SAS/Graph: code hatched from EG

Mike Atkinson &
Cheryl Sivertson

SAS/Graph using Enterprise Guide

- Can generate charts and plots without requiring any actual coding
- Generates all SAS code underneath, which gives options:
  - Work strictly through Enterprise Guide
  - It is possible to insert SAS code at certain points, while still managing the code using EG settings
  - You can change the code – afterwards you'll have to maintain the SAS code
    - Enterprise Guide gives you a good starting point

Goptions code generated by EG

```
GOPTIONS    xpixels=900 ypixels=900;

GOPTIONS COLORS = (CX9999CC , CX66997F ,
  CXCCCC66 , CXCC6666 , CXB3CC99 ,
  CX6699CC , CXCC9966 , CX66CC99 ,
  CXCC99CC , CX3F769A , CX9966CC ,
  CXB0C1F4);
```

EG-generated Legend statement

```
Legend1
        CSHADOW=GRAY
        POSITION = (TOP CENTER OUTSIDE)
        LABEL=(  "Grade Codes")
        ;
```

EG-generated Axis Statements

```
Axis1
      STYLE=1
      WIDTH=1
      LABEL=( HEIGHT=10pt  " ")
      VALUE=( " ");
Axis2
      STYLE=1
      WIDTH=1
      MINOR=NONE
      LABEL=( HEIGHT=9pt  "Percent of Grades");
Axis3
      STYLE=1
      WIDTH=1
      LABEL=( HEIGHT=8pt  " ")
      VALUE=(ANGLE=0 HEIGHT=8pt JUSTIFY=R);
```

Axis statement

- Can specify labels, scale, and more for each axis.
- Axis statement can be referenced in the VBAR or HBAR statement (of GCHART) for:
  - raxis: Response axis (vertical axis for VBAR)
  - maxis: Midpoint axis
  - gaxis: Group axis (if group used)

EG-generated Proc Gchart code

```
PROC GCHART DATA=WORK.SORTTempTableSorted;
format Grade_Numeric Grade.;
HBAR  TERM_CODE  /
      SUBGROUP=Grade_Numeric
      GROUP=COURSE_FACULTY
      FRAME
      TYPE=PCT
      G100
      LEGEND=LEGEND1
      COUTLINE=MAGENTA
      MAXIS=AXIS1
      RAXIS=AXIS2
      GAXIS=AXIS3
      LREF=1
      CREF=BLACK
      AUTOREF
;
```

About fonts

- There are 3 font families defined in the PDF specification that will look in PDFs:
- Helvetica
- Courier
- Times
- Each of these has a base version and can also be specified as:
  - /bold
  - /oblique
  - /bold/oblique
- E.g. Helvetica/oblique

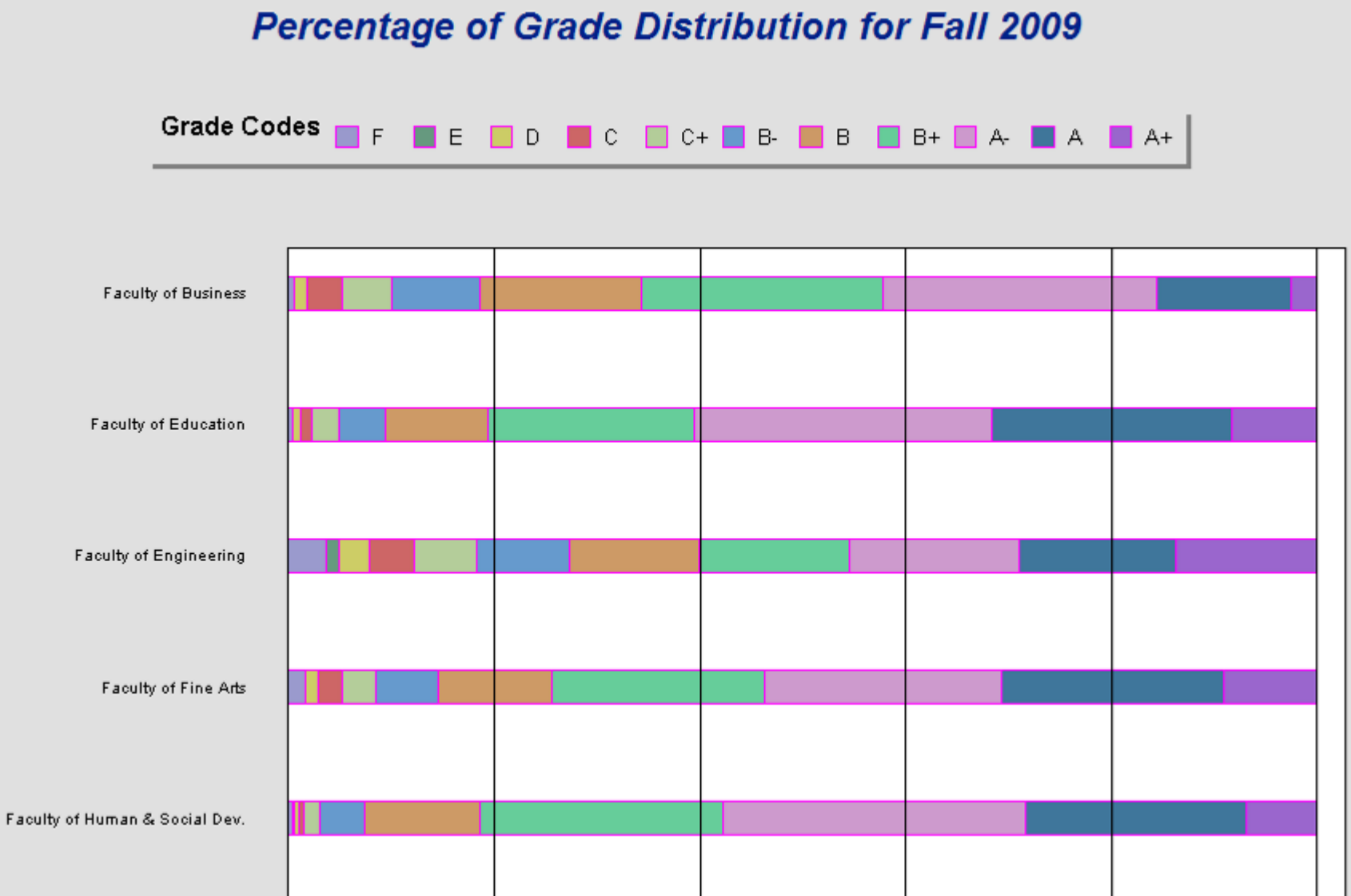
Added ODS statements to PDF

```
filename pdffile “path/to/file/UVic_chart.pdf”;

options orientation=landscape;
goptions dev=sasprtc ftext="Helvetica";
ods listing close;
ods printer pdf file=pdffile  notoc;
ods noresults;

* SAS/graph code here;

ods listing;
ods printer close;
ods results;
```

To create ActiveX, minor changes:

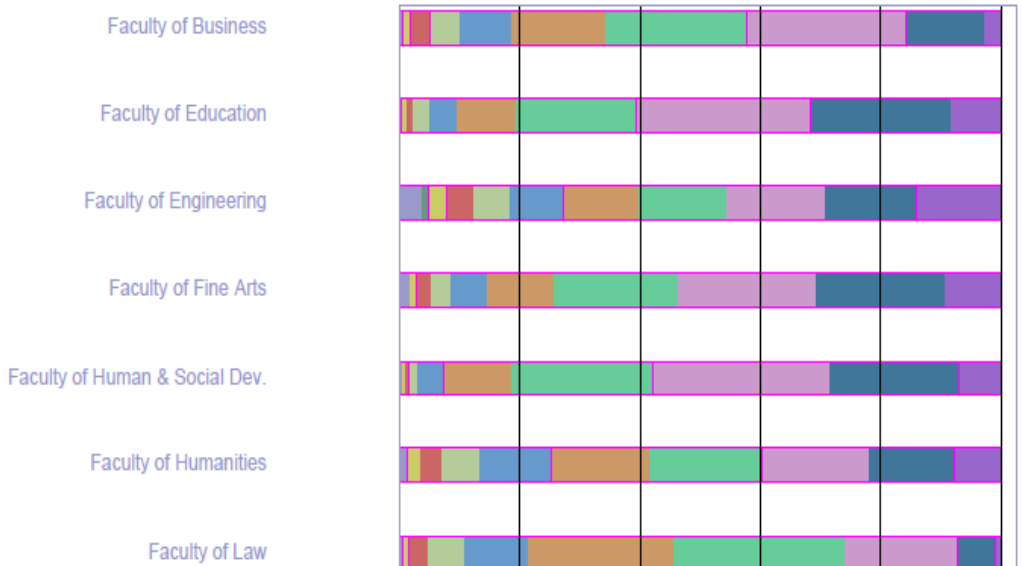
```
filename htmlfile “path/to/file/UVic_chart.html”;

options orientation=landscape;
goptions dev=activex ftext="Helvetica";
ods listing close;
ods html file=htmlfile;
ods noresults;

* SAS/graph code here;

ods listing;
ods html close;
ods results;
```

ActiveX output (truncated)



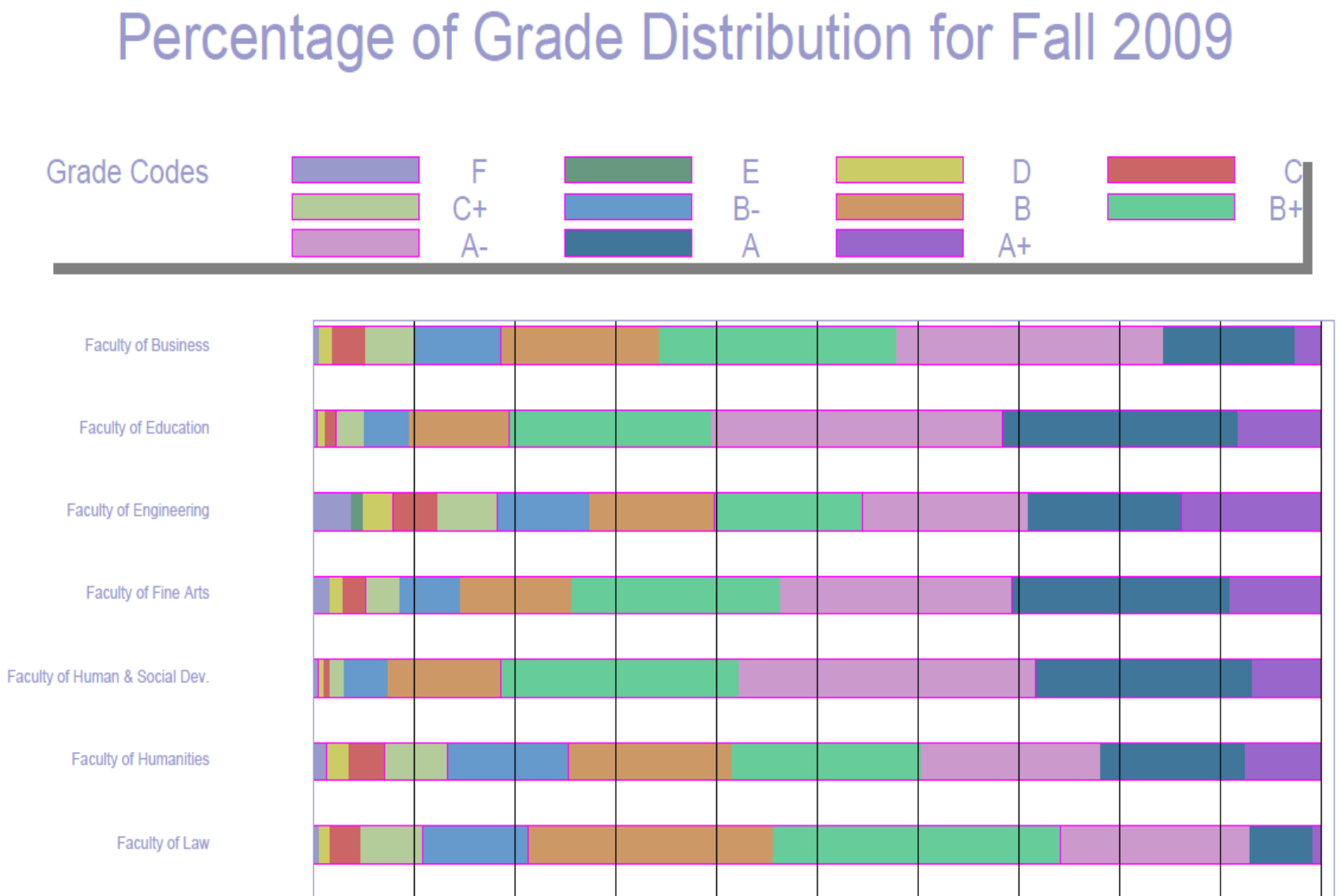
PDF Output (truncated)

Percentage of Grade Distribution for Fall 2009

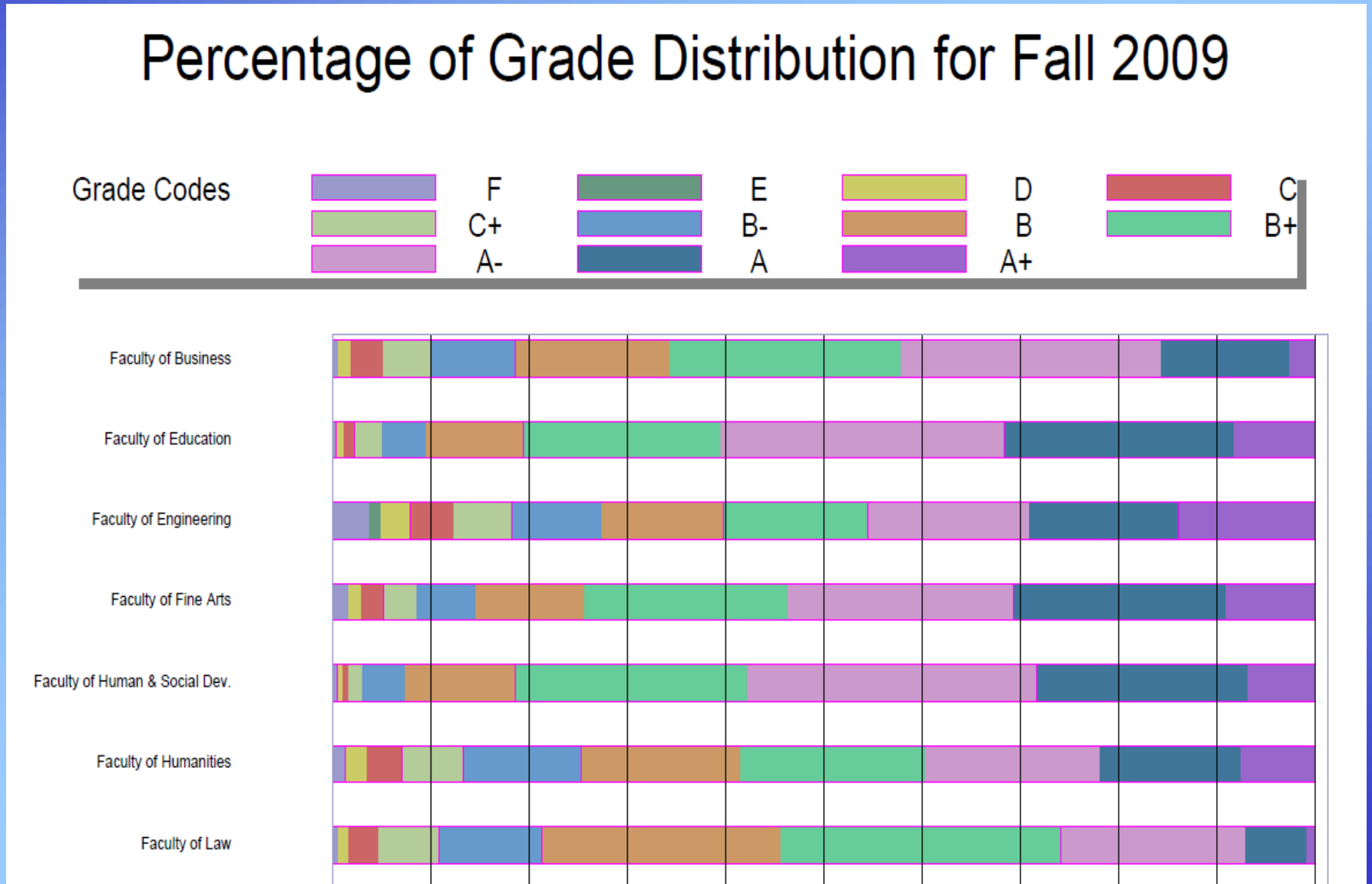


	FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
Faculty of Business	3906	3906	100	100
Faculty of Education	4677	4677	100	100
Faculty of Engineering	3941	3941	100	100
Faculty of Fine Arts	3616	3616	100	100
Faculty of Human & Social Dev.	3799	3799	100	100
Faculty of Humanities	10952	10952	100	100
Faculty of Law				

With `nostats` option added



Adding `goptions ctext=black;`



Working with colour

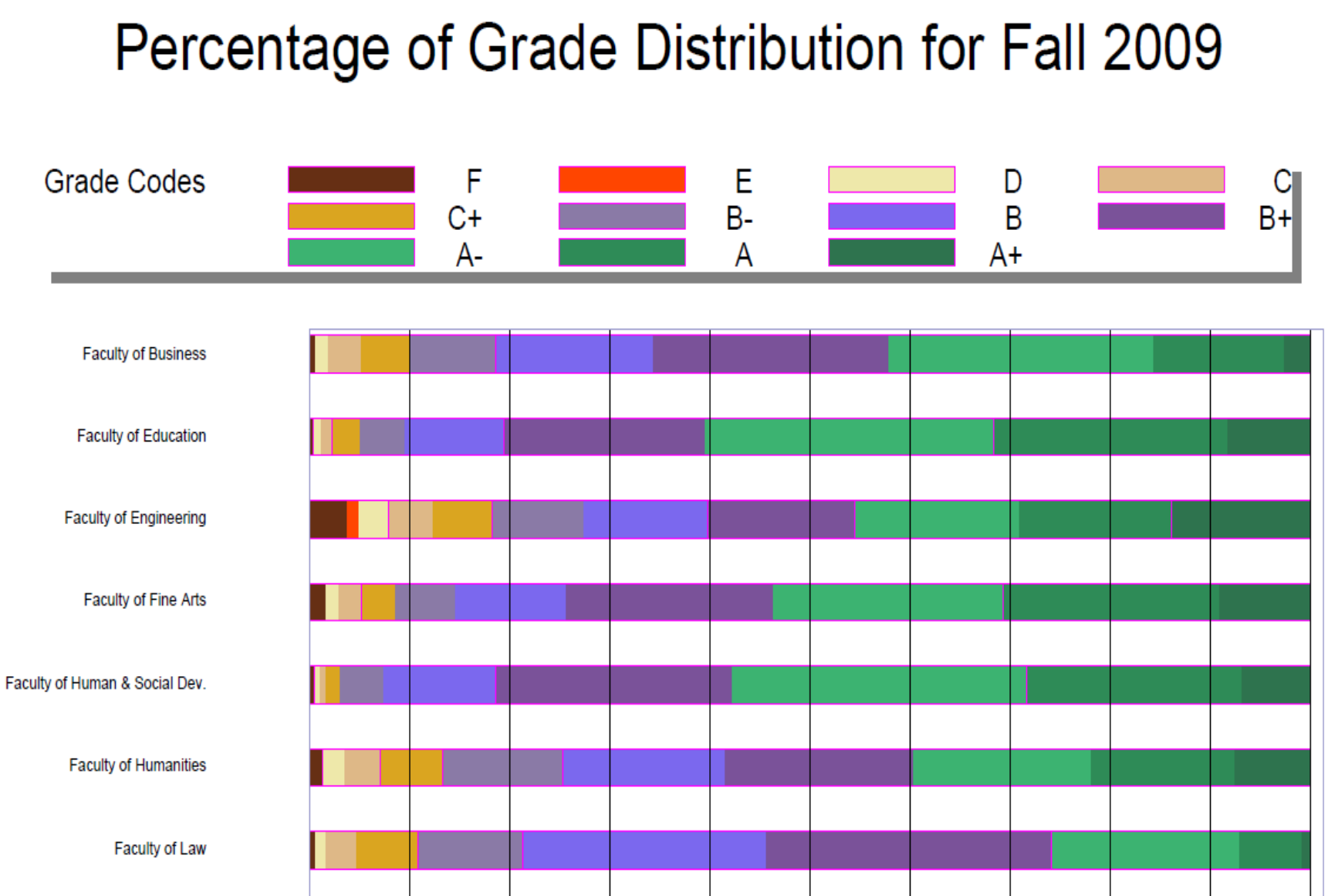
- Can specify RGB values using format: color=cxFFFFFF
- Can also reference many colours by name, such as:
  - DodgerBlue (cxFFDAB9)
  - Burlywood (cxDEB887)
  - and (yeah) Blue (cx0000FF), Green (cx008000), Cyan (cx00FFFF), etc.
- A good resource for colours is the SAS web page:

<http://support.sas.com/techsup/technote/ts688/ts688.html>

Pattern statements for colours

```
pattern1  color=cx662F14;  * Deep redish orange;
pattern2  color=cxFF4500;  * Orange Red;
pattern3  color=cxEEE8AA;  * Pale goldenrod;
pattern4  color=cxDEB887;  * Burlywood;
pattern5  color=cxDAA520;  * Goldenrod;
pattern6  color=cx8A7AA6;  * Pale purplish blue;
pattern7  color=cx7B68EE;  * Medium slate blue;
pattern8  color=cx7A5299;  * Light violet;
pattern9  color=cx3CB371;  * Medium sea green;
pattern10 color=cx2E8B57;  * Sea green;
pattern11 color=cx2E734E;  * Strong green;
```

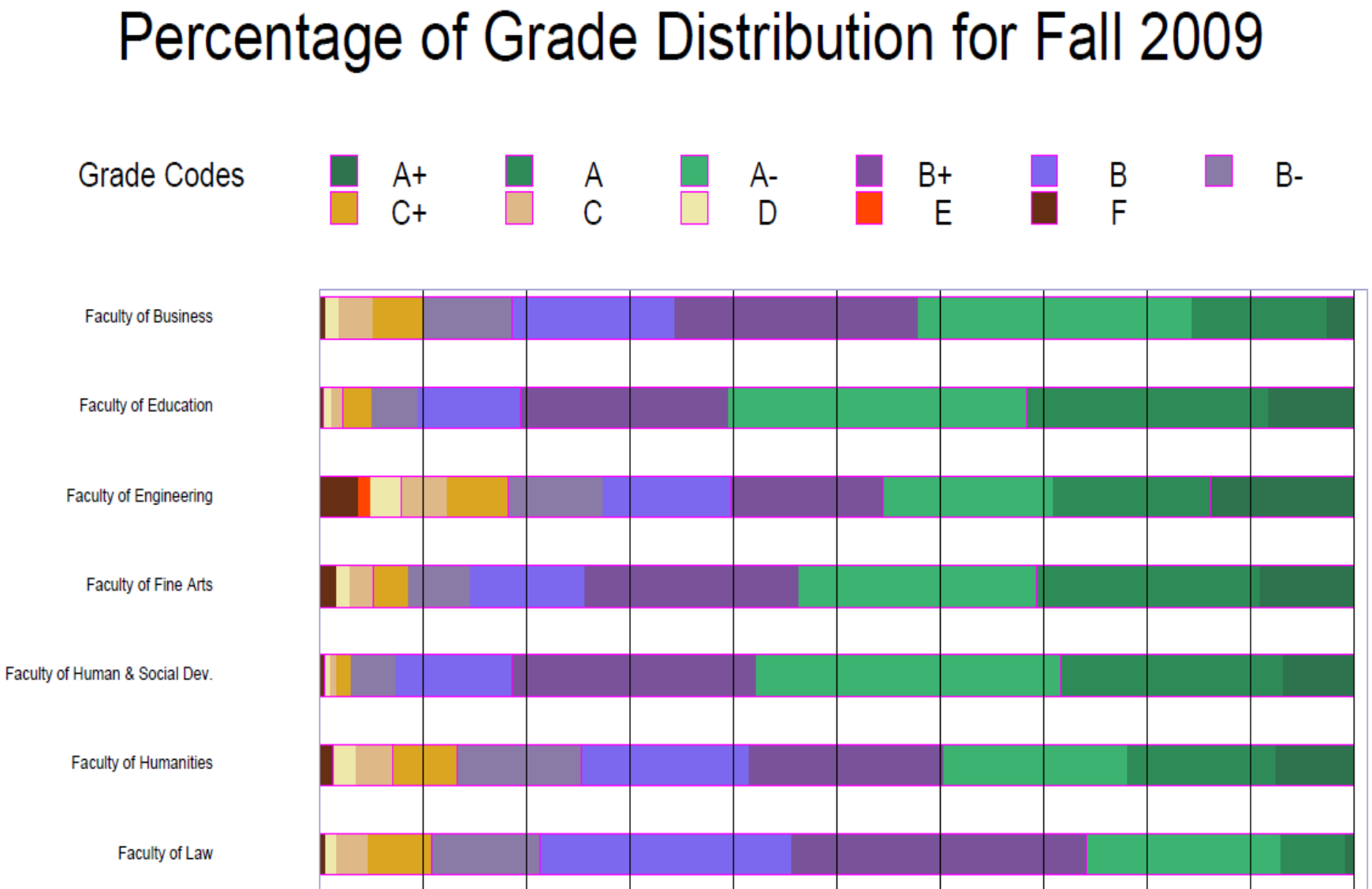
Bar colour now more logical



Improving the legend

```
legend1
        POSITION = (TOP CENTER OUTSIDE)
        LABEL = ("Grade Codes")
        order = (9 to -1 by -1)
        shape = bar(0.5cm, 0.5cm)
        ;
```

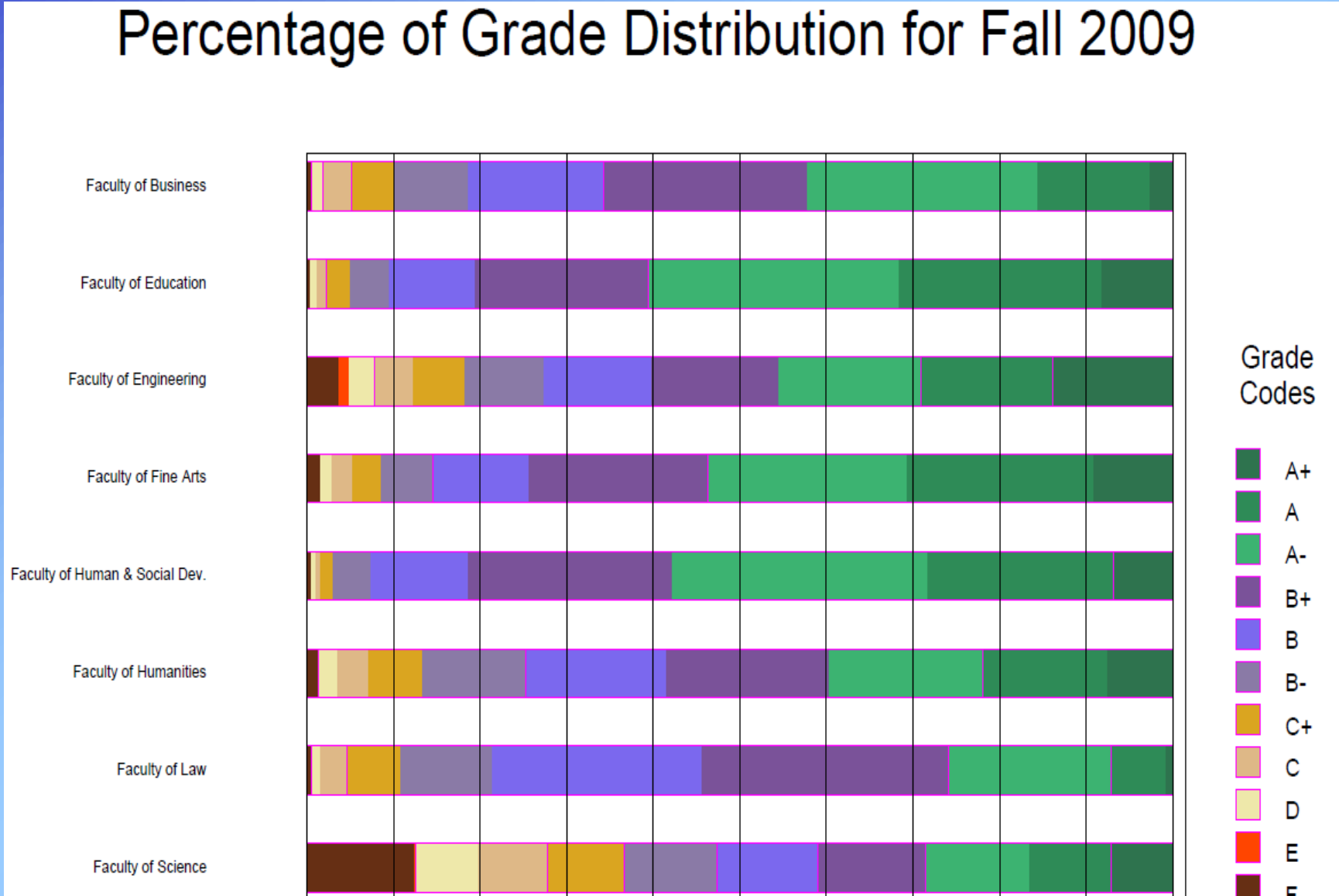
Some improvement to legend



More improvements to the legend

```
legend1
      POSITION = (right middle OUTSIDE)
      order=(9 to -1 by -1)
      shape=bar(0.5cm, 0.5cm)
      value=(justify=left h=12pt)
      across=1
      LABEL=(position=top "Grade“
             justify=center "Codes")
      ;
```

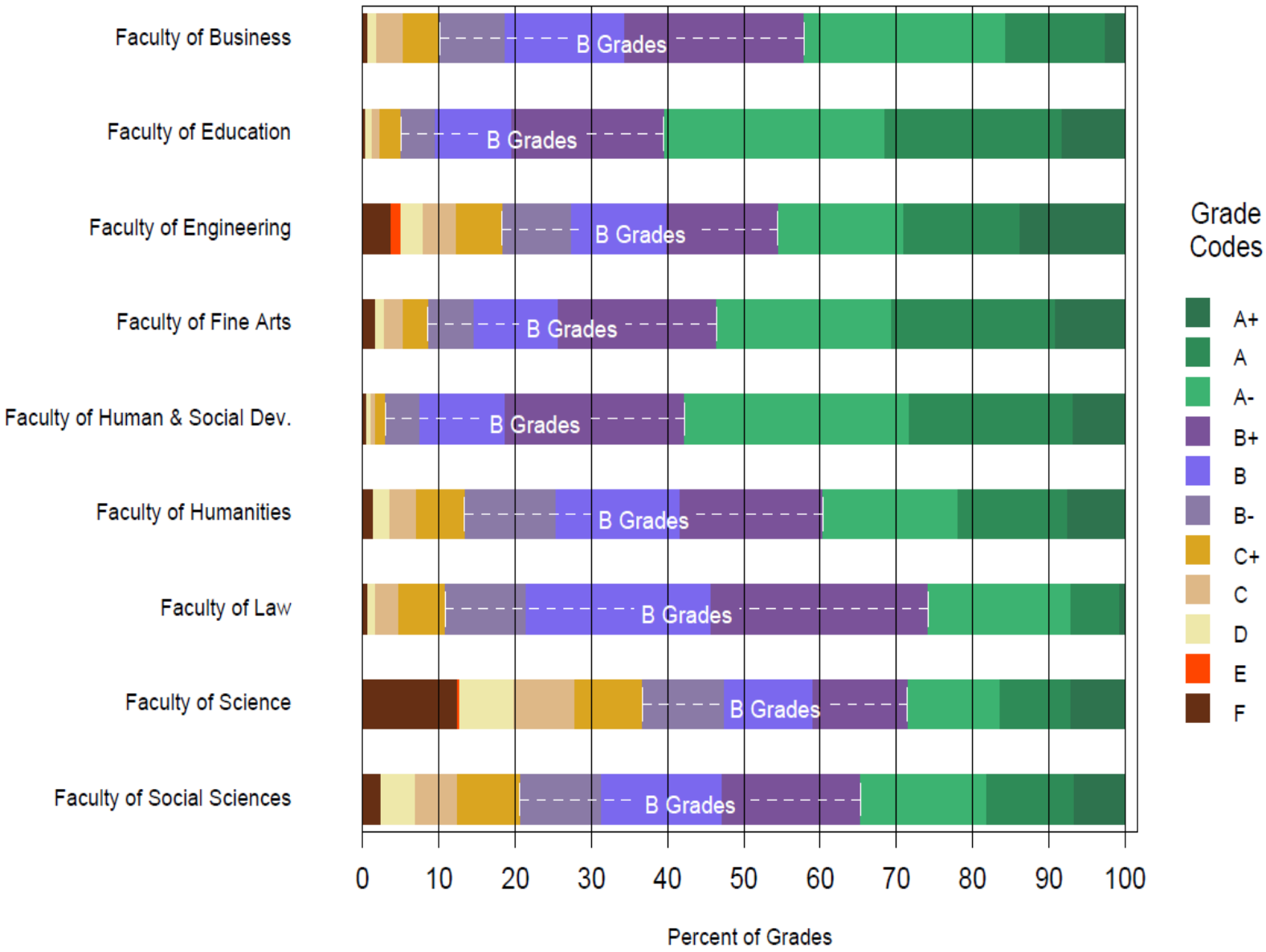
Legend at right



Going a step further with annotations

```
HBAR   TERM_CODE   /
       NOSTATS
       GROUP    = course_faculty
       SUBGROUP = Grade_Numeric
       TYPE     = PCT
       G100
       FRAME
       LEGEND = LEGEND1
       MAXIS  = AXIS1
       RAXIS  = AXIS2
       GAXIS  = AXIS3
       LREF   = 1
       CREF   = BLACK
       AUTOREF
       annotate = annotations ;
```

Percentage of Grade Distribution for Fall 2009



Percentages for each grade are relative to the total undergraduate grades in each faculty.

Creating Annotations dataset

- Gives instructions to SAS/Graph
- Has one observation per instruction
- The location of items can be given in relation to items in the bar chart (such as the horizontal bars)
- It's usually best to create the annotations using values in the dataset being charted as a starting point
  - In this case, however, the percentages had to be calculated first

Creating percentages, for use in building annotations

```
proc sql;
   create table percentages as
   select TERM_CODE,
          COURSE_FACULTY,
          sum(case when grade_code in ('A+', 'A', 'A-')
              then 1 else 0 end) as a_group,
          sum(case when grade_code in ('B+', 'B', 'B-')
              then 1 else 0 end) as b_group,
          count(*) as students,
          (calculated a_group) / (calculated students)
              as pct_a_group  format=percent7.1,
          (calculated b_group) / (calculated students)
              as pct_b_group  format=percent7.1
   from UVic_data
   group by TERM_CODE, course_faculty;
quit;
```

percentages dataset

TERM_CODE	COURSE_FACULTY	a_group	b_group	students	pct_a_group	pct_b_group
200909	Faculty of Business	1647	1864	3906	42.2%	47.7%
200909	Faculty of Education	2831	1612	4677	60.5%	34.5%
200909	Faculty of Engineering	1793	1427	3941	45.5%	36.2%
200909	Faculty of Fine Arts	1940	1366	3616	53.7%	37.8%
200909	Faculty of Human & Social Dev.	2196	1488	3799	57.8%	39.2%
200909	Faculty of Humanities	4341	5149	10952	39.6%	47.0%
200909	Faculty of Law	260	637	1006	25.8%	63.3%
200909	Faculty of Science	3271	3993	11474	28.5%	34.8%
200909	Faculty of Social Sciences	4771	6154	13768	34.7%	44.7%

Variables in the Annotate dataset

- When:
  - ‘A’ = write annotations after drawing chart
  - ‘B’ = write annotations before drawing chart (default)
  - Recommendation: usually you will want to use when=‘A’

Variables in the Annotate dataset

- Xsys and Ysys:
  - Specify how locations on the page are interpreted
  - E.g. xsys="2" and ysys="2" positions using data values (relative to those being charted)
  - E.g. xsys="7" and ysys = "7" positions using relative percentages of the data area

Variables in the Annotate dataset

- Hsys:
  - Specifies the size of text, symbols, and potentially a few other items
  - Same choices as for xsys and ysys
  - For simplicity, I use hsys="1", for size as a percentage of the data area

Variables in the Annotate dataset

- Function:
  - This is the key variable, giving the instruction this observation represents
  - Sample values:
    - ‘label’ – write text
    - ‘symbol’ – draw a symbol
    - ‘draw’ – draw a line from the previous position to a new position
    - ‘move’ – move to a position without drawing a line

Variables in the Annotate dataset

- Color: (without a “u”)
  - RGB

    e.g. cxCB74D9 (very light purple)
  - Named colors (in SAS registry)

    e.g. peachpuff
  - Color Naming System

    e.g. light moderate purplish blue
  - *plus many more ways*

Variables in the Annotate dataset

- Text:
  - When function="label", gives the text to be written
  - When function="symbol", gives the name of the symbol to be drawn
    - E.g. text="dot", with function="symbol", writes a dot symbol, not the word "dot"

Variables in the Annotate dataset

- Size:
  - Size is specified on the scale defined by the hsys coordinate system
  - When function="label", specifies the height of text
  - When function="symbol", specifies the height of the symbol
  - When function="draw", specifies the thickness of the line

Variables in the Annotate dataset

- Midpoint:
  - In a vbar or hbar chart, the midpoint variable is used to indicate the bar
  - Set it to the value of the midpoint variable
  - Need to also use group and/or subgroup if those are specified in the chart
  - Position along the bar is indicated by the x variable (for hbar charts) or the y variable (for vbar charts)

Variables in the Annotate dataset

- Group:
  - Applies to charts that use a group variable, in addition to midpoint variable
  - With the midpoint variable, names the bar that will help determine the position of an annotation element

Variables in the Annotate dataset

- X:
  - Indicates a location along the x (horizontal) axis
  - Can be used along with the midpoint variable for positioning on horizontal bar charts
  - Can be used along with the y variable for positioning in a plot

Variables in the Annotate dataset

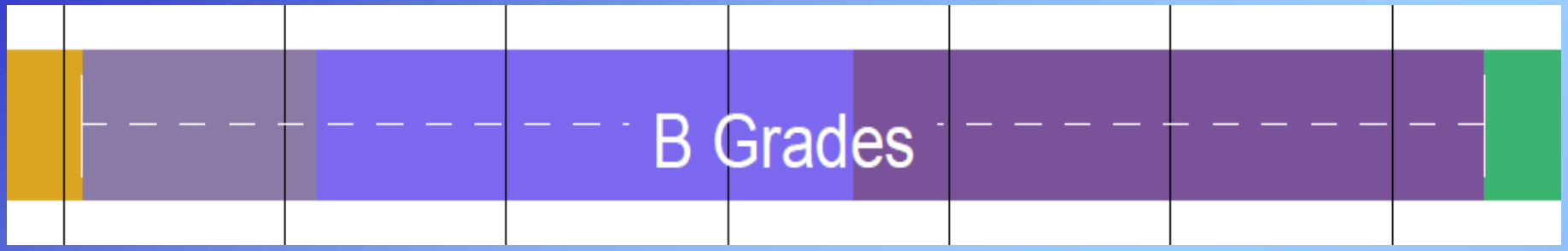
- Y:
  - Indicates a location along the y (vertical) axis
  - Can be used along with the midpoint variable for positioning on vertical bar charts
  - Can be used along with the x variable for positioning in a plot

Variables in the Annotate dataset

- Line:
  - Line type
  - When drawing lines:
    - Line type 1 = solid line
    - Line types 2 through 46 = various dot/dash lines

Instructions used to annotate each bar

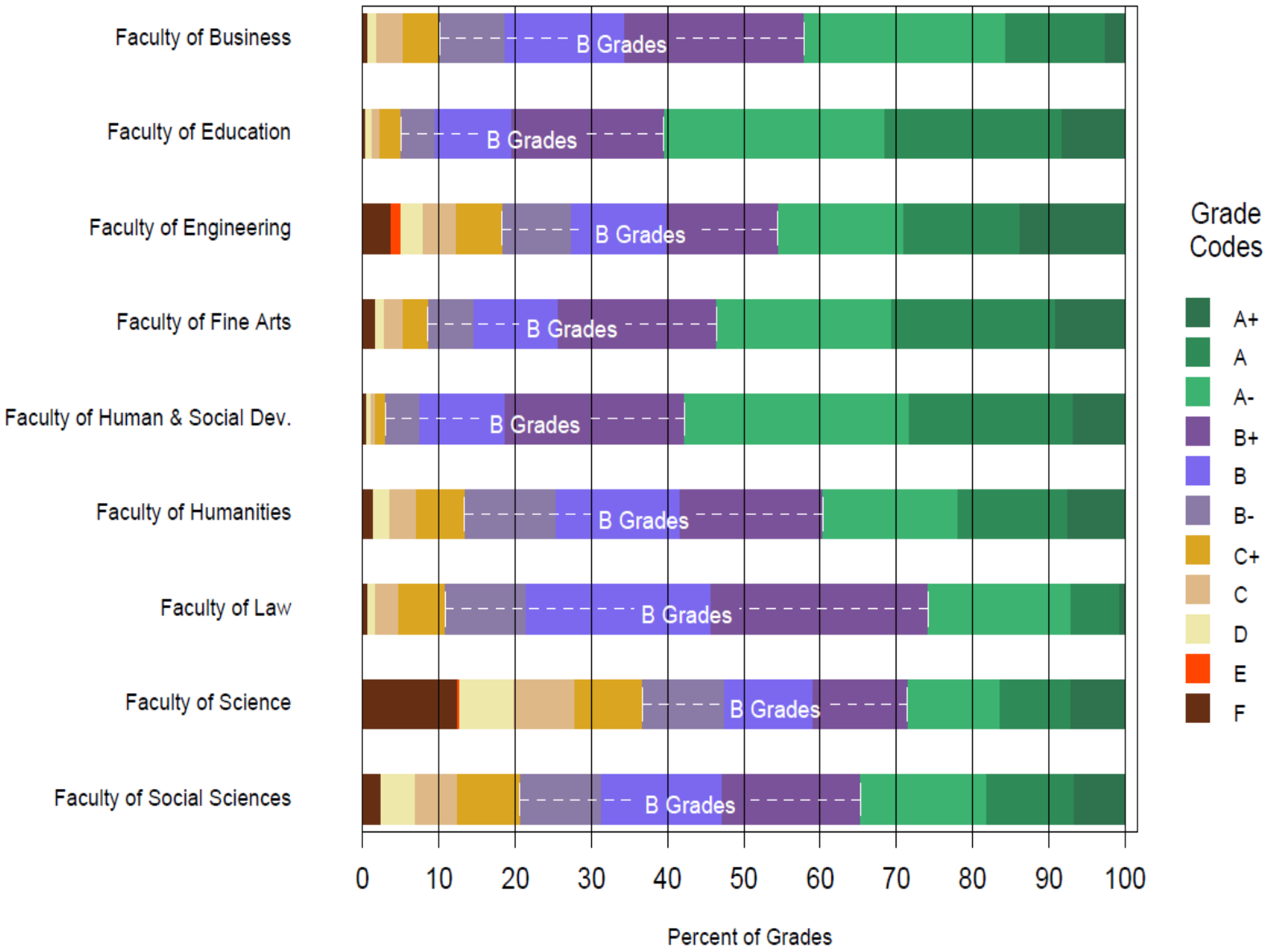
- Calculate all the relevant x values for positioning elements
- Using absolute positions:
  - Draw dashed lines across the B grades, leaving room for the text (line=2)
  - Put the label in the middle of the B grades
- At each end of the B grade group, draw a vertical line:
  - Position using absolute position (xsys, ysys='2')
  - Draw line using relative position (xsys, ysys='7')



when	hsys	group	midpoint	color	function	xsys	ysys	x	y	size	line	text
A	1	Faculty of Business	200909	white	move	2	2	10.1126				
A	1	Faculty of Business	200909	white	draw	2	2	26.9734		0.1	2	
A	1	Faculty of Business	200909	white	move	2	2	57.8341		0.1	2	
A	1	Faculty of Business	200909	white	draw	2	2	40.9734		0.1	2	
A	1	Faculty of Business	200909	white	move	2	2	33.9734		0.1	2	
A	1	Faculty of Business	200909	white	label	2	2	33.9734		3	2	B Grades
A	1	Faculty of Business	200909	white	move	2	2	10.1126		3	2	
A	1	Faculty of Business	200909	white	move	7	7	0	2	0.1	1	
A	1	Faculty of Business	200909	white	draw	7	7	0	-4	0.1	1	
A	1	Faculty of Business	200909	white	move	2	2	57.8341		0.1	1	
A	1	Faculty of Business	200909	white	move	7	7	0	2	0.1	1	
A	1	Faculty of Business	200909	white	draw	7	7	0	-4	0.1	1	

12 annotation observations per bar

Percentage of Grade Distribution for Fall 2009



Percentages for each grade are relative to the total undergraduate grades in each faculty.

Done

Questions?