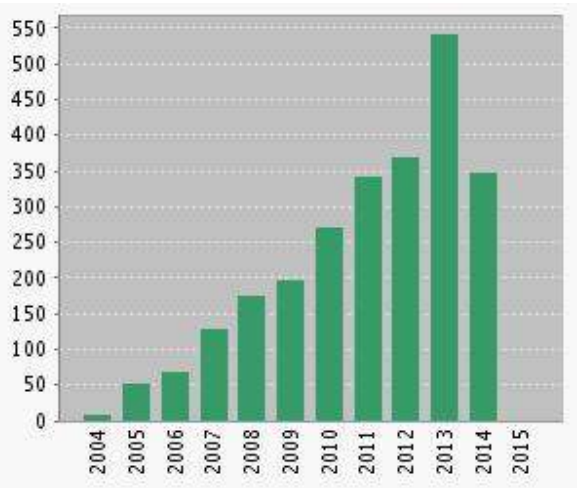
Authors	Sankar, Surya; Harshan, Hiron M.; Somarajan, S. R.; Srivastava, S. K.
Source Title	RESEARCH IN VETERINARY SCIENCE, 2010, 88(3), 375-378
Total Citations	5

MEDICAL COLLEGES

Citation Report: 622
(from Web of Science Core Collection)
You searched for: PS=kerala AND AD=med
Refined by: ORGANIZATIONS-ENHANCED: (COLL MED OR GOVT MED COLL OR CALICUT MED COLL OR THIRUVANANTHAPURAM MED COLL OR GOVT DENT COLL OR MED COLL HOSP OR MED COLL HOSP TRIVANDRUM OR PUSHPAGIRI INST MED SCI RES CTR OR KOTTAYAM MED COLL OR MES MED COLL OR MED COLL CALICUT OR GOVT MED COLL HOSP OR GOVT TD MED COLL OR TRIVANDRUM MED COLL OR TD MED COLL OR KANNUR MED COLL OR TD MED COLL HOSP OR MED COLL KOZHIKODE OR PARIYARAM MED COLL OR MED COLL TRIVANDRUM OR PUSHPAGIRI INST MED SCI OR MED COLL)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year



Citations in Each Year

Results found	622
Sum of the Times Cited	2515
Average Citations per Item	4.04

Remarks:

The total output is large enough to be taken notice of but it is highly fragmented across a large number of institutions. About half of the output comes from the Thiruvananthapuram Medical College. The number of published items has risen slowly during the period. The impact of the research at 4.04 citations per paper, is low for research output in the life sciences and clinical medicine areas.

Ten most highly cited papers:

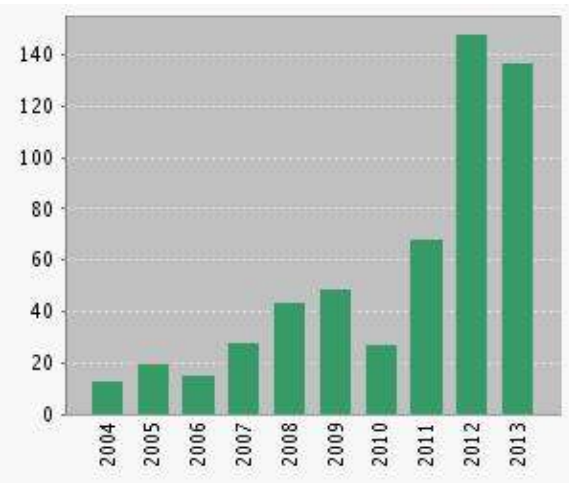
No.	1
Title	Effect of intravenous corticosteroids on death within 14 days in 10008 adults with clinically significant head injury (MRC CRASH trial): randomised placebo-controlled trial
Authors	Muzha, I; Filipi, N; Lede, R; Copertari, P; Traverso, C; Copertari, A; Vergara, EA; Montenegro, C; de Huidobro, RR; Saladino, P; Surt, K; Cizlzeta, J; Lazzeri, S; Lucero, L; Pinero, G; Ciccioli, F; Videtta, W; Barboza, MF; Svampa, S; Sciuto, V; Domeniconi, G; Bustamante, M; Waschbusch, M; Gullo, MP; Posadas, A; Linares, JCA; Camputaro, L; Penna, J; Troccoli, G; Galimberti, H; Tallott, M; Horn, S; Eybner, C; Buchinger, W; Fitzal, S; Oleffe, V; Grollinger, T; Delvaux, P; Carlier, L; Braet, V; Jacques, JM; de Knoop, D; Choi, HK; Schmitt, M; Gentil, A; Nacul, F; Barrios, PB; Chen, XK; Hua, LS; Tian, HH; Cai, XD; Gualteros, W; Otero, AA; Ciro, J; Jaramillo, H; Garcia, G; Gonzalez, I; Gomez, C; Arias, A; Fonseca, M; Mora, C; Cabrera, EGL; Betancurth, JL; Munoz, P; Quinonez, JA; Castillo, MEG; Lopez, O; Yepes, RP; Cuellar, DL; Paez, G; Chaves, HD; Ordonez, PE; Plata, R; Pineda, M; Pulido, LE; Britton, T; Jaramillo, JSV; Rebolledo, C; Palma, O; Cuadrado, AS; Pastrana, I; Falero, R; Castro, AM; Perera, MD; Garcia, AA; Oliva, R; Domenech, MA; Delgado, HL; Carnero, AM; Lopez, BL; Gallardo, AL; Morales, AO; de Cespedes, CM; Lezcano, H; Lima, GA; Ferrer, MI; Enriquez, M; Bess, IZ; Canino, GR; Ruiz, EMP; Cruz, OG; Kantorova, I; Ochmann, J; Scheer, P; Kozumplik, L; Marsova, J; Edelmann, K; Chytra, I; Bosman, R; Andrejsova, H; Pachl, I; Burger, J; Kramar, F; Vernaza, L; Ulloa, MI; Gonzalez, L; Daccach, A; Ortega, A; Cevallos, S; Cueva, BZ; Arteaga, JC; Ochoa, M; Tapia, JV; Hurtado, J; Wong, MCS; Carbo, TM; Santos, R; Khamis, H; Abaza, AH; Fekry, A; El Kordy, S; Shawky, T; El-Sayed, H; Khalil, N; Negm, N; Fisal, S; Alamin, M; Shokry, H; Elhusseny, AY; Radwan, A; Rashid, M; Gogichaisvili, T; Ingorokva, G; Gongadze, N; Otarashvili, A; Moritz, E; Kleist, W; Kalkum, M; Ulrich, P; Andrews, N; Nakos, G; Karavelis, A; Archontakis, G; Myrianthefs, P; Yadav, Y; Yadav, S; Khatri, R; Baghel, A; Husain, M; Jha, D; Chhang, WH; Dhandhania, M; Fonning, C; Iyengar, SN; Gupta, S; Ravi, RR; Bopiah, KS; Herur, A; Venkataramana, NK; Satish, A; Bhavadasan, K; Morris, R; S, R; Felcry, A; Tirschenreuth, K; Gupta, S; Dewan, Y; Singh, Y; Bhagchandani, R; Bhagchandani, S; Sethurayar, VU; Ipe, S; Sreekumar, G; Panigrahi, M; Reddy, A; Khosla, V; Pillay, H; Thomas, N; Sridhar, K; Jose, B; Kurian, N; Praharaj, S; Pillai, S; Kiyawat, D; Maheshwari, K; Panikar, D; Chawla, J; Shenoy, S; Raja, A; Rupayana, Y; Reddy, S; Mohan, N; Kelkar, S; Johri, M; Golden, N; Maliawan, S; Fauzi, A; Farouk, U; Fakharian, E; Aramesh, A; Ahmadzadeh, F; Gholami, A; Eghtedari, M; Plunkett, P; Redican, C; McMahon, G; Annetta, MG; Mouchaty, H; Bruzzone, E; Harding, A; Qureshi, M; Idris, Z; Abdullah, J; Ghazali, G; Ghani, ARI; Cheah, F; Cabrera, A; Gonzalez, JLM; Loria-Castellanos, J; Jackson, S; Hutchinson, R; Komolafe, E; Adeolu, A; Komolafe, M; Adeyemi-Doro, O; Bankole, F; Danfodiyo, U; Shehu, B; Danlami, V; Odebode, O; Oluwadiya, K; Sanni, A; Giebel, H; Kumar, S; Jooma, R; Guerrero, MA; Mezquita, JE; Ovelar, CO; Gonzalez-Portillo, M; Rodriguez, D; Balica, L; Oprita, B; Sklerniacof, M; Steflea, L; Bandut, L; Danil, A; Iliescu, R; Bagdasar, D; El-Dawlafly, A; Alwatidy, S; Al-Yafi, W; El-Dawlatly, M; Krunic-Protic, R; Janosevic, V; Tan, J; Seah, C; Trenkler, S; Humenansky, M; Stajancova, T; Poprad, N; Schwendt, I; Laincz, A; Bojnice, N; Julius, Z; Maros, S; Kosice, F; Firment, J; Trebisov, N; Cifranicova, M; Saniova, B; Ruzinov, N; Kalig, K; Zamky, NN; Medekova, S; Mikulas, NL; Wiszt, R; Roosevelt, FD; Zilina, N; Macuga, I; Hartzenberg, B; du Pleissis, G; Houlie, Z; Nathoo, N; Khumalo, S; Tracey, R; Munoz-Sanchez, A; Murillo-Cabezas, F; Flores-Cordero, J; Rincon-Ferrari, D; Rubi, M; Caler, L; del Campo, MM; Laguna, LB; de Terrassa, M; Nava, JM; Trueta, J; Haya, C; Lopez, AM; Ramos-Gomez, L; de la Torre-Prados, V; Pellejero, R; Laloe, VR; Mahendran, K; Stocker, R; Ludwig, S; Zimmermann, H; Schaffhausen, K; Denzier, U; Yutthakasemsunt, S; Kittiwattanagul, W;

	Piyavechvirat, P; Tapsai, P; Nanmang-jan, A; Chantapimpa, U; Watanachai, C; Subsompon, P; Pussanakawatin, W; Khunjan, P; Tangchitvittaya, S; Nilapong, S; Klangsang, T; Taechakosol, W; Srinat, A; Jerbi, Z; Borsali-Falfoul, N; Rezgui, M; Cakar, N; Ssenyonjo, H; Kobusingye, O; Lomas, G; Yates, D; Lecky, F; Bleetman, A; Baldwin, A; Jenkinson, E; Pantrini, S; Stewart, J; Contractor, N; Roberts, T; Butler, J; Pinto, A; Lee, D; Brayley, N; Robbshaw, K; Dix, C; Graham, S; Pye, S; Green, M; Kellins, A; Moulton, C; Fogg, B; Cottingham, R; Funnell, S; Shanker, U; Summers, C; Malek, L; Ashcroft, C; Powell, J; Moore, S; Buckley, S; Grocutt, M; Chambers, S; Morrice, A; Marshall, H; Harris, J; Matthews, W; Tippet, J; Mardell, S; MacMillan, F; Shaw, A; Luthra, P; Dixon, G; Ahmed, M; Young, M; Mason, S; Loveday, I; Clark, C; Taylor, S; Wilson, P; Ali, K; Greenwood, S; White, M; Perez, R; Eljamel, S; Wasserberg, J; Read, C; McCarron, J; Pennell, A; Ray, G; Thurston, J; Brown, E; Jaffey, L; Graves, M; Bailey, R; Loveridge, N; Evans, G; Hughes, S; Ahmed, K; Richardson, J; Gallagher, C; Odedun, T; Lees, K; Foley, D; Payne, N; Pennycock, A; Griffiths, C; Moore, D; Byrne, D; Dasan, S; Banerjee, A; McGuinness, S; Chikhani, C; Zoltie, N; Barlow, I; Stell, I; Hulse, W; Crossley, J; Watkins, L; Dorani, B; Van Viet, T; Baigent, C; Bracken, M; Chadwick, D; Curley, K; Duley, L; Farrell, B; Haegi, M; Nickson, G; Peto, R; Pickard, J; Roberts, I; Sandercock, P; Teasdale, G; Collins, R; Haines, S; MacMahon, S; Warlow, C; Edwards, P; Ritchie, N; Shakur, H; Ramos, M; Barnetson, L; Fernandes, J; Tooth, D; Free, C; Narayanan, L; Collander, J; Abernethy, J; Bardswell, J; Mashru, R; Godward, C; Afolabi, L; Ritchie, A; Hosford, T; Collingwood, A; Massey, S; Svoboda, P; Mazairac, G; Laloe, V; Arango, M; Olldashi, F
Source Title	LANCET, 2004, 364(9442), 1321-1328
Total Citations	332
No.	2
Title	Methods for establishing a surveillance system for cardiovascular diseases in Indian industrial populations
Authors	Reddy, KS; Prabhakaran, D; Chaturvedi, V; Jeemon, P; Thankappan, KR; Ramakrishnan, L; Mohan, BVM; Pandav, CS; Ahmed, FU; Joshi, PP; Meera, R; Amin, RB; Ahuja, RC; Das, MS; Jaison, TM
Source Title	BULLETIN OF THE WORLD HEALTH ORGANIZATION, 2004, 84(6), 461-469
Total Citations	73
No.	3
Title	Health Care-Associated Native Valve Endocarditis: Importance of Non-nosocomial Acquisition
Authors	Benito, Natividad; Miro, Jose M.; de Lazzari, Elisa; Cabell, Christopher H.; del Rio, Ana; Altclas, Javier; Commerford, Patrick; Delahaye, Francois; Dragulescu, Stefan; Giamarellou, Helen; Habib, Gilbert; Kamarulzaman, Adeeba; Kumar, A. Sampath; Nacinovich, Francisco M.; Suter, Fredy; Tribouilloy, Christophe; Venugopal, Krishnan; Moreno, Asuncion; Fowler, Vance G., Jr.
Source Title	ANNALS OF INTERNAL MEDICINE, 2009, 150(9), 586-U5
Total Citations	61
No.	4
Title	Urban rural differences in prevalence of self-reported diabetes in India - The WHO-ICMR Indian NCD risk factor surveillance
Authors	Mohan, Viswanathan; Mathur, Prashant; Deepa, Raj; Deepa, Mohan; Shukla, D. K.; Menon, Geetha R.; Anand, Krishnan; Desai, Nimesh G.; Joshi, Prashant P.; Mahanta, J.; Thankappan, K. R.; Shah, Bela
Source Title	DIABETES RESEARCH AND CLINICAL PRACTICE, 2008, 80(1), 159-168
Total Citations	59
No.	5
Title	Three day versus five day treatment with amoxicillin for non-severe pneumonia in young children: a multicentre randomised controlled trial
Authors	Awasthi, S; Kabra, SK; Kulkarni, M; Murali, N; Niswade, AK; Pillai, RM; Singhi, S; Chande, CA; Das, B; Jain, A; Kamath, J; Mathur, M; Raje, K; Roy, P; Lalitha, MK; Agarwal, G; Jayseelan, L; Qazi, S; Agarwal, G; Awasthi, S; Kabra, SK; Kaul, A; Singhi, S; Walter, SD; Pande, JN; Wakhlu, I
Source Title	BRITISH MEDICAL JOURNAL, 2004, 328(7443), 791-794
Total Citations	53
No.	6
Title	Catechotaminergic polymorphic ventricular tachycardia
Authors	Francis, J; Sankar, V; Nair, VK; Priori, SG
Source Title	HEART RHYTHM, 2005, 2(5), 550-554
Total Citations	50
No.	7
Title	Expression of VEGF as prognosticator in primary nasopharyngeal cancer and its relation to EBV status
Authors	Krishna, SM; James, S; Balaram, P
Source Title	VIRUS RESEARCH, 2006, 115(1), 85-90
Total Citations	45

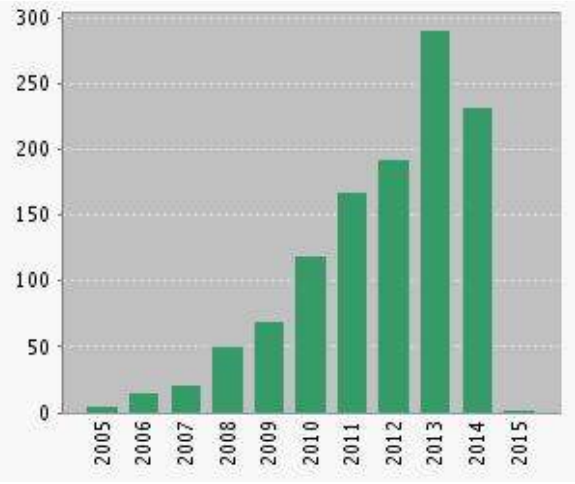
No.	8
Title	Identification of subtype C human immunodeficiency virus type 1 by subtype-specific PCR and its use in the characterization of viruses circulating in the southern parts of India
Authors	Siddappa, NB; Dash, PK; Mahadevan, A; Jayasuryan, N; Hu, F; Dice, B; Keefe, R; Satish, KS; Satish, B; Sreekanthan, K; Chatterjee, R; Venu, K; Satishchandra, P; Ravi, V; Shankar, SK; Shankarappa, R; Ranga, U
Source Title	JOURNAL OF CLINICAL MICROBIOLOGY, 2004, 42(6), 2742-2751
Total Citations	44
No.	9
Title	Association of cathepsin B gene polymorphisms with tropical calcific pancreatitis
Authors	Mahurkar, S.; Idris, M. M.; Reddy, D. N.; Bhaskar, S.; Rao, G. V.; Thomas, V.; Singh, L.; Chandak, G. R.
Source Title	GUT, 2006, 55(9), 1270-1275
Total Citations	34
No.	10
Title	RADIO FREQUENCY ELECTROMAGNETIC RADIATION (RF-EMR) FROM GSM (0.9/1.8GHZ) MOBILE PHONES INDUCES OXIDATIVE STRESS AND REDUCES SPERM MOTILITY IN RATS
Authors	Mailankot, Maneesh; Kunnath, Anil P.; Jayalekshmi, H.; Koduru, Bhargav; Valsalan, Rohith
Source Title	CLINICS, 2009, 64(6), 561-565
Total Citations	31

ENGINEERING COLLEGES

Citation Report: 549
(from Web of Science Core Collection)
You searched for: PS=kerala AND AD=engn
Refined by: ORGANIZATIONS-ENHANCED: (COLL ENGN OR RAJAGIRI SCH ENGN TECHNOL OR GOVT ENGN COLL OR TKM COLL ENGN OR COLL ENGN TRIVANDRUM OR SAINTGITS COLL ENGN OR AMAL JYOTHI COLL ENGN OR GOVT COLL ENGN OR NSS COLL ENGN OR SCT COLL ENGN OR GOVT COLL OR RAJIV GANDHI INST TECHNOL OR MODEL ENGN COLL OR MES COLL ENGN OR KMEA ENGN COLL OR UNIV COLL ENGN OR MAR BASELIOS COLL ENGN TECHNOL OR KMCT COLL ENGN OR VISWAJYOTHI COLL ENGN TECHNOL OR TRAVANCORE ENGN COLL OR ST JOSEPHS COLL ENGN TECHNOL OR MARIAN ENGN COLL OR MA COLL ENGN OR LBS COLL ENGN OR GOVT MODEL ENGN COLL OR GOVT ENGN COLL THRISSUR OR GOVT ENGN COLL IDUKKI OR ST JOSEPHS COLL ENGN OR NSS COLL ENGN PALAKKAD OR MOHANDAS COLL ENGN TECHNOL OR JYOTHI ENGN COLL OR GOVT ENGN COLL TRICHUR OR GOVT ENGG COLL OR COLL ENGN MUNNAR OR ADI SHANKARA INST ENGN TECHNOL OR YOUNUS COLL ENGN TECHNOL OR VIVEKANANDA INST TECHNOL OR VASAVI COLL ENGN OR THANGAL KUNJU MUSALIAR COLL ENGN OR SREE CHITHRA THIRUNAL COLL ENGN OR SREE BUDDHA COLL ENGN OR RAJAGIRI SCH ENGN TECHNOL RSET OR MAR ATHANASIUS COLL ENGN OR GOVT POLYTECH COLL OR GOVT ENGN COLL BARTON HILL OR COLL ENGN KIDANGOOR)
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC
Time span: 2004-2013. Indexes: SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC.



Published Items in Each Year



Citations in Each Year

Results found	549
Sum of the Times Cited	1166
Average Citations per Item	2.12

Remarks:

As in the case of medical colleges, the total output is large enough to be taken notice of but it is highly fragmented across a large number of institutions. About half of the output comes from the Thiruvananthapuram Medical College. The number of published items has risen slowly during the period. The impact of the research at 2.12 citations per paper, is low for research output in the engineering sciences area.

Ten most highly cited papers:

No.	1
Title	Dynamic mechanical behavior of short coir fiber reinforced natural rubber composites
Authors	Geethamma, VG; Kalaprasad, G; Groeninckx, G; Thomas, S
Source Title	COMPOSITES PART A-APPLIED SCIENCE AND MANUFACTURING, 2005, 36(11), 1499-1506
Total Citations	86
No.	2
Title	Murraya Koenigii leaf-assisted rapid green synthesis of silver and gold nanoparticles
Authors	Philip, Daizy; Unni, C.; Aromal, S. Aswathy; Vidhu, V. K.
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2011, 78(2), 899-904
Total Citations	57

No.	3
Title	Extracellular biosynthesis of gold and silver nanoparticles using Krishna tulsi (Ocimum sanctum) leaf
Authors	Philip, Daizy; Unni, C.
Source Title	PHYSICA E-LOW-DIMENSIONAL SYSTEMS & NANOSTRUCTURES, 2011, 43(7), 1318-1322
Total Citations	37
No.	4
Title	Independent field-oriented control of two split-phase induction motors from a single six-phase inverter
Authors	Mohapatra, KK; Kanchan, RS; Baiju, MR; Tekwani, PN; Gopakumar, K
Source Title	IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, 2005, 52(5), 1372-1382
Total Citations	36
No.	5
Title	A Bezier curve based path planning in a multi-agent robot soccer system without violating the acceleration limits
Authors	Jolly, K. G.; Kumar, R. Sreerama; Vijayakumar, R.
Source Title	ROBOTICS AND AUTONOMOUS SYSTEMS, 2009, 57(1), 23-33
Total Citations	33
No.	6
Title	Aqueous synthesis and characterization of CdS, CdS:Zn2+ and CdS:Cu2+ quantum dots
Authors	Unni, C.; Philip, Daizy; Smitha, S. L.; Nissamudeen, K. M.; Gopchandran, K. G.
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2009, 72(4), 827-832
Total Citations	29
No.	7
Title	Fractal Based Space Vector PWM for Multilevel Inverters-A Novel Approach
Authors	Gopinath, Anish; Mohamed, Aneesh A. S.; Baiju, M. R.
Source Title	IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, 2009, 56(4), 1230-1237
Total Citations	28
No.	8
Title	Studies on optical absorption and photoluminescence of thioglycerol-stabilized CdS quantum dots
Authors	Unni, C.; Philip, Daizy; Gopchandran, K. G.
Source Title	SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY, 2008, 71(4), 1402-1407
Total Citations	27
No.	9
Title	Studies on optical absorption and photoluminescence of thioglycerol-stabilized ZnS nanoparticles
Authors	Unni, C.; Philip, Daizy; Gopchandran, K. G.
Source Title	OPTICAL MATERIALS, 2009, 32(1), 169-175
Total Citations	24
No.	10
Title	Simulation-based metamodels for scheduling a dynamic job shop with sequence-dependent setup times
Authors	Vinod, V.; Sridharan, R.
Source Title	INTERNATIONAL JOURNAL OF PRODUCTION RESEARCH, 2009, 47(6), 1425-1447
Total Citations	23

Chapter Three

Feedback from Academicians/Stakeholders

The Committee elicited the opinion of a large number of stakeholders in the higher education sector through a Questionnaire (Annexure 3). The responses received from them are condensed in the subsequent paragraphs.

Q1. Why do you think Kerala has not been able to develop and nurture research-intensive universities?

Our University System does not promote research culture. Teaching, conduct of examinations and certification are considered to be the main mandate of Universities in Kerala. Our Universities lack academic culture and an environment suitable for sincere research.

Presently most of the research is done only in the Universities. Kerala lacks autonomous research institutes. Seats available to do research are very limited and most of the students have difficulty in finding even a mentor to initiate them into a meaningful career in research.

Even though Kerala boasts of hundred percent literacy, a foremost drawback of our higher education system is that the methodology of pedagogy remains almost the same from school to post graduate studies. Most of the Higher Education institutions in Kerala gave importance to dissemination of knowledge rather than generation of ideas. They lack proper motivation for research at under graduate and post graduate level.

Shortage of skilled manpower is another reason, i.e. scarcity of competent teaching staff in Universities. The vacancies in Universities remain unfilled for considerable period of time. There is also a lack of sufficient and timely funding from the part of authorities for conducting research.

Lack of proper research facilities and improper research facilities and improper maintenance of available facilities is another major issue. Our Universities lack interdisciplinary research and collaborative research works, which are highly essential for raising the level of research.

Since there is no incentive for guidance and supervision, there is dearth of research supervisors, which in turn affects the quality of research. Our system failed to recognize as well as appreciate

meritorious researchers and their supervisors and also to build up their findings to application level.

Most of the researchers lost their interest in research due to a lot of administrative hurdles they have to overcome in getting research funding, and in getting permission to do collaborative work with Universities in India and abroad.

Hence the state and universities must take a "Research Friendly Policy".

Q2. How many of the HEIs in Kerala should evolve into a research intensive unitary University style of functioning?

All Universities in Kerala, Autonomous Colleges and even some government colleges have the potential to be developed into research intensive Universities. But sincere efforts are not there to identify their potential and offer support without any prejudices.

Q3. Do you think the affiliating nature of many of our Universities have stood in the way of Kerala for developing world class facilities and opportunities?

Most of the respondents opined that the affiliating nature of our Universities blocks the growth of research environment in the State, to some extent. The Universities are concentrating mostly on conducting examinations, and the entire resources and machinery of the University is used for this. Hence the number of affiliating colleges should be restricted to 20 or 25 or the colleges may be allowed to conduct majority of the examinations and the responsibility of the University may be reduced to conduct Programme end Examinations and setting up of Autonomous Colleges should be promoted.

University affiliation can be leveraged to support the institutions depending on them and add to the facilities of the Universities by proper co-ordination.

Q4. Please give a detailed description for the interventions needed from the government, cooperative and private sectors so that instead of having a fragmented base of 1000 colleges, we can put in place a resource sharing of 30 to 60 universities having a unitary structure:

The following suggestions were put forward by the respondents.

- Identify institutions which have the capability of undertaking quality research.
- MPhil should be made mandatory prerequisite for doing PhD.
- There should be a mechanism to ensure the quality of research output.
- Attractive incentive system should be implemented for research supervisors.
- Adequate infrastructure, human resource and finance should be provided for research centres.
- Existing Universities can be split up and new Universities can be started with the existing staff.
- Setting up of new Universities in the Cooperative sector and PPP model can be experimented.
- The present concept of University and affiliated system to be changed.
- The action plan taken which elevate Regional Engineering Colleges to NITs may be taken as a guideline.
- Separate centres for sharing research resources under one umbrella for each discipline must be taken into consideration.
- There should be arrangement for Resource sharing along with transparency in research outputs.
- There should be provision for updated information.
- Since the number of affiliating Universities in Kerala are already inadequate, more number of Universities, Autonomous Institutions, Independent Research Centres, Off Campus centres of foreign Universities with adequate plan will help us to attain our goal.
- A culture must be developed for both fundamental and applied research.
- The Government must promote research collaborations with well known scholars of the world and create a mechanism for promoting such research collaborations.
- High academic atmosphere, 24 hours uninterrupted power supply, best internet facilities, best computing machines, high quality faculties etc must provided by the institutions.
- In Universities there must be separate frame for the PG Courses and research.
- The Government /University should promote trans-disciplinary collaboration with top ranking academics and R and D institutions.

Q5. Any other thoughts and suggestions you have regarding the subject that the committee can take into consideration?

The following suggestions were put forward by the respondents:

- Incentives for research supervisors.
- Financial, Human and infrastructure support to research centres.
- Create opportunities for international exchange programmes and collaborations.

- In every year, efforts are to be made to identify potential research scholars in different subjects and they must be given special grant to travel to good institutions in India and abroad for their research purpose.
- Government should ensure accessibility and sharing of facilities and resources between the publically funded institutions.
- Introduction of software to check plagiarism in all subjects including languages.
- Adequate steps to publish the research studies.
- Total restructuring of the whole system so that our Universities also rank somewhere among world universities.
- Bring regularity in disbursal of fellowship.
- Hike in the fellowship of project students.
- The committee should give support to the researchers by all means.
- The researchers, who do research projects, should avoid from the official formalities like inviting tenders, quotations etc.
- The faculty strength in every institution must be adequately maintained.
- There must be accountability for both the teaching and research efforts undertaken by the teachers.
- Incentives for researchers who publish their work in reputed journals.

There should be a common resource base for interdisciplinary research

Chapter Four

Recommendations from the various subcommittees

At the first meeting of the Committee on 7th November 2014 it was decided that leading researchers in the state would be approached to elicit their views on the current status, achievements and highlights of academic research in the higher education sector in Kerala, as well as on the problems and irritants faced by individual teacher-researchers. Initially it was proposed that a few sittings could be held at various locations to obtain the views of all stakeholders involved in the arena of research in Kerala, in addition to the suggestions obtained from an online portal for harvesting opinions from as broad a base as possible. Many leading researchers within Kerala (based on Web of Science searches) were approached directly by e-mail. Chapter Three of this report is largely a summary of the results obtained from the online survey.

Instead of moving to various locations across the state, it was felt that the various sub-committees in major research disciplines could get together and formulate a report that would highlight the deficiencies in the existing conditions and seek to make recommendations. The committee took cognizance of the fact that first and foremost there is considerable reform needed in the administrative machinery to turn our Universities and Colleges into research-intensive teaching environments. Often, trivial matters or silly interpretations of rules discourage young investigators who are entering the University system. This chapter hopes to focus on those issues and some general measures we could take to improve the system.

Since research in the higher education sector in Kerala is conducted across a vast spectrum, expert sub-committees were initially set up in the following seven areas:

1) Physical & Chemical Sciences
2) Biological Sciences
3) Engineering Sciences
4) Life Sciences/Clinical Medicine
5) Mathematical Sciences/Information Science
6) Social Sciences
7) Arts & Humanities

Although a tight time frame of three months was set, it was after much coaxing and persuasion that six of the seven sub-committees submitted their reports after more than a year after the stipulated time. The Biological Sciences was combined with the Life Sciences and Clinical Medicine. The suggestions, representative of the challenges faced by researchers in different disciplines across the state are summarized below.

1) Physical & Chemical Sciences

Problems in the university are aplenty and are often created by the system and self-perpetuated. The basic sources of these problems lie in the de-motivation on the part of researchers/ teachers/ mentors.

Research Crisis

No cutting edge research is being pursued in any of the Universities in the area of Physical Sciences. APT driven assessment of research aided by journals with purchased ISSN and ISBN promotes only mediocre research which breeds further mediocrity. Researchers are often 'harassed' and humiliated by the administration by creating 'holy cows' belonging to the category of so called audit objections which act as a repellent for further initiatives. Further, the following problems were mentioned:

1. The quality of work being carried out by researchers are not peer reviewed.
2. Young researchers are not being sent to National Labs
3. No mentoring by senior faculty members.
4. No deliverable component in the research.
5. Duplication of research
6. Lack of affinity towards research

Equipment

Expensive and high end state of the art equipment often die a natural death after the warranty/guarantee . This is in the context of the fact that it is extremely difficult to secure funds for maintenance of costly equipments on a sustainable scale. Purchase of equipments and chemicals is to be centralized using a single window operation.

1. Duplication of equipment and denial of access to these instruments/equipment by colleagues "owning" these instruments/equipment.

2. No scientific personnel for operating the equipment.

Projects

Except in Cochin University of Science and Technology , the implementation of a project under a PI, often, consumes enormous amount of time (Cochin University of Science and Technology has evolved a fairly robust/modest set of regulations which is researcher friendly and can be duplicated).

State of Grants

Researchers are often required to attend National and International conferences to present papers, deliver invited talks but are mainly dependent on the mercy of the UGC's unassigned grant and luck favours the fortunate only once in 3 years. The fact that there are no start-up grants for young researchers is equally problematic.

In addition to these problems, some other issues listed were:

1. Large amount of toxic chemicals/acids are dumped in to sink and finally ends up in the environment.
2. No sufficient recreational facilities like Gym, swimming pool etc.
3. No central instrumentation/computer/video conferencing facilities in the campuses.
4. Securing permission from government for travel is a very –cumbersome -- procedure.
5. No vibrancy among the research community on the campuses.

Changes Proposed

- **Administrative Reforms**

In the proposed unified Universities Act components needed to improve upon the existing rules and the administrative reforms required should be incorporated .

They are:

1. Single window for submission of Projects.
2. Single window and Quick implementation of the Projects.
3. In the case of delay in release of promised grants University should advance these amount to facilitate smooth running/operation of the Project/ Investigations.
4. Introduce incentives like 5% of the O/H components to the teachers/Researchers.

5. A onetime "special Incentive" in an year for teachers for papers published in high impact factor journals such as Science/Nature.
6. Research professors to be appointed solely for research with guideship for M.Phil/Ph.D programmes.
7. Best Researcher award based on citation/h-index/patents.
8. 2 months vacation salary to be generated solely from research projects.
9. For implementing a project the existing CUSAT regulations can be used as a base.
10. Audit objection is found to be a major bottleneck. All audit objections both trivial and serious to be settled by a committee in a time bound manner.
11. Procedure for security permission for international travel to be simplified.

- **Create Atmosphere Conducive to Research**

1. 24x7 coffee clubs/Restaurants with fully lit, secured perimeters for the safety of lady researchers.
2. 24x7 access with Biometrics and surveillance cameras.
3. No curfew for lady Researchers.
4. Promote new Inter departmental/ Intra departmental National/International collaborations.
5. 24x7 library with surveillance cameras.
6. Coffee kiosks in all departments.
7. 24x7 electricity/water to laboratories

- **Increase the capacity of the Campuses**

A planning officer or Director(R&D) must be appointed not below the rank of an Associate Professor with rich research, administrative and management expertise. Other requirements include:

1. Fast track promotion for extra ordinary researchers
2. Encourage youngsters, promote and mentor.
3. Provide grants for travel with no strings every two years.

4. Provide funds for inviting visiting Professors.
5. Good guest house (International standards).
6. Build state of the art residential complexes with 24x7water, electricity, internet access and intercom.
7. Eco-friendly shuttle services from Residences to Campus.
8. Fully Residential campus nurture full time research.
9. Colloquium and Seminars
10. Public lecture by eminent persons
11. State of the art convention centre.

2) Biological Sciences/Life Sciences/Clinical Medicine

The sub-committee conducted a questionnaire-based survey circulated to over 250 medical doctors and administrators working in government institutions, non-clinical teachers of medicine, health science researchers and doctors in the private sector. Premier institutes like Sree Chitra Tirunal Institute for Medical Sciences and Technology, Regional Cancer Centre, Government Medical Colleges and Private Medical institutions including corporate hospitals were covered, as also professionals in solo medical practice outside health care delivery institutions. The following points emerged as highlights:

- **Inadequate exposure to Research Methodology**

The medical and allied sciences, both in the undergraduate and post-graduate years do not give emphasis to teaching the basics of research methodology. Many felt that exclusive exposure to methods of research and researchers with proven track record would help in sensitizing the younger generation to research. This can be overcome by introducing teaching sessions with focus on training in research methodologies. A significant number of respondents cited lack of teaching of research methodology as well as deficiencies in training in research as one of the reasons for poor quality of research in our institutions.

- **Research as an extracurricular activity during undergraduate years**

The Indian Council for Medical Research runs summer studentship program for the undergraduate students in medicine to pursue clinical studies. This will serve as an introductory effort to the younger generation in research and ensure that they learn the basics of doing a

scientific study. All efforts must be undertaken to popularize the same among undergraduate students.

- **Post-graduate training**

None of the post-graduate Medical courses offered in Kerala at present require any prior training in Research Methodology. Such teaching should be made mandatory and should be a prerequisite for joining post-graduate courses. At present such a system is being followed in National institutes only.

- **Making scientific publications mandatory for acquiring degrees**

The idea that publishing their studies in national and international journals is important has not caught the imagination of the academia in Kerala. It is good if academic institutions draw up guidelines which make publications mandatory for post-graduate and doctoral programmes in the state. This would ensure that a candidate who goes through such programmes would have one or two publications prior to completion of their course. Also peer-review that would ensue from publications ensures that the research work is a valid one increasing the credibility of such efforts.

The present system, wherein a thesis is required for obtaining a post-graduate medical degree, has not been effective in generating genuine research. Research performed for thesis, is at times, not original and is usually not published in indexed journals.

- **Lack of information on funding sources**

Many clinical doctors felt that procuring funds for research is a cumbersome process. They felt that a single window of information with portals detailing Indian and foreign funding sources at teaching research institutions would be of great help.

- **Lack of time**

All faculty members in clinical subjects are required to do clinical and ward rounds and participate in teaching throughout the year. This leaves very little time for research. Many institutions do not confer any extra time for research initiatives. For the busy medical practitioner who has loads of patients to treat, the idea of finding time for the pursuit of research is definitely an impossible task. A possible solution would be to ensure a fraction of the clinician's time every year to be dedicated to research initiatives inside and outside the home institution.

The concept of "Protected Time" for doing research is proposed as a solution to this problem. An average of 20-25% of total time may be considered as protected time for research. Faculty members can devote this time to do research and do not have to participate in routine clinical activities.

The Sree Chitra Thirunal Institute for Medical Sciences and Technology has launched a three month break every two years to its faculty to pursue research programmes.

- **Lack of research infrastructure**

The educational institutions of the state lack proper research infrastructure including statisticians, clinical research coordinators, ethics committees which can supervise and aid the work of researchers. The government must legalize mandatory infrastructure in every institution or clusters of institutions. This will endure that research gets a broad supervision for ensuring ethical conduct as well as aid the academicians with secretarial and statistical support.

- **Frequent transfer of place of work**

The complaint that the medical personnel in government-run medical colleges and health care centres are subjected to frequent change in their place of work, depriving researchers the much-needed stability required for pursuits in the direction of academic research resonated throughout this study. This meant that doctors were not allowed to settle down in one place where they could weigh anchor and pursue initiatives other than the practice of medicine. This can be offset by maintaining a longer tenure at one station of work and making transfers a predictable event.

- **Leadership issues**

A small section of respondents felt that they did not get substantial help from their bosses and as a result academic research did not get the support it deserves. There was much affinity to maintaining the status-quo. At least one researcher said that the boss took the credit for the work done by the understudy. There was a need to manoeuvre research as an independent initiative not requiring the hierarchical suffocation that leadership often confers on independent thinkers.

- **Research for promotions and incentivizing publications**

The periodic promotions in many academic institutions in our state are time-bound rather than based on any valid merit. This often works as a disincentive for many who pursue research which does not confer any advantage over their counterparts who do nothing. Publishing their work should fetch them some incentive in the form of a letter of appreciation or any cash incentives as well. Research should also be considered and given due importance for job promotions.

- **Encouraging inter-institutional partnerships**

Currently, many academic institutions are biding their time as planets spinning in their own orbits not knowing what is happening in another planet. The inter-institutional collaborative efforts must be strengthened in all possible ways. This will ensure that greater synergy and better research outcomes between institutions based on interdependence.

Changes Proposed

- **Training in Research Methodology**

The lack of training in research methodology should be redressed. Research Methodology should form part of undergraduate training. The best time for training as part of the curriculum is debatable. One option is to train students when they enter clinical medicine, i.e. in the second or third year of MBBS while some argue in favour of teaching research methodology as part of basic pre-clinical training. A minimum of 8-10 hours of training should be made mandatory while visits to a clinical basic science research laboratory and interaction with researchers would give the students a firsthand exposure to research. This would generate interest at an early stage.

- **Harnessing the corporate world**

Many corporate institutions inside and outside the state have earmarked funds for Corporate Social Responsibility (CSR). This funding can be made available for research with ethics committee supervising the transactions ensuring that no disrepute is brought to the institution. Research should be a key area where public-private participation is actively practised.

- **Publications**

Publication of at least one original paper per year in an indexed journal would help generate more publications from higher education institutions. Adequate funding for doing research should be provided.

3) Engineering Sciences

The objective of this evaluation was to assess the inadequacies in the field of Engineering Sciences in institutions in Kerala and to suggest solutions. A few salient points are highlighted and some remedies to improve the overall quality of the Engineering Sciences suggested.

Current Scenario of Engineering Education in the country

According to data from AICTE, the regulator for technical education in India, there were 1,511 engineering colleges across India, graduating over 5,50,000 students back in 2006-07 which is now raised to double the number by 2014-15. However higher education, particularly engineering education is facing a crisis.

State of Private Engineering Colleges

The reasons for this crisis are manifold. There is no proper mechanism to measure the quality of the private engineering colleges in the state nor are they periodically evaluated. A recent assessment made by an eight-member committee appointed by the Kerala government revealed that hardly one-fifth of the engineering institutions in the State met the stipulations made by the

All India Council for Technical Education (AICTE). Although the AICTE has made M.Tech Degree mandatory for faculty, most private engineering colleges are yet to abide by it.

Shortage of Faculty

Often there is an acute shortage of faculty which has plunged from 54 per cent to 40 per cent nationally a few years ago. Unattractive pay is another reason for the dearth of faculty in engineering colleges. Although the AICTE has stipulated a pay scale, none of the private engineering colleges (unaided sector) in the state offer that pay package to the faculty. As a result of this, many faculties resign from the colleges during a semester and join other places. Therefore, the students suffer a lot without teachers during the semester time.

Lack of Quality

The lack of quality at higher level academic programme, particularly doctoral and post-doctoral research, deprives our institutes from the international ranking. Of the 160+ engineering colleges in Kerala, hardly one-fourth offer MTech programmes. In the wake of a new AICTE stipulation and an appeal by the former Union Human Resource Minister Kapil Sibal, many institutions came forward to start postgraduate programmes. But the State's universities have not taken much initiative in this direction. Several colleges were denied permission to do so.

Poor Employment Rates

The National Association of Software and Services Companies (NASSCOM) observed a couple of years ago that hardly 25 per cent of the students graduating from the country's engineering institutions were employable. In the absence of proper orientation in the system, the quality of the degree will suffer and can result in more and more degree holders being unemployed. Looking at the number of engineering colleges in Kerala and the number of engineers and the quality of engineers coming out of these colleges, serious attention should be given by taking each point into consideration. Even when the country's education managers talk volumes about enhancing the quality, little is often done towards walking that talk.

Changes Proposed

The following proposals are put forward for improving the quality of research in engineering sciences:

- **Promote Welfare of and Support for Research Activities**

Engineering institutes (colleges) should be instructed to have a research centre for every department with the facilities to promote research. This will facilitate the undertaking of research work and research supervision in the department by qualified teachers.

- **Encourage Research by Faculty Members**

Based on a quick assessment of the self-financing colleges, the aided and government colleges indicated that there are excellent faculty members with PhD and post-doctoral degrees working as teachers in these institutions. They should be given a chance to undertake high level of research. Further, research should be an integral part of the curriculum and should be a mandatory for all faculty members. They should be encouraged to submit research projects to various funding agencies. Institutional support for research initiatives by faculty members would include, but not be limited to:

1. Faculties should be given paid leave to undertake Faculty Improvement Programme to advance their academic career.
2. Faculty should be given leave with service benefits to undertake post-doctoral work in India and abroad.
3. Faculties should be given sabbatical leave after every six years of service to undertake advanced studies in India and abroad.
4. The faculties of the institute should be given proper support to take up research activities along with their career.
5. The faculties should be given training so as to help them inculcate the research interest in the students or they should be trained to promote research activities among the younger generations.
6. The faculties should be given proper incentives while on publishing research papers in international refereed journals.
7. The faculties should be given full support for conducting research seminars, talks conferences etc.
8. Incentives should be given to faculty members who do good research works and who can orient the student in finding out their research interest and find the aptitude for the particular subject or branch of study.

- **Governmental and Administrative Support**

The government should extend financial and managerial support to Institutions that are found to take genuine interest in research activities. This should be followed up with periodic assessment. The following steps are proposed to ensure quality control:

1. The criteria for faculty appointment should be strictly based on qualifications and Ph.D. in the concerned subject should be made mandatory.

2. Promotions and awards should be linked to publications, patents, and reviews published by the faculty.

3. Redesign of certification process should be done and must be based on quality of research outputs and awards.

- **Self-financing Colleges**

Self - financing colleges are a reality in Kerala now, with many teachers employed in these institutions. Their chances of getting a higher post in Government or aided institutions are highly limited. The service period of faculties appointed in self-financing institutes in conformity with the AICTE norms may be counted for appointment in aided, government and University positions. As of now, their years of expertise in self-financing institutes are not counted when they apply for positions in the government and aided sector.

- **Encourage interaction between industries and institutes**

Proposals should be submitted between the universities in collaboration with the industries. Syllabus must be updated regularly keeping in tune with industry requirement. An industry representative also must be included in the syllabus committee. Students should be directed to take special courses before being absorbed to industries. Engineering faculty should be allowed to spend at least a month in industry every year.

1. Adjunct faculty from the industry should be invited on a periodic basis.

2. Industry – University joint projects should be undertaken and this could be submitted to funding agencies such as DST, DBT, DietY, etc.

3. Industrial experts should be invited as members of the board of studies.

- **Promote partnership between research institutes around the world**

Promoting partnership between research institutes around the world will facilitate research collaborations, job offers and exchange of knowledge. The following step must be taken to this end:

1. Faculty should be encouraged to undertake international project offered by DST, DBT, UGC etc to have international faculty exchange and student exchange.

Summary

The main challenge is to create an academic environment and education system that promote and ensure effective teaching, learning and research. The process is quite challenging, but not impossible to achieve with honest effort if everyone will join hands together to achieve this great goal.

4) Mathematical Sciences/Information Science

Presently, the Mathematical Sciences and Information Science departments in the university face a host of problems that are related to the inefficiency of the university system.

Rigid and Sluggish Bureaucracy

This includes serious issues such as the rigid and sluggish bureaucracy which still functions on acts, statues and regulations of the 20th century which do not reflect transformations, realities and aspirations of the present society.

Lack of Coordinated Research

There is also a lack of coordinated research which stems from the lack of effective initiatives to promote inter-disciplinary research as well as the dearth of effective research training and course work (bookish knowledge on research is tested).

Over-Politicized Campuses

Over-Politicized Campuses are another aspect of the problem.

Changes Proposed

The following measures are proposed to overcome the issues:

- **Administrative Reforms Required**

The rigid and sluggish bureaucracy must be reformed and the acts, statues and regulations of the 20th century must be revised to reflect recent transformations and realities and the aspirations of the present society.

- **Research Reforms Required**

Effective measures to promote coordinated and interdisciplinary research must be initiated. Effective research training and course work must be designed. Test of skills, knowledge and aptitude must be carefully developed. Collaborative research within and outside the department (For e.g., Computer Science and Mathematics departments) must be encouraged, This approach should also be extended to collaboration with the other Universities in Kerala, India and even with international research groups. The collaborative research will definitely improve the quality of research that is going on in the universities presently. Ultimately this will create strong research groups in the Universities.

- **Teaching at UG and PG levels**

At undergraduate & post-graduate level, emphasis must be given to impart thorough knowledge of basic mathematics. Young students need to be trained how to pose mathematical problems, and also to impart problem posing skills. This should continue to problem solving skills, formalizing problems etc., helping to create mathematical thinking at their undergraduate level itself. Concepts learning should be connected to real life examples. It is not topics but insights that need to be taught or passed on to students. Such approach can be found in the website www.betterexplained.com or intuitive explanations at https://www.quora.com/ where many

concepts are explained in layman's terms. This kind of education is what makes a top notch scientific problem solver.

- **Promoting interdisciplinarity**

Areas like "Financial Mathematics", "Industrial Mathematics" and "Computational Mathematics" need promotion. In computing, Computational sciences (computational physics, computational chemistry, bioinformatics, computational linguistics, cognitive computing, educational informatics etc.) are candidate areas. These, however need enabling in laws to ensure that the research students who choose this area are not stranded in their career.

- **Incentives for targeting top class journals**

The damage done by predatory journals to research is well known. Computer science seems to be exceptionally a prey. Incentives to researchers targeting top class journals should be put in place.

- **Computational Infrastructure**

Though not all computing researchers are constrained by infrastructure, high-end computing facility is a requirement for some researchers in the area of big data analytics. This is best to be provided centrally as a cloud facility which can be upgraded as technology evolves.

5) Social Sciences

The sub-committee on social sciences met on 20.05.2015. The following observations were made:

Quality of Research

It was suggested that the number of research scholars under each guide should be further reduced from the current intake of 8. An ideal number will be 5. A committee of three experts - research guide concerned, chairperson of the Doctoral Committee and an external expert from outside the state - shall be constituted and entrusted with the responsibility of framing the syllabus for the course work examination (for papers other than research methodology). Presence of such an external expert shall be made mandatory during pre-submission seminar as well. It should be ensured that the suggestions made in the pre submission presentation are strictly incorporated in the thesis. Other reforms suggested include:

1. One way of promoting interdisciplinary research is to encourage faculty members belonging to different departments to undertake collaborative research projects for which the KSHEC shall provide necessary funds/seed money. Co- guide system for Ph. D Programme may also be encouraged.

2. Publication, every year, of at least one research paper in journals with impact factor and presentation of papers in national/ International conferences organized by Universities / research institutions outside the state by research guides shall be made mandatory.

3. Specific rules may be passed by the University in the case of Part time research to plug loopholes such as, inordinate delay in thesis submission, lack of rigor etc on the part of the Scholars.

4. There must be, as for as possible and practicable, a uniform pattern in regard to the regulations governing research in all the Universities in the state.

5. The state government may be asked to earmark a separate fund for promoting research under a separate budget head for each University. Funds under this head could be utilized for undertaking interdisciplinary research, providing travel grant for students to participate and present papers in national (outside the state) and international (outside the country) conferences, visiting libraries/research labs and institutions outside the state etc.

6. A meeting of eminent scholars in the respective fields may be convened by the KSHEC to identify: areas which are not adequately researched, issues relevant for interdisciplinary research, and frontier areas of research.

7. Workshops on Research Methodology may be conducted for research guides by the KSHEC and for research scholars by the concerned university departments. Workshops organized by the departments may funded by the KSHEC.

Publications

Members of the faculty may be encouraged to become members of editorial boards and peer review committees of reputed Journals. In such cases, adequate weightage should be given at the time of promotion to higher position.

1. Financial assistance may be provided by the KSHEC to departments in the Universities , Research Centres and Professional Organizations to publish journals .Proposals may be invited from various universities and institutions out of which a few – basically depending on the quantum of money available – may be selected. Grants shall be given for one year/ two years on an experimental basis, and the continuance of the same shall depend on both quality and regularity of publication.

2. Paid journals may be blacklisted.

Further, universities may be asked to take **speedy and proactive** steps to grant recognition and equivalency to the qualifying degrees obtained by the students from Universities/ Autonomous Colleges/ Deemed Universities from other states and countries.

Some additional suggestions were made by some sub-committee members:

- **Cultivation of Research Culture**

Number of research scholars allotted to guides must be restricted and it can vary among Asst. Professors, Associate Professors and Professors as the teaching hours for these categories are different.

Presently many universities do not conduct classes on course work and the whole exercise is reduced to a syllabus and exam. Six month course work with classes and hands on training should be made compulsory. KSHEC can take a lead in organizing at least two 15 days sessions, each for quantitative and qualitative research methods in social science at state level. Competent faculty members including those from outside the state must be invited to handle sessions in such workshops.

1. Along with research scholars, research guides must also be given orientation/ refresher courses in research methodology.
2. Critical reading and reviewing, academic writing, analysis using computer software must be covered in the research methodology syllabus across universities and in all these three areas a hands on training must be ensured. A special orientation on research ethics must also be given.
3. At present, in most of the universities the research proposal is accepted in the first place during the doctoral committee. This must be changed. The Supervising teacher should see that the Scholar works on his/her proposal at least for 3-4 months and only then be allowed to defend the proposal before the doctoral committee. Progress of research must be evaluated by the doctoral committee every year.
4. Pre-Submission seminar should be made mandatory in every university and which should be attended by an external expert.
5. Peer group interaction is very minimal among scholars these days, inter university exchange of scholars (both within and outside India) should be encouraged and facilitated. Scholars should be given travel assistance, conference registration re-imbursement to promote them to interact with academicians in possible widest level.
6. Inter disciplinary research must be encouraged and co-guides can be appointed in such cases.

- **Addressing administrative bottlenecks**

The maximum processing time for admission should be fixed and inordinate delay in sanctioning order in many cases should be avoided. It can be an online based admission procedure which is currently followed by University of Kerala. After the submission of thesis its evaluation must be completed within a maximum period of 6 months.

- **Infrastructure and other facilities**

1. Timely distribution of fellowship and facility for stay for scholars must be ensured by universities. Currently there is a huge difference in fellowship between universities and no fellowship is given for M.Phil scholars. University fellowships must be made uniform in all universities, as currently there is a huge disparity. The amount must be revised and must be fixed at least as 50% of UGC fellowship. This is essential in attracting good students to research. All the fellowship recipients must be asked to publish at least two papers in standard journals before the submission of the thesis.

2. Subscription of standard journals must be ensured. Inter University sharing of resources research facilities can be thought off, this will reduce the burden of huge purchase and will diversify the availability of resources within the state.

3. Financial support by KSHEC may be given to the existing standard Journals in social sciences to increase the periodicity and number of pages so that more research scholars will get chance to publish articles. KSHEC nominee should be there in the Editorial Board of such journals to ensure the purpose.

- **Quality of Teachers**

Quality of Research is contingent on the quality of the faculty. Unfortunately, appointments of faculty members are not made on this basis. Often appointments are made without alignment with existing or proposed research programmes. Notification of vacancy as well as appointment of the teachers on the basis of the stipulations put forward by the particular university departments are no longer made in the universities.

- **Area of Specialization**

Number of vacancies under the Research guides, number of seats in the departments and entrance examination decide the research programme and students are not given complete freedom to choose the area of research. There is often a mismatch between specialization of guides and allotment of students and topics. The teachers are given a particular number of

students according to intake and they are forced to guide the scholars not in their specialized area or according to the student's areas of interest.

- **Admission**

As a screening process, the entrance exam is essential. Based on the result of the entrance examination and availability of seats, provisional registration can be given by the doctoral committee. After attending a course work for 6 months, the performance of the scholar will be assessed by the doctoral committee and confirm the permanent registration. Thrust area and specialization should be informed to the public (e.g. Sree Sankaracharya University of Sanskrit Kalady uses this system while admitting the research students). Once the students are admitted they must be given an orientation regarding the choice of the topic and identifying of the research problem.

No commitment from the part of students

There is no commitment from the part of students because of the ignorance of this specialization and the areas taught in the particular university. New areas of research possibilities are not informed to the students while they apply. Some criteria should be there for selection of students. PhD production and preparation of NET should not be done together. This is mere waste of time and it affects the quality of research. Complete dedication is not possible from the part of students.

- **Integrated MPhil and PhD course**

Integrated course is to be implemented. Students who complete MPhil can continue their research with great interest and without much difficulty.

- **Part time Research**

As most of the part time scholars are working, departments and guides are not able to keep accountability and consistency. A particular time-limit, e.g. 7 years may be prescribed for part-time scholars.

- **University**

University should come up with strict, clear research regulations. Time frame should be strictly maintained. University could not do this because of the interference from the part of concerned faculty.

- **Department**

An academic atmosphere is very much necessary in the departments. Mindset, attitude and approach of the teachers in the particular department should be positive in this regard. Peer group and informative discussions will nourish the research department. New avenue should be opened for discussion among teachers which facilitate the department to nurture the research activities. Most of the time this is not happening due to the inefficiency and ego of the research guides in the departments

- **Infrastructure**

No ample library facility. No proper updated books. Automated and INFLIBNET facilities are there but not working properly. Proper guidance should be given to students by the librarians in accessing the documents they need.

- **Administration**

Attitude of officials in the departments towards the research works are not very healthy. Staff should be competent enough. Encouragement and positive approach from the part of officials towards teachers and students should be improved.

- **Research Papers**

Not all the journals are good. Some do not keep the quality. Paid journals are really a threat to the quality of research papers. NAAC consultants stressed the ideas of foreign collaboration and international Research papers. Indian universities have only a very few number of papers in Social Science as landmark. Such types of works are not done in Kerala.

- **Students**

80% of students are not given job assurance. Inclination towards the subject from the part of students are not seen much. Most of them do the course for employment. So genuine interest may not be taken by students in doing research.

- **Harassment from the part of Research Guides to Research Scholars**

Effective measures to combat mental/sexual harassment should be implemented.

6) Arts & Humanities

The sub-committee on Arts & Humanities met on 13-05-2015 at KSHEC, Thiruvananthapuram, Kerala. Most of the inputs were organised in a faculty-wise manner initially and then commonalities were listed. Most of the faculties felt that interdisciplinary research is yet to be pursued in its true sense.

There are many areas in Fine Arts and Performing Arts where there is a unique Kerala identity that can be explored. Our universities have failed to exploit this. As case in point is dance research. Our art studies at the academic level can critically revisit the historiographies of various

classical traditional practices and can deconstruct more precise theoretical and conceptual aesthetic definitions in terms of different ideologies in the modern perspective. Research in such areas yield paramount possibilities in contemporary times and interpretations.

Problems of Research in the Arts and Humanities

- **Test for Research Aptitude**

Research candidates are taken in without proper tests for research aptitude. Secondly, the syllabi of our education systems do not stress research enough. Research projects are not given the same weightage as written exams. M.A., M.Phil and PhD dissertations are not valued with the rigor demanded of original intellectual exercises. They are seen merely as partial fulfillment of the requirement for degrees and are treated to lax evaluations.

- **Lack of Journals**

Further there are not enough research publications or peer reviewed journals brought out by the university where students may publish their articles. The ones that are available are not strictly peer-reviewed; certain editors practice favoritism which allows articles without substance to be published.

- **Plagiarism**

The fear of plagiarism which is rampant in the discipline is seen to be detrimental to healthy research. Without proper public documentation of the various topics already being worked upon, it is impossible to track down the perpetrators of plagiarism.

- **Grants**

Another issue is the funding provided to researchers. While the university JRF promises a hefty amount, the bureaucratic and general delays in sanctioning the funds on the part of the university is appalling. A PhD candidate has to apply for an order that will then allow them to consequently apply for the amount. The whole process takes upward of six months. Such convoluted procedures make funding extremely hard to come by and impact research activities adversely.

- **Lack of Quality**

    1. Lack of Interdisciplinary research and approaches by faculty members should be reviewed and interdisciplinarity should be encouraged.
    2. Research quality monitoring system should be implemented
    3. Abstract in one page should be included in the thesis while submitting.
    4. Common methodology such as MLA style or Chicago style etc, have to be used by the faculty.
    5. Restrict the number of general chapters to one, the rest of the thesis should comprise content chapters.
    6. Pre-presentation should be implemented once every 4 months for full time research scholars.
    7. Follow a methodical approach streamlining the whole research work.
    8. Marginalized areas are yet to be identified and considered.
    9. Outstanding works are yet to emerge.
    10. Scholars take up contacts with scholars abroad on their own.
    11. Interdisciplinarity is not reflected in the analytical and methodological aspects in its real sense in many of the theses.
    12. Marginalized areas of research such as edition works of unpublished manuscripts lying in the repositories of Kerala, especially in the field of Technical Literature have yet to be studied. The critical editions have not been brought into research either (Critical editions of several significant works like *Natyasatra*, *Abhinavabharati* and the complete works of *Sankaracharya* are yet to come out.)

- **Facilities and Grants**

    1. International consultancy to be promoted
    2. Infrastructural facilities are to be improved.
    3. Regarding the financial support, the fellowships given by our Universities are meager. An amount not less than Rs 10,000/- per month would be a reasonable amount. It is suggested that KSHEC may launch a Research Fellowship scheme similar to the UGC JRF, of course based on some selection criteria.

- **Administrative Support**

Regarding the administrative support, the existing system is satisfactory. But it may be ascertained that trivial administrative technicalities are not hampering the spirit of a genuine researcher. It is suggested that the Research regulations in the Universities of our state shall maintain a tolerable level of uniformity.

Changes Proposed

- **Implement Research Sharing**

In the first place, system where resource sharing is possible between the various departments, centres and universities would have to be implemented. Such sharing is not happening at the moment. The authorities must look into updating, computerizing and making accessible public records and lists of dissertations, publications, details about the faculty, library catalogues from all the colleges in the university and so on. This would help students in their research by defining the resources available to them. Students should be able to make use of these resources without procedural and bureaucratic delays. Students should be able to attend inter-departmental and inter-college courses as electives. All major libraries should be open to students of the university, regardless of their college and department. It should be made possible for government, co-operative and private sector institutes to open their facilities to students for research purposes.

- **Develop Research Ethics**

Primary importance must be placed on developing ethical practices and attitudes towards research. The issue of plagiarism must be dealt with seriously and must be treated as an intellectual crime. Researchers must not be taught to consider their research activities, dissertations and open defenses as mere formalities. The importance of original and relevant research must be imbibed through the curriculum.

- **Reforms Suggested**

1. Availability of better grants and research conditions will encourage talented youngsters to take up research.
2. MoUs with acclaimed foreign universities which facilitates student and faculty exchange can help to create a more vibrant research atmosphere.

3. Scholar in residence programs which allow acclaimed scholars from India and abroad to spend a year at key research departments of the University would help emerging researchers to learn from the best scholars in their fields.

4. Instead of focusing on conventional topics, it would be better to focus on topics which might have practical impact.

5. To improve the quality of research, a workshop/colloquium on the Research methodology in each discipline may be organized.

6. The existing Research regulations in the Universities may be studied and unified to the possible extent. Sufficient representation shall be given to the Research scholars and Supervising teachers in the bodies which makes such a study.

7. A practical workshop/colloquium may be organized in each discipline to assess the existing system and to improve/revamp the same if necessary.

8. The university must look into ways of incorporating student publications in the major university publications. It must also start peer-reviewed and standardized journals where students can publish their material.

9. Another area where major change is necessary is the lack of information about on-going research. Researchers working on the same broad area must be given avenues to share their findings and discuss them. A system of ethical sharing must be encouraged between various research departments and centres. Emphasis should be given to interdisciplinary and original research.

10. Research funding should be easier to apply for. The bureaucratic and procedural delays should be ironed out.

11. Evaluations of M.Phil and PhD dissertations must be carried out speedily and effectively.

12. Researchers must be given an atmosphere conducive to their research which includes updated library and archival access, safe avenues for publication and funding.

13. Another area that could be considered is travel allowances for research students so that they may attend conferences, seminars and symposiums across India.

14. A mechanism for grievance redressal of issues faced by researchers may be implemented by KSHEC.

Chapter Five

Conclusions

Research in Kerala suffers from many demons, not the least of which is the tyranny of low expectations. Although at the primary and secondary school levels enrolment is very high and standards are acceptable, this is by no means so when we come to higher education and research. When this committee began its work, it started with a comprehensive bibliometric evaluation of the current status of academia-led research in the state which is reported in Chapter Two. The committee at its earliest meetings had hoped that the various discipline-wise sub-committees will concentrate on the "state report" on their respective areas, mapping the research excellence scenario in Kerala, institution-wise and also at the level of individual excellence, but it was beyond the expertise of all concerned. Also, Kerala did not have an institutional framework which could carry out such an evaluation for all its sectors engaged in research. As a result, it is impossible to answer questions like: Do we have any on-going activities within Kerala that would automatically recommend itself for a Shanti Swarup Bhatnagar Prize or an election to one of the three major Academies of Science? At the next higher level, are there any prospects of getting elevated to international benchmarks like the FRS or Nobel Prizes and Field Medals?

It is well known that in most countries, nearly 80% of the research is conducted in the university environment. The latest Excellence Mapping report (http://www.excellencemapping.net) covering articles published during the period 2008-2012 visualizes scientific excellence

worldwide in 22 major subject areas collects institutions (universities or research-focused) that have published at least 500 articles, reviews and conference papers in each category within the publication period. From India, of the 70 unique institutions that make the cut in 213 appearances in the list, 83% are from the Higher Education sector. And only one is from Kerala; the Sree ChitraThirunal Institute for Medical Sciences and Technology appears only in one area, Medicine. This is very poor performance indeed. In contrast, Tamil Nadu has 10 institutions appearing in 10 subject areas, at this level of scientific excellence.

Keralites are known for their claim that in intelligence and enterprise, they are second to none in the world. But the reality in the world of Higher Education and Research is just the opposite. We saw in Chapter Two that The Republic of Slovenia, a small nation state with a population of 2.06 million, smaller than each of the nine most populous districts of Kerala has one University in the ARWU Top 500, namely the University of Ljubljana which published more scientific articles than all the institutions in Kerala put together. Although in primary and secondary education, Kerala has done well in comparison to other states in India, in higher education and research, it has fallen behind.

The reasons for this have been delineated in Chapter Three and Chapter Four based on feedback directly from individuals through a web-based survey and indirectly from the various sub-committees. The irritants and impediments can easily be addressed as these are completely within the ambit of the various governance, leadership and management bodies of the various universities and the government departments.

As far as empowering agencies which can provide futuristic vision and mentorship, Kerala already has the right institutional framework in place, through the Kerala State Higher Education Council (KSHEC) and the Kerala State Council for Science Technology and Environment (KSCSTE). KSCSTE is an autonomous body re-constituted by the Government of Kerala in November 2002 (earlier, the body responsible for carrying out similar work was the State Committee for Science, Technology and Environment (STEC) established in 1972), to encourage and promote science and technology-related activities in Kerala State. KSCSTE runs seven R&D centres and it is important that these must work more closely with the colleges and universities that come directly under KSHEC. It is also possible that the KSCSTE institutions can be embedded in the University system as CNRS has done in France. It has been more than 40 years since STEC, followed by KSCSTE have been in the research space but Kerala has not been able to make a mark in the global arena as far as scientific excellence is concerned. It is also important that KSCSTE set up an internal mechanism to report at steady intervals an assessment and evaluation of the current strengths and weaknesses of the research and innovation environment in the state based on emerging data analytical techniques.

In Chapter Two we saw institutions in the private sector, performing exceptionally well in comparison to other similarly placed institutions already operating in Kerala. If given autonomy and encouragement, these institutions can be guided along the track that takes them to the Excellence Mapping threshold. It is worthwhile noting in this regard that three of the ten institutions that have made the cut from Tamil Nadu in the Excellence Mapping net are the Christian Medical College in Vellore (medicine), the PSG College of Technology in Coimbatore and VIT University in Vellore (both in engineering). There is no reason why institutions in Kerala cannot make it into this league.

This report is probably the first of its kind for the state of Kerala. I would like to end with the submission that this exercise be repeated after a meaningful interval, may be every five years if possible.

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Annexure I

List of Higher Educational Institutions in Kerala

	University	**Location**
	Central	
1	Central University of Kerala	Kasaragod
	State	
1	Cochin University of Science and Technology	Ernakulam
2	Kannur University	Kannur
3	Kerala Agricultural University	Thrissur
4	Kerala University of Fisheries and Ocean Studies	Kochi
5	Kerala University of Health Sciences	Thrissur
6	Kerala Veterinary and Animal Sciences University	Wayanad
7	Mahatma Gandhi University	Kottayam
8	SreeSankaracharya University of Sanskrit	Kalady
9	University of Calicut	Malappuram
10	University of Kerala	Thiruvananthapuram
11	National University of Advanced Legal Studies	Kochi
12	Thunchath Ezhuthachan Malayalam University	Malappuram
13	Kerala Technological University	Thiruvananthapuram
	Deemed to be University	
1	Indian Institute of Space Science and Technology	Thiruvananthapuram
2	Kerala Kalamandalam	Cheruthuruthy
3	Amrita Vishwa Vidyapeetham	Amritapuri and Kochi (Hqs at Coimbatore)
4	Indian Institute of Management	Kozhikode
	Institute of National Importance	
1	Sree ChitraThirunal Institute for Medical Sciences and Technology	Thiruvananthapuram
2	Indian Institute for Science Education and Research	Thiruvananthapuram
3	National Institute of Technology	Kozhikode
4	Indian Institute of Technology	Palakkad

Annexure II

List of Higher Educational Institutions in Kerala appearing in SIR 2014

Sl. No.	Higher Education Institution	Output
1	Cochin University of Science and Technology	0.68
2	Sree ChitraThirunal Institute for Medical Sciences and Technology	0.42
3	University of Kerala	0.39
4	AmrithaVishwa Vidyapeetham (incl. campuses outside Kerala)	0.37
5	National Institute of Technology Calicut	0.27
6	Mahatma Gandhi University	0.26
7	Kerala Veterinary and Animal Sciences University	0.18
Reference	**CNRS, France**	**100**

Annexure III

The Kerala State Higher Education Council

Questionnaire for Academicians and Stake holders

1. Name:

2. Please give a brief description of positions held and research and academic roles (not more than 250 words)

3. Why do you think Kerala has not been able to develop and nurture research-intensive universities? (not more than 250 words)

4. How many of the HEIs in Kerala should evolve into a research-intensive unitary university style of functioning?

5. Do you think the affiliating nature of many of our universities have stood in the way of Kerala developing world-class facilities and opportunities?

6. Please give a detailed description for the interventions needed from the government, cooperative and private sectors so that instead of having a fragmented base of 1000 colleges, we can put in place a resource-sharing system of 30 to 60 universities having a unitary structure. (not more than 500 words)

7. Any other thoughts and suggestions you have regarding the subject that the committee can take into consideration? (not more than 500 words)

ANNEXURE IV

Terms of Reference of the Committee

The Committee has to study the academic status of relevant Universities in research and propose appropriate measures to increase the capacity of the campuses to convert them into globally competent research centres by addressing,

1. The Present problems of the University System
2. The administrative reforms required
3. The Steps to create more ambiance for research and innovation on the campuses.